GEN-SYS User Manual

About this Manual

This user manual contains all the information you will need to initially install and run the Owlstone GEN-SYS system. Additional information and updates are available on the Owlstonenanotech.com website under the vapour generator product tag. Also on the website are permeation source ordering information and software tools such as concentration calculators (see calculating concentrations section).

It is essential that this user manual be read and understood before commencing any work with the system. Read and understand the various precautionary notes, signs, and symbols contained inside this manual pertaining to the safe use and operation of this product before using the device. Using the GEN-SYS in a way that is not specified in this manual could be harmful to health of the operator and co-workers.

This symbol is used to highlight a section explaining particularly important safety considerations

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Contacting Owlstone

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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 so should not be disposed of in normal waste. In some locations the radioactive source has additional disposal requirements; please consult Owlstone Ltd for details of our recycling and disposal program for this product.

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

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 GEN-SYS is in conformity with the following standards:

- **EMC Directive**

  The GEN-SYS 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.

Introduction

Overview

The GEN-SYS is a modified 19" rack unit especially design to houses a series of instruments that provide the functionality and adaptability needed to create a wide range of vapour standards. As the system is based on a modular design the user has a choice of when and what modules they wish to employ, the choices of modules are the OVG-4, OVG-4C, 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 OVG-4C is a corrosive vapour version of the OVG-4 with silica coated flow path and optimised flow geometry to allow the generation of very corrosive vapours.
- The OHG-4 is the Owlstone humidity generator, which can create and monitor a range of humidities from 40 to 90 ± 1% RH and when used with the Owlstone flow controller (OFC-1) the humidity range increase from 1 to 90% ± 1% RH.
- The OFC-1 is a flow control unit that can provide accurate flows to increase the functionality of the OVG-4/4C and OHG-4.

Harmful substances

The 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 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.

Pre-installation guide

Location

GEN-SYS is designed to create chemical vapours, therefore to limit the user's exposure to these chemical vapours it is strongly recommended that the GEN-SYS be operated in a fume hood, or ideally in a well-ventilated space. 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°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 %

Power

GEN-SYS 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 GEN-SYS is 170 W. The Power supply comes with a 5A IEC mains lead for the UK, or a European / USA equivalent.

Warning if power is interrupted to unit this will result in an increase in concentration of vapour levels. If unit found in a powered down state it is suggested to purge the permeation oven by opening the split flow fully for 2 hours.

Gas supply

GEN-SYS requires a pressure regulated supply of air / nitrogen at 40 psi. As the GEN-SYS is primarily used to validate instrument detection capabilities it is recommend that the gas supply has a dew point lower then -35^{0}C, is free from impurities (Hydrocarbon 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 connected using Swagelok fittings.

Please note that if the gas supply is interrupted whilst a permeation source is being incubated within the 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 a flow controller alarm where the permeation oven will be turned off. If found in this state please purge the oven through the exhaust with the sample outlet closed.

Exhaust

A separate exhaust line off ¼" OD and 2 meters in length should be made ready to connect to the exhaust outlet of the GEN-SYS. This line should be checked for chemical compatibility and it is recommended that it is exhausted to a fume hood. Check the exhaust line at regular intervals for blockages and leaks.

Analyte(s)

- Check chemical compatibility: Materials in the flow path include PTFE, copper, stainless steel, and Viton®. Ensure 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 GEN-SYS.

General Installation safety requirements

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

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

OVG-4

Overview

The OVG-4 (Figure 1) is a versatile chemical vapour generator that when used in the GEN-SYS either on its own or in a combination of two or three can generate single or multiple gas mixtures. The OVG-4 comprises of two main sections, the oven and the flow control system. The oven chamber can hold up to three 6cm length, ¼" diameter PTFE permeation sources and the temperature is digitally controlled from 30 to 100C±0.1C in 0.1°C increments. The flow control system comprises of the sample flow and split flow. The sample flow is digitally controlled from 50ml min^{-1} to 500ml min^{-1} at 1 ml min^{-1} increments. The split flow is manually set using the needle value and split access at the front of the unit.

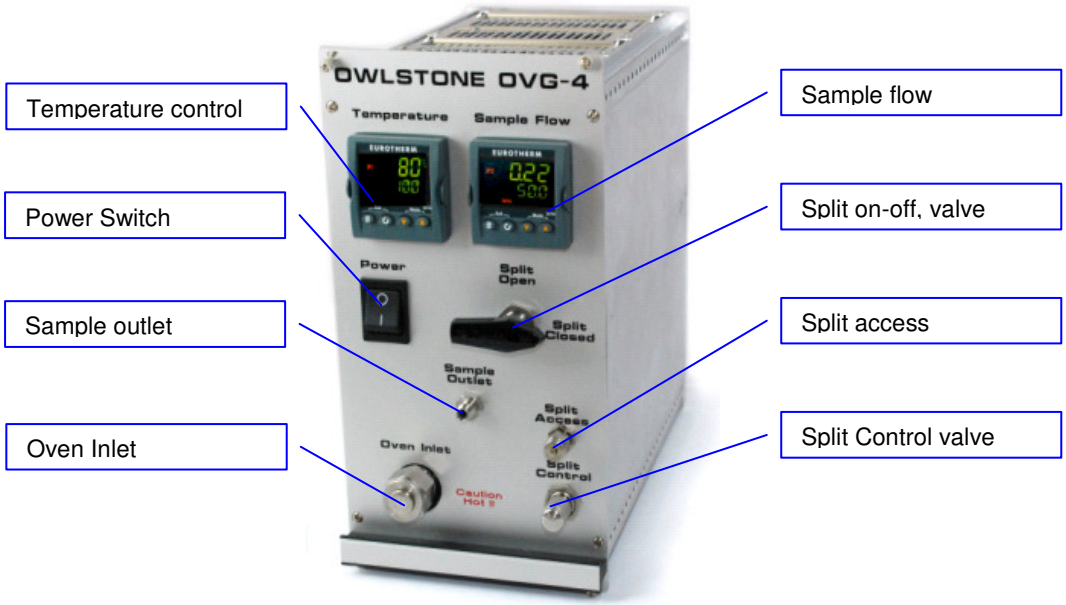


Figure 1 – The OVG-4

OVG-4 Parameters and Operating Ranges

Parameter	Operating Ranges
Gas	Air / nitrogen
Inlet pressure	40psi
Inlet fitting	¼" Swagelok quick connect
Sample outlet pressure	10psi
Outlet connection	1/8" Swagelok compression
Exhaust outlet	1/8" Swagelok compression
Oven Diameter	10mm
Oven length	200mm
Power supply	24V
Current rating	2.0A
Fuse	F2A H 250V
Temperature range	30 to 100C±0.1C in 0.1C increments
Sample flow	50ml min^{-1} to 500ml min^{-1} at 1 ml min^{-1} increments
Split flow range	50ml min^{-1} to 1000ml min^{-1}

OVG-4C – corrosion resistant OVG variant

The OVG-4C is a variant of the OVG with a silica coated flow path and optimised internal geometry to enable the generation of corrosive vapours. The OVG-4C operation is almost identical to the OVG-4 except that there is no split flow available.

The OVG-4C (Figure 2) is a versatile chemical vapour generator that when used in the GEN-SYS either on its own or in combination with other OVGs can generate single or multiple gas mixtures. The OVG-4C comprises of two main sections, the oven and the flow control system. The oven chamber can hold up to three 6cm length, ¼" diameter PTFE permeation sources and the temperature is digitally controlled from 30 to 100C ±0.1 °C in 0.1°C increments. The flow is controlled by a single mass flow controller via a digital controller.

When using corrosive vapour permeation sources a flow should be present at all times to prevent a build up of saturated vapour inside the permeation oven. Saturated vapours inside the OVG can damage the mass flow controller and flow path despite the OVG-4C's coatings and geometry.

Figure 2 – OVG-4C variant

OVG-4/4C 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 3; 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.

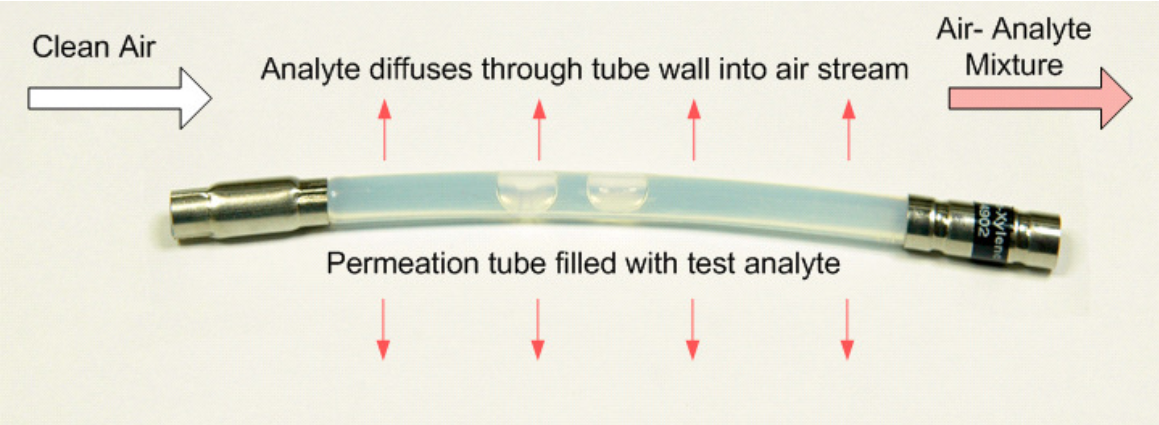


Figure 3 - Example of permeation device

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 (½" 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 (½" 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

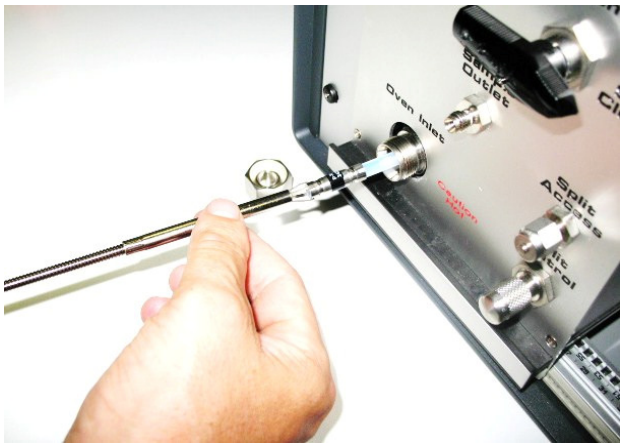


Figure 4 – Always use the supplied extraction tool

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 5. The Minimum and maximum temperature of the permeation oven are 25C and 100C respectively.

Figure 5 - Eurotherm temperature controller

Temperature Control Alarms

The temperature controller alarms when a deviation of ±0.2C from the set point is encountered (see Figure 6), 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).

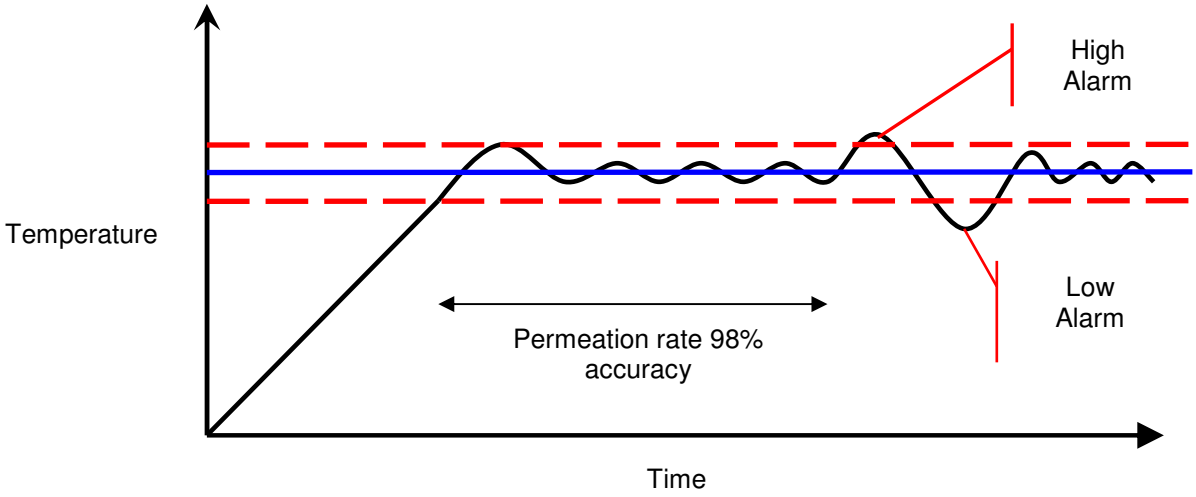


Figure 6 - Set point deviation alarm

Flow Path and Flow Control

Figure 7 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.

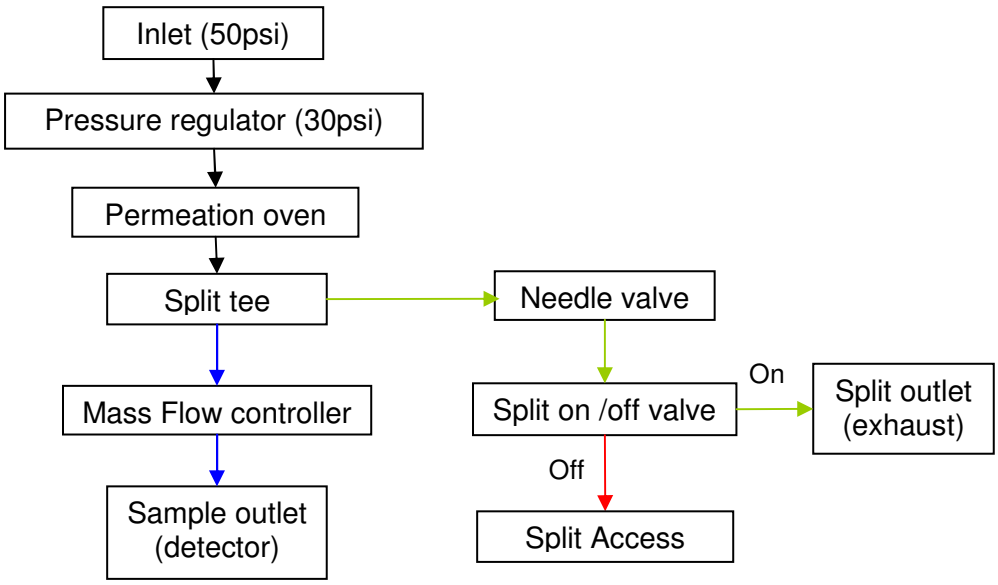


Figure 7 - Schematic of flow path through the OVG-4

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 8. The maximum and minimum flows are 500 and 50ml min^{-1} respectively

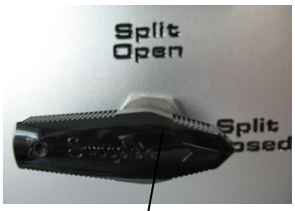
Figure 8 - Eurotherm sample flow controllers

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 9 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.



Turn split open-close valve to Closed position

Remove split access plug wit 7/16th spanner and attach flow meter

Whist measuring split flow from split access use split control to set split flow rate

Replace split access plug finger tight followed by a ¼ turn with a 7/16th spanner

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

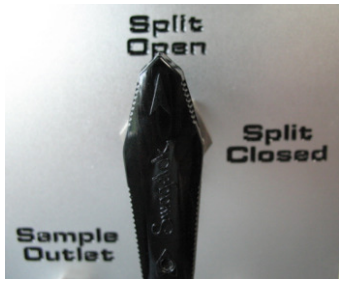


Figure 9 - How to change the split flow

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 ¼ turn with a 7/16th spanner), as failure to do so could result result in uncheck release of vapour.

Always have the split flow set within the range of 100 – 1000ml min^{-1}.

Sample outlet

An 1/8" compression fitting is used for the sample outlet, to which and 1/8" tubing (ID no less the 1mm) can be connected to act as a transfer line between the OVG-4 and testing device. Do not over tighten Finger tight followed by a ¼ turn is sufficient to ensure a leak tight connection. Also the testing device can sample straight from the sample outlet.

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.

To increase the concentration range that can be generated an extra dilutent gas can be attached to the sample outlet.

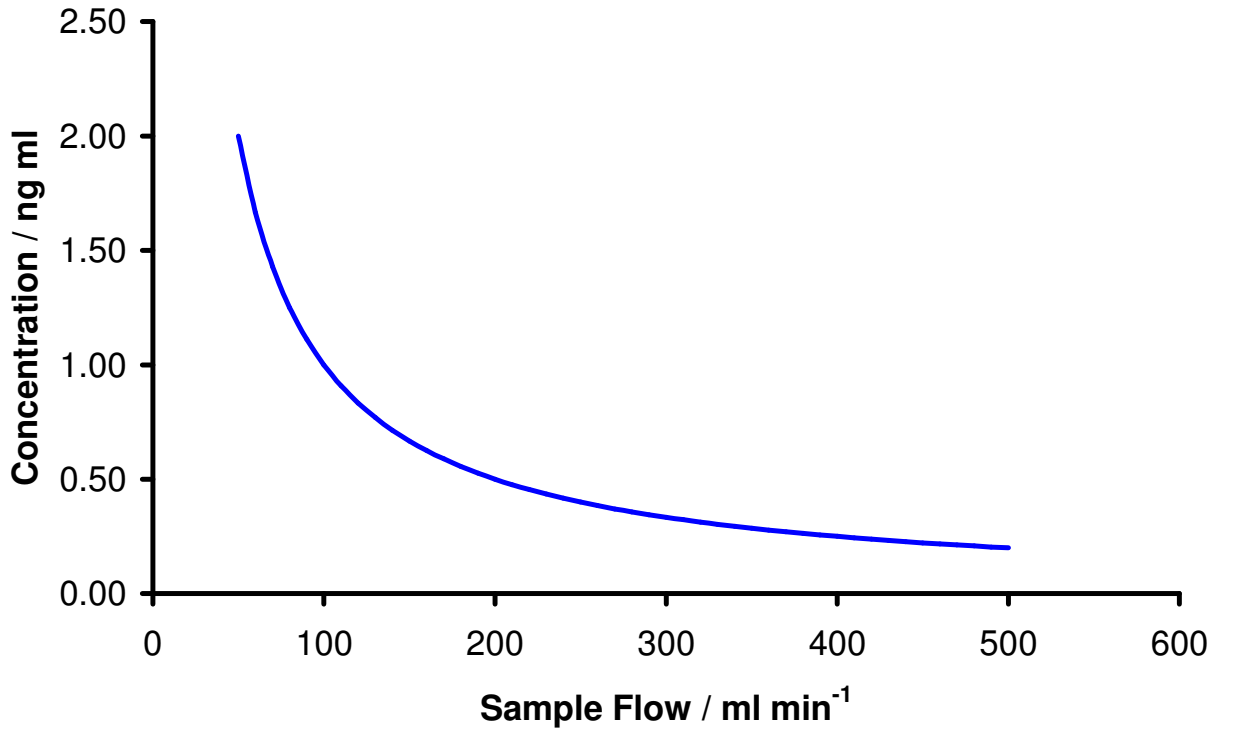
OVG-4/4C Calculating concentrations

Calculating concentrations with split flow closed and open

The split flow can be opened or closed dependent on the user requirements. When the split valve is closed, the OVG-4 works as a normal vapour generator where the concentration (Equation 1) can be altered by adjusting the sample flow as shown in Figure 10.

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

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



F

igure 10 - Theoretical analyte concentrations at different sample flows, with an analyte permeation rate of 100ng min^{-1}

Whereas with the split flow open the concentration is still altered by adjusting the split whilst the sample flow remains constant, with the split flow open, the concentration is calculated (Equation 2) by dividing the permeation rate by the sum of the split and sample flow, therefore adjusting either flow will alter the concentration. Figure 11 outlines the different concentration ranges that can be generated using the split flow with a high or low sample flow

$$[i] = PR / \left[F_{SP} + F_{SA}\right]$$

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}

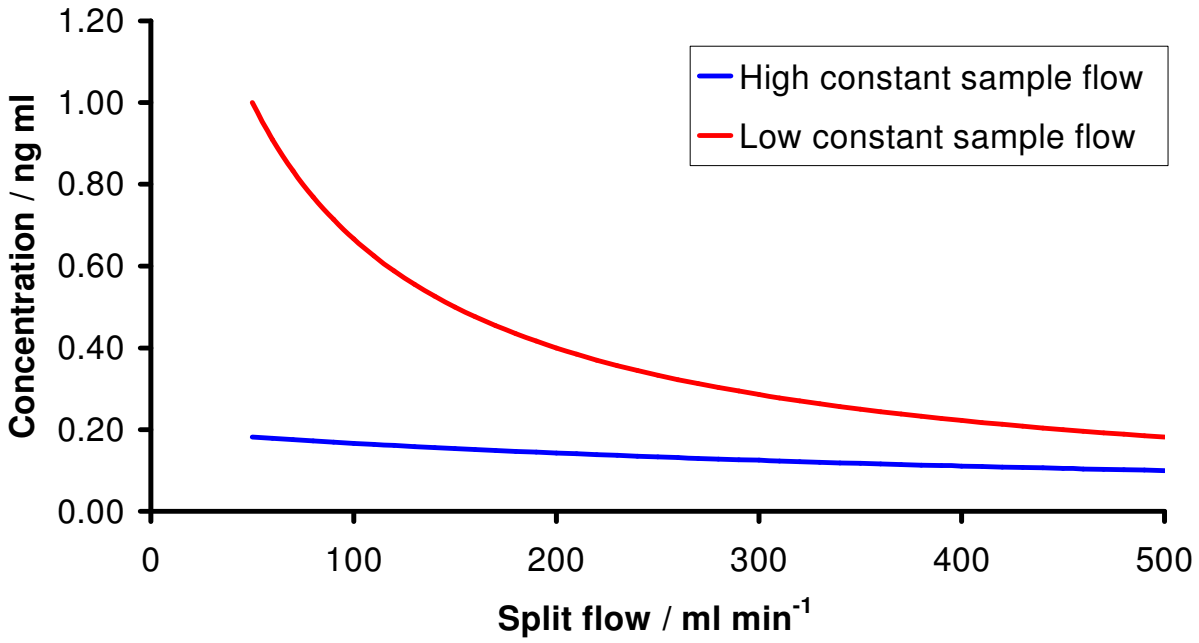


Figure 11 - Theoretical High and low constant sample flow concentrations at different split flows. Concentrations calculated using an analyte permeation rate of 100ng min^{-1}

On the Owlstonenanotech.com website an online concentration calculator is available to simplify the setting of flows, temperatures and splits to give a particular concentration for a particular source.

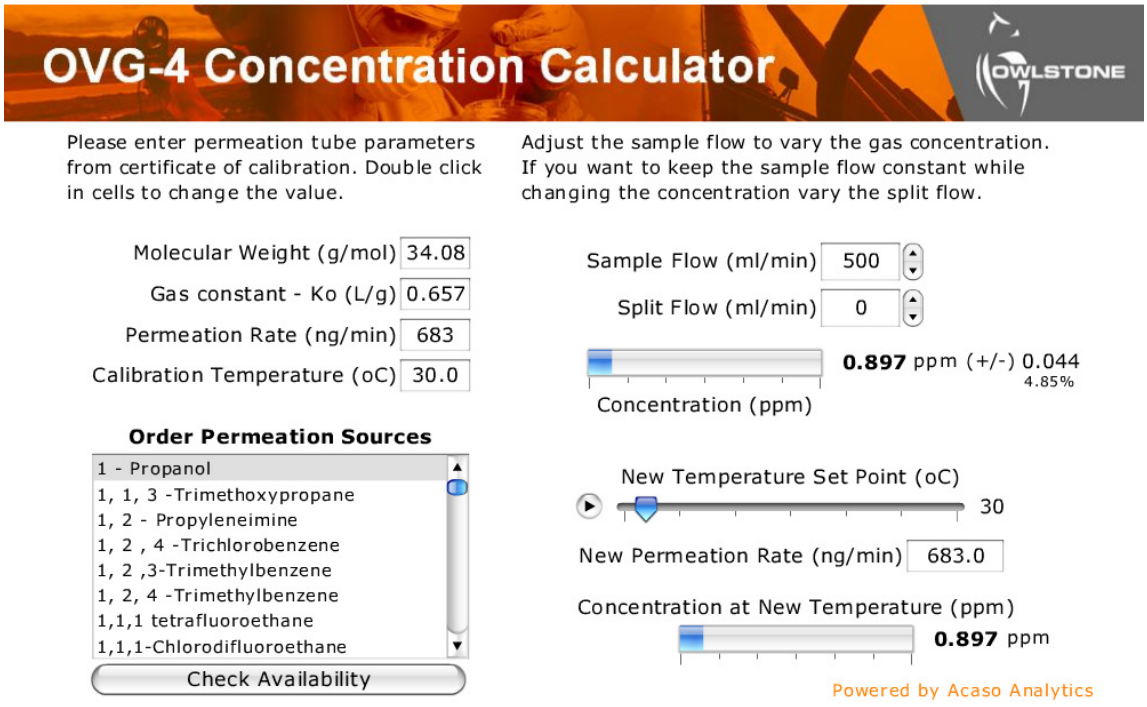


Figure 12 - Concentration calculator

OVG-4/4C Maintenance

The OVG-4 is design to be run continuously at the set point temperature with minimum maintenance, however it is recommended to ensure prime performance that the following steps are taken:

Maintenance Step	When	How
System bake-out for 1 days	Every time a permeation device is changed	After removing device, set temperature to 100C and have the split and sample flow at 500 ml min^{-1}
Service	Every Year	Contact supplier: The temperature, flow and mass flow controller will be recalibrated

OVG-4/4C Troubleshooting

Symptom	Possible cause/remedy
OVG-4 does not switch on	• Check unit is plugged in • Check fuse on back of unit and replace if necessary with F2A H 250V fuse • Contact supplier
Unstable or inaccurate concentration generation	• Check Gen-sys unit for leaks (see section 4.6)
Sample flow does not match set point	• Check gas supply line • Check outside pressure is set to 40psi • Flow path blockage (contact supplier) • Check oven inlet is tighten fully (finger tight ¼ turn) • Check that the transfer line attached to the split outlet has a I.D greater then 1mm • Check that there is no flow restrictions after the sample flow outlet
Split flow non operational (OVG-4 only)	• Contact supplier
Contamination	• Bake out the unit at 100°C with the split and sample flow at 500 ml min^{-1} until contamination has been removed
Chemical vapour is decreasing	• Change permeation source
Not reaching correct temperature	• Flow Interruption alarm activated (see section 4.4.4.2) • Thermal cut out switch activated, contact supplier
Over shooting set-point temperature	• Contact supplier

OHG-4

Overview

The OHG-4 (Figure 13) is a versatile humidity generator to be used to generate a range of relative humidity concentrations from 1 to 90% ± 1%.

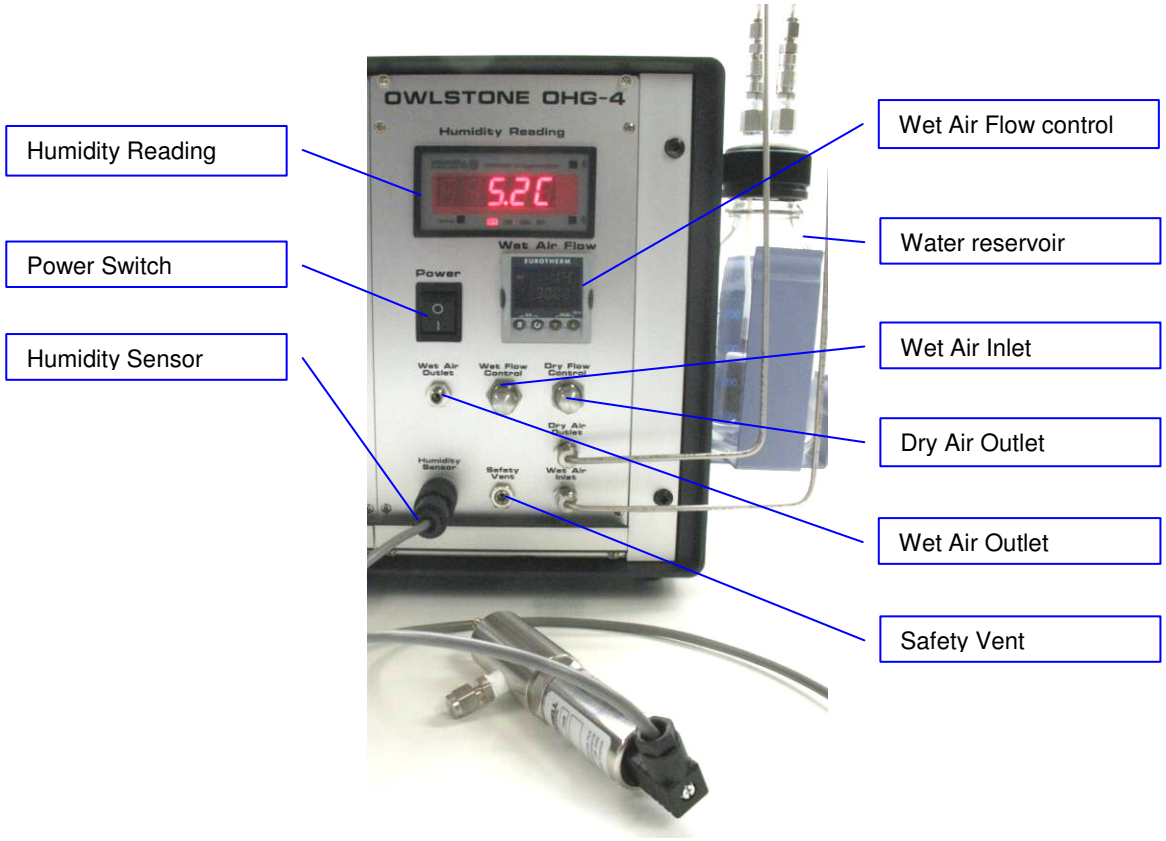


Figure 13 - OHG-4

OHG-4 Parameters and Operating Ranges

Parameter	Operating Ranges
Gas	Air / nitrogen
Inlet pressure	50psi
Inlet fitting	¼" Swagelok quick connect
Sample outlet pressure	10psi
Outlet connection	1/8" Swagelok compression
Power supply	24V
Current rating	0.5A
Fuse	1AF
Humidity range	30 to 100°C±0.1°C in 1°C increments
Wet gas outlet flow	500ml min^{-1} to 3000ml min^{-1} at 1 ml min^{-1} increments

Operating parameters for the OVG-4

OHG-4 Operation

The OHG-4 is designed to generate and monitor a range of humidities. The humidity is varied by changing the ratio of dry air to wet air using two control valves and the generated humidity can then be monitored using the integrated hygrometer.

Flow Path and Flow Control

Figure 14 is a schematic of the flow path through the OHG-4. The airflow is controlled by a mass flow controller, a flow suitable for the application should be set on the OHG on the front panel wet air flow control (which controls the mass flow controller), this flow is then split between two flow paths, one a direct path the other passing through a water reservoir before mixing. The ratio of the two valve setting controls the humidity.

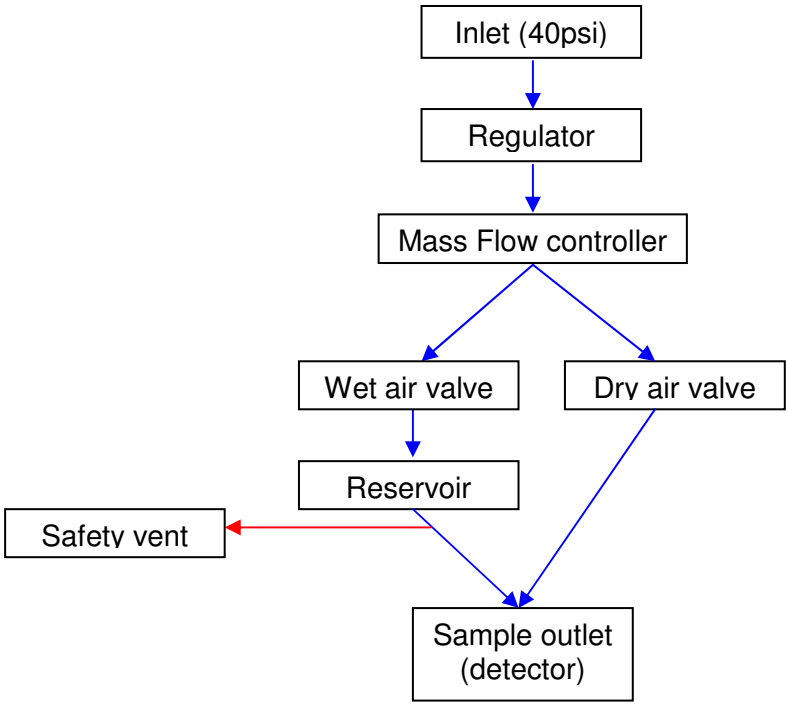


Figure 14 Schematic of flow path through the OHG-4

Setting the wet air flow

The wet air flow is set by using the up and down arrow keys (red circle) on the right Eurotherm controller as shown in figure 15. The maximum and minimum flows are 3000 and 300ml min^{-1} respectively

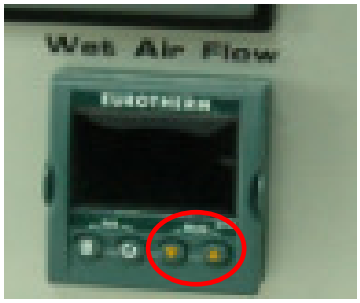


Figure 15 Eurotherm with airflow controllers

Setting the humidity level

The two control valves set the ratio of dry to wet air passing through the outlet. With the dry control closed (clockwise) and the wet control open maximum humidity can be achieved (~90% RH). Slowly opening the dry control will give humidity levels between 90% and 45% RH. Once the dry control valve is fully open slowly closing the wet valve will provide humidities between 45% and 0% RH.

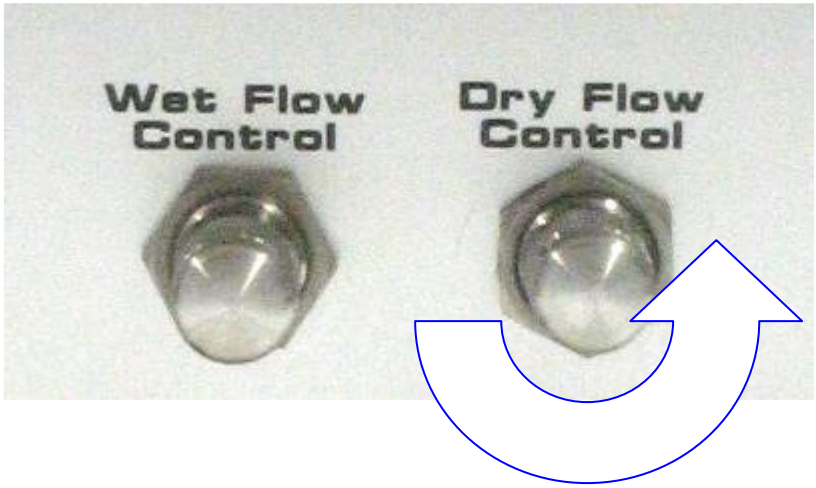


Figure 16 control valves

Safety vent

To protect the water reservoir from over pressure a safety valve is fitted which will vent at 10psi of overpressure.

Do not obstruct, block or bypass the safety vent.

Figure 17 - Safety vent

Humidity Measurement

The integrated hygrometer manual contains further details on the operation of the humidity sensor. Humidities can be displayed as %RH, dew point or ppm.

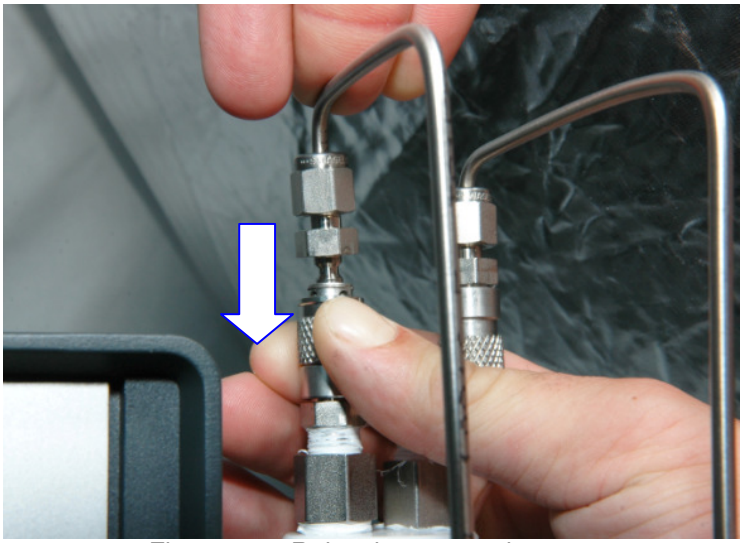
OHG-4 Maintenance

The OHG-4 is design to be run continuously at the set point temperature with minimum maintenance, however it is recommended to ensure prime performance that the following steps are taken:

Maintenance Step	When	How
Water change	Every 2 months or when level falls below top of diffuser	Always use distilled water. follow instruction below
Service	Every 12 months	Contact supplier: Flow and mass flow controller will be recalibrated

Changing water reservoir

To release the bottle pull the quick connect stubs down till the connectors pop out.



Push the body of the QC down. Pull out QC stub and release body

Figure 18 – Releasing reservoir

Fill the bottle with distilled water to the 400ml mark and reconnect the reservoir by reversing the removal process.

Check the bottle when refilling, any damage to the reservoir bottle (even a scratch/chip) effects the vessels pressure rating, if any damage is found do not use the OHG and contact Owlstone for a replacement.

OHG-4 Trouble shooting guide

Problem	Solution
Does not switch on	• Check unit is plugged in • Check fuse on back of unit and replace if necessary with a T1A fuse • Contact supplier
Sample flow does not match set point	• Check outside pressure is set to 50psi • Check that the transfer line attached to the split outlet has a I.D greater then 1mm • Check gas supply line • Check that there is no flow restrictions after the sample flow outlet
Cannot reach the desired humidity level	• Check water reservoir • Check for leaks in the tubing

OFC-1

Overview

The OFC-1 (Figure 19) is a versatile flow controller and is used to increase the functionality of the OHG-4 and OVG-4.

Figure 19 - OFC-1

OFC-1 Parameters and Operating Ranges

Parameter	Operating Ranges
Gas	Air / nitrogen
Inlet pressure	50psi
Inlet fitting	¼" Swagelok quick connect
Sample outlet pressure	10psi
Outlet connection	1/8" Swagelok compression
Power supply	24V
Current rating	0.5A
Fuse	1AF
Flow range	500ml min^{-1} to 3000ml min^{-1} at 1 ml min^{-1} increments

Operating parameters for the OFC-1

OFC-1 operation

The OFC-1 is designed to generate and monitor a range of different flows. This is achieved by using the Eurotherm controller. The airflow is set by using the up and down arrow keys (red circle) on the Eurotherm controller as shown in figure 20. The maximum and minimum flows are 3000 and 500ml min^{-1} respectively

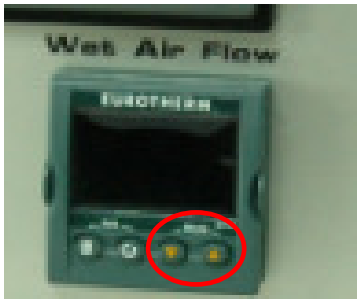


Figure 20 Eurotherm sample flow controllers

OFC-1 maintenance

The OFC-1 is design to be run continuously with minimum maintenance, however it is recommended to ensure prime performance that the following steps are taken:

Maintenance Step	When	How
Service	Every 6 months	Contact supplier: Flow and mass flow controller will be recalibrated

OFC-1 trouble shooting guide

Problem	Solution
Does not switch on	• Check unit is plugged in • Check fuse on back of unit and replace if necessary with a 1AF fuse • Contact supplier
Sample flow does not match set point	• Check outside pressure is set to 50psi • Check that the transfer line attached to the split outlet has a I.D greater then 1mm • Check gas supply line • Check that there is no flow restrictions after the sample flow outlet

GEN-SYS Rack Unit

The GEN-SYS Rack Unit is an adaptable mounting system for the component modules, which provides for the connection of power and other services to the modules.

Note: A set of modules installed in the GEN-SYS Rack Unit and powered by the supplied PSU forms a system that is complaint with the EMC Directive and the Low Voltage Directive. Compliance with these Directives cannot be assumed if an alternative PSU is used, or the modules are used outside the GEN-SYS Rack Unit.

GEN-SYS Parameters and operating ranges

Parameter	GEN-SYS.
Gas	Air / nitrogen
Inlet pressure	40psi
Inlet	¼" Swagelok
Exhaust outlet	¼" Swagelok
PSU	24VDC
Current rating	6.0A

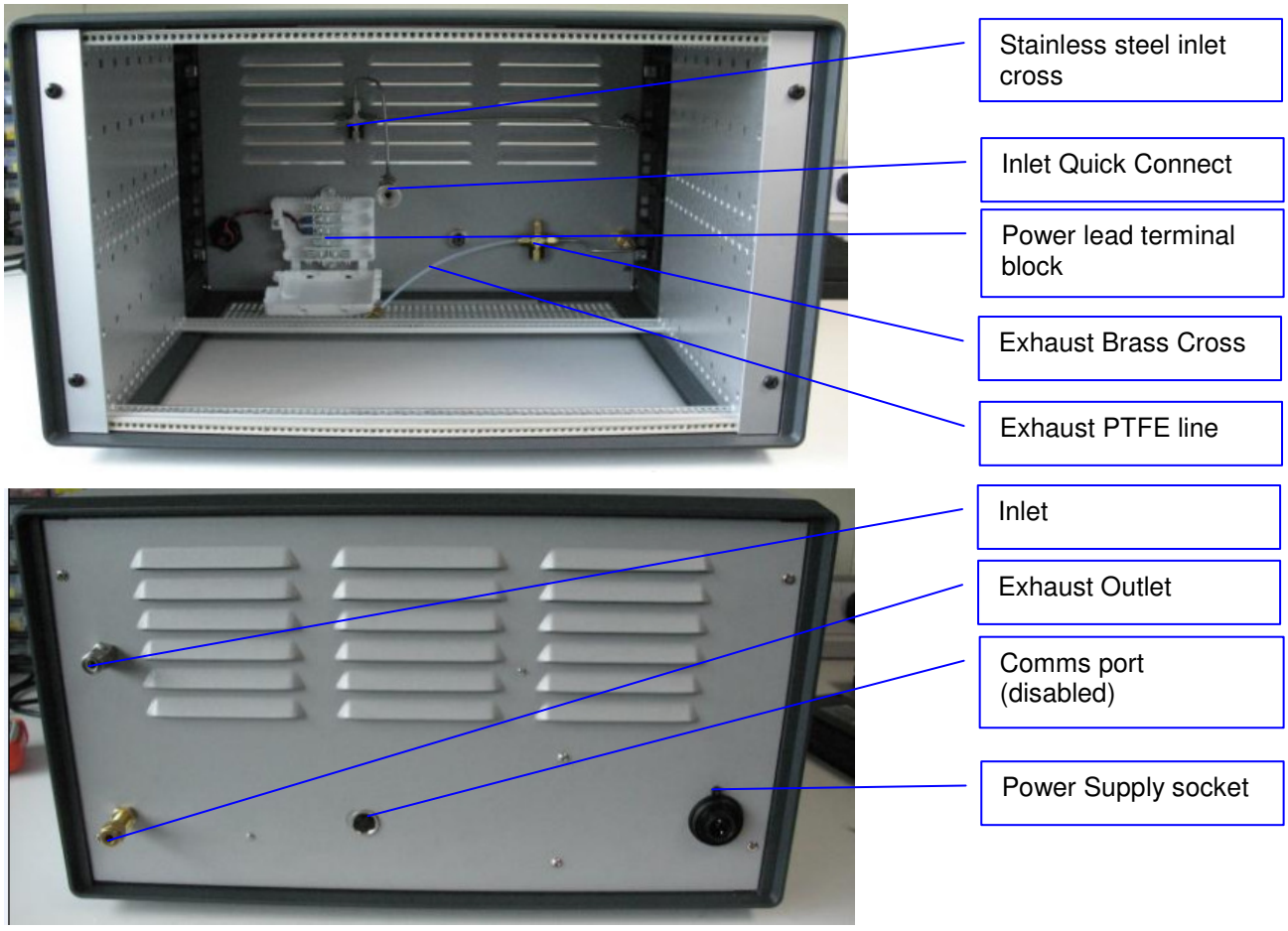


Figure 21 - Gen-Sys Rack unit front and back view

GEN-SYS Rack Unit Installation

Regardless of modular configuration, each GEN-SYS Rack Unit is the same to install.

Gas line Installation

Connect a clean dry air supply (40psi) to the stainless steel ¼" inlet situated at the back of the rack unit. It is recommended that ¼" analytical grade stainless steel tubing be used; however refrigeration copper tubing may also be used.

Exhaust line Installation

Referring to Figure 1 connect a 2 meter exhaust line venting into a fume-hood to the ¼" exhaust outlet situated on the back of the racking unit below the inlet. It is important to note that using longer lengths of exhaust line or an exhaust under negative pressure can effect the total split flow exiting each OVG.

Power Supply Unit

Connect the power supply to the back of the GEN-SYS Rack Unit and the plug to the mains power supply. Please ensure that the mains plug is accessible during operation.

GEN-SYS Rack Unit Maintenance

Maintenance is limited but the following tasks should be performed periodically:

- Check that all cables are intact with no damaged insulation or frays.
- Check that the pipe-work, particularly the exhaust pipe-work is in good condition and correctly connected.
- Clean the unit: Clean the outside of the equipment with a damp cloth, using water only. 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 it from 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.

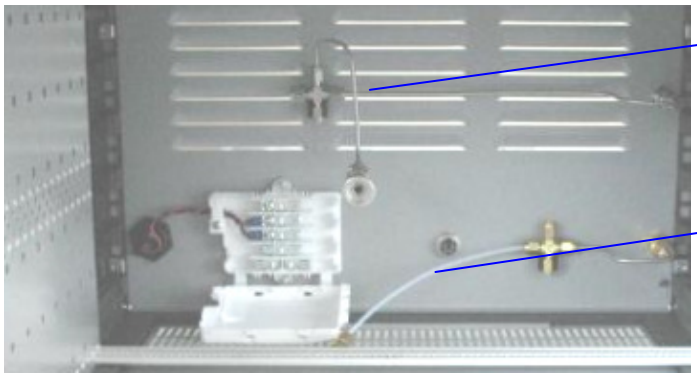
Routine Safety Tests

The power supply supplied with this product provides protection by double insulation, but because it has a functional earth, cannot be marked as double insulated. The earth connection is not a protective conductor and should not be tested for continuity using e.g. a PAT tester.

If routine tests are to be made, we recommend an insulation test at 500 Vdc. Routine flash testing is not recommended for any electrical equipment, because repeated high voltage tests degrade insulation materials.

Sub unit installation into GEN-SYS

The first OVG-4 arrives already installed into the Gen-Sys, however if additional units are purchased afterwards the user will have to install these additional units. Referring to Figure 22 the air inlet, split outlet and power supply socket must be connected to the GEN-SYS rack unit to do this use the 1/8" PTFE tubing and brass Swagelok fittings provided in the fittings pack; connect the 1/8" PTFE and stainless steel tubing with quick connector to the brass exhaust cross and the stainless steel inlet cross respectively, and the red and black power lead into the white terminal block.



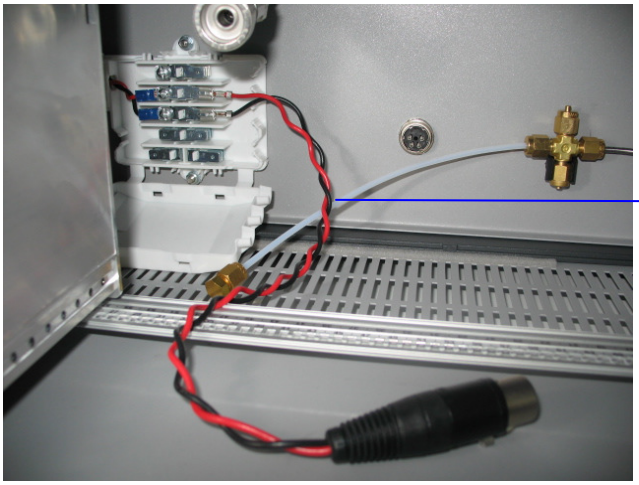


Figure 22 - Gen-Sys rack unit connections

Installation of an OVG into the GEN-SYS

Fit the OVG-4 into the GEN-SYS rack.

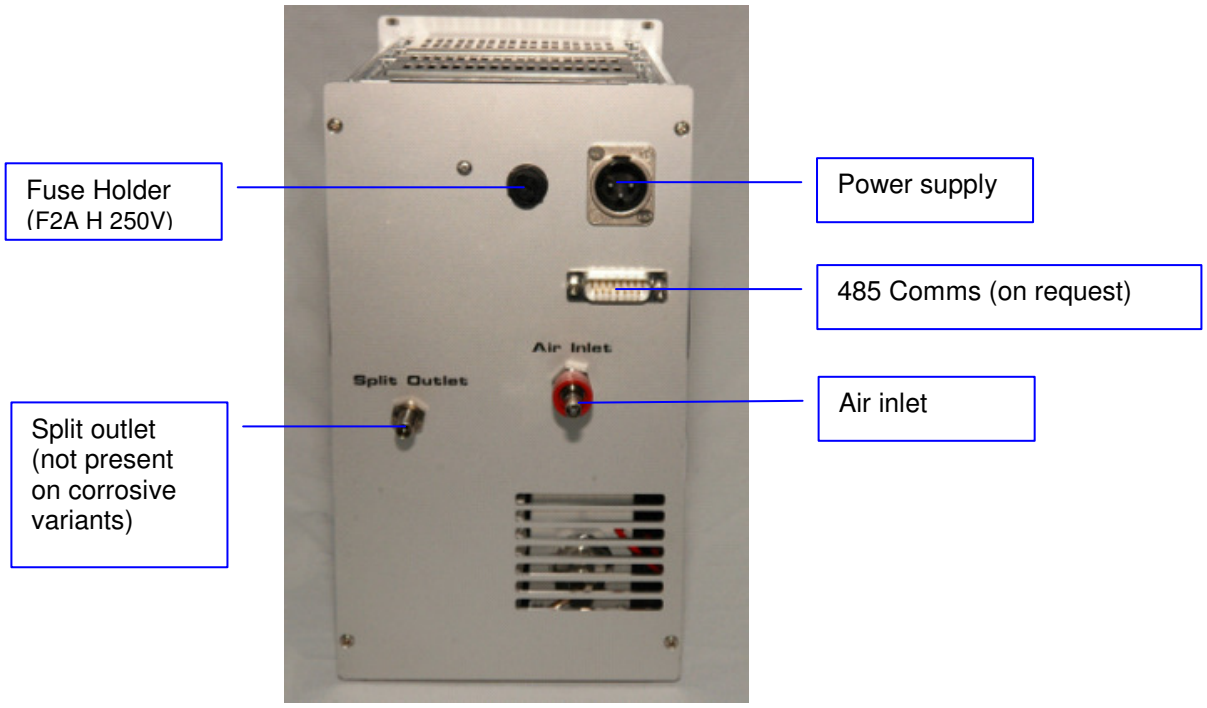


Figure 23 - OVG-4 connections

Important: Please insure that all unused exhaust outlets on the brass cross union are blanked, as failure to do so will result in exhaust failure.

Referring to Figure 24 the air inlet, split outlet and power supply socket must be connected to the GEN-SYS to do this:

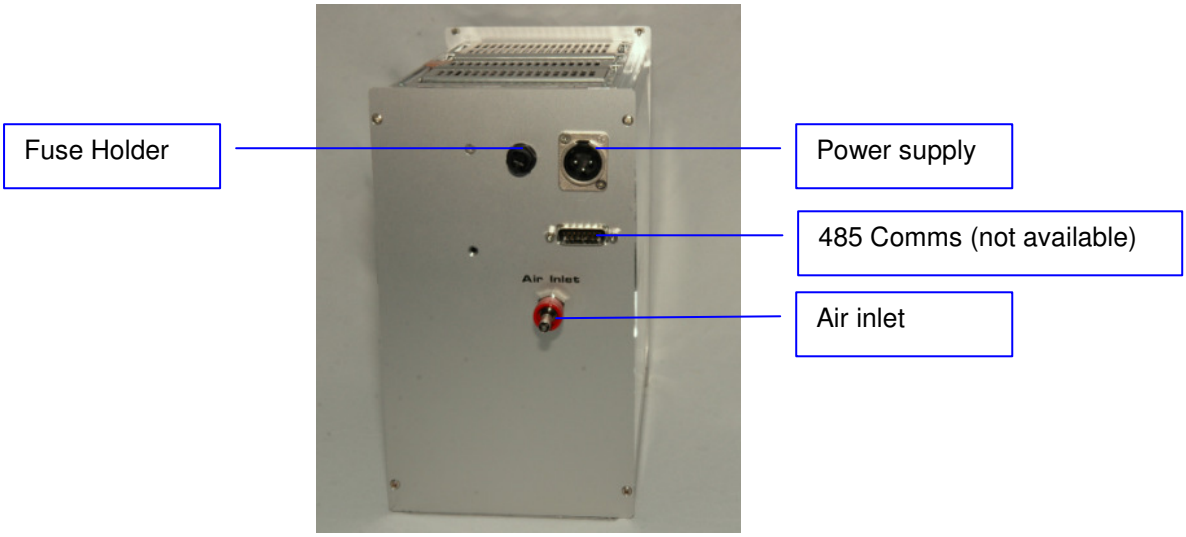


Figure 24 Back view of the OFC-1

Connect the quick connect value to the air inlet as shown on Figure 25, by pushing valve firmly on the inlet until a click is heard

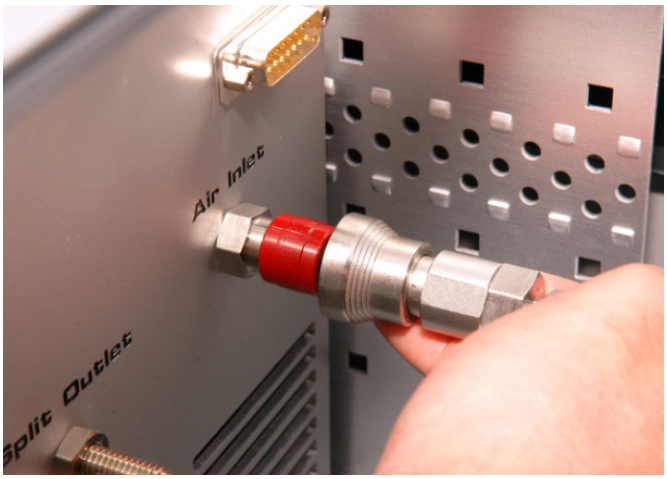


Figure 25 - Connect Quick Connect Valve

Plug power cable in to power socket

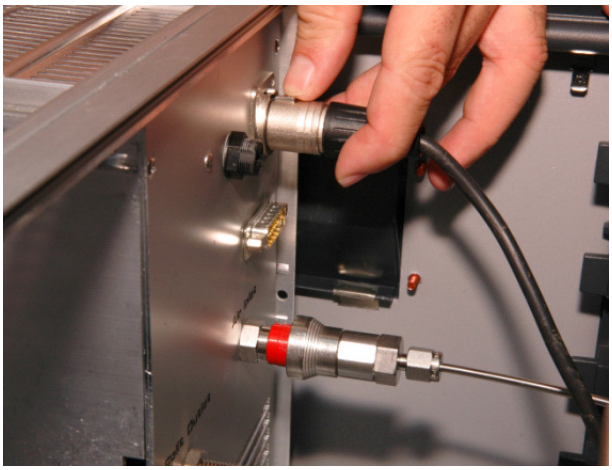


Figure 26 - Plug power cable into socket

Finally attach the PTFE exhaust line to the split out, by finger tightening nut and then further tighten with a ¼ turn using a 7/16” spanner.

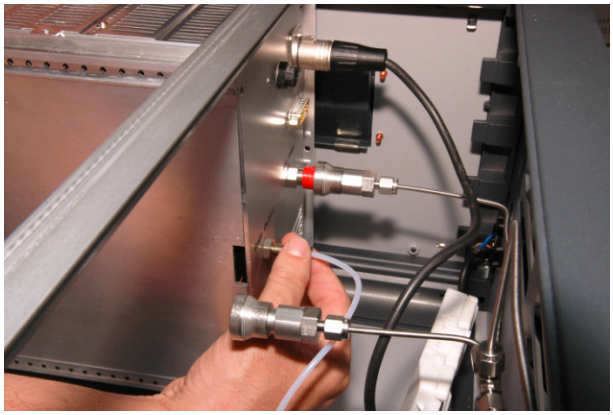


Figure 27 - Attach PTFE exhaust line to split outlet

The OVG-4 is now installed.

Installation of an OHG into the GEN-SYS

Referring to Figure 28 the air inlet, split outlet and power supply socket must be connected to the GEN-SYS to do this:

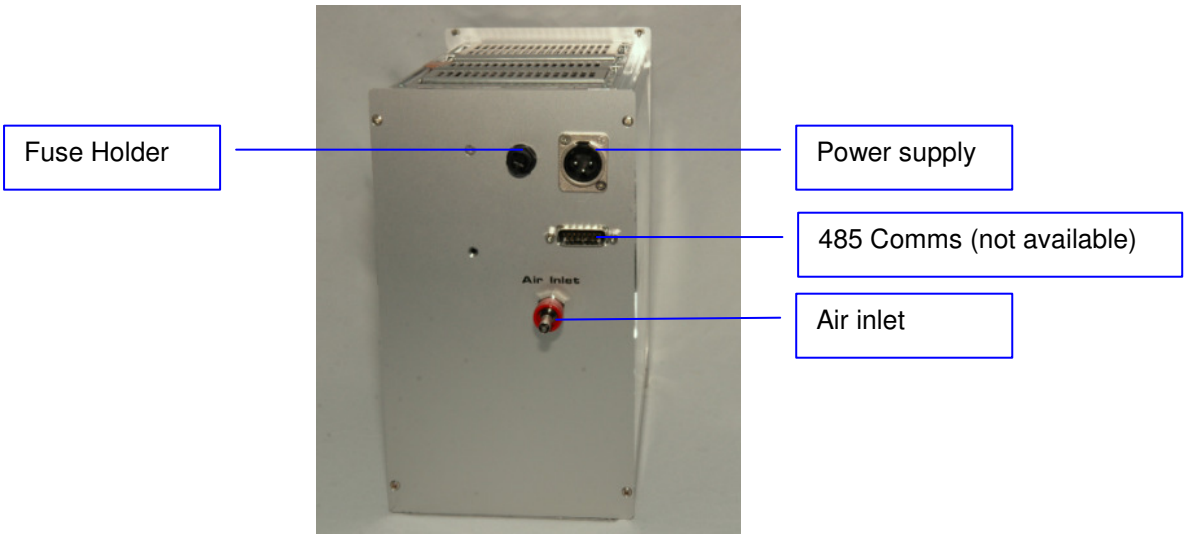


Figure 28 - Back view of the OHG-4

Place the OHG-4 into the GEN-SYS as shown in Figure 29 being careful not to trap any cables or tubing.

Figure 29 - Place OHG-4 in the GEN-SYS on the side with the reservoir holder

Connect the quick connect value to the air inlet as shown on Figure 30, by pushing valve firmly on the inlet until a click is heard

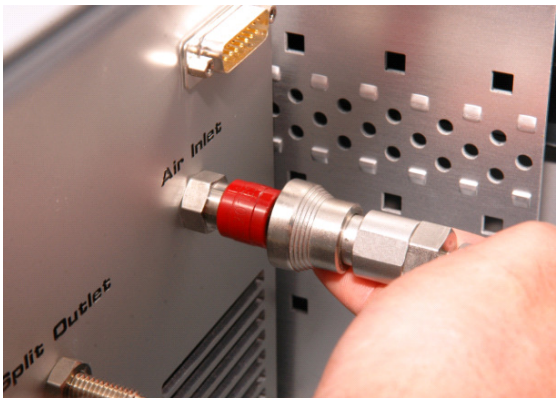


Figure 30 Connect Quick Connect Valve

Plug Power cable in to power socket

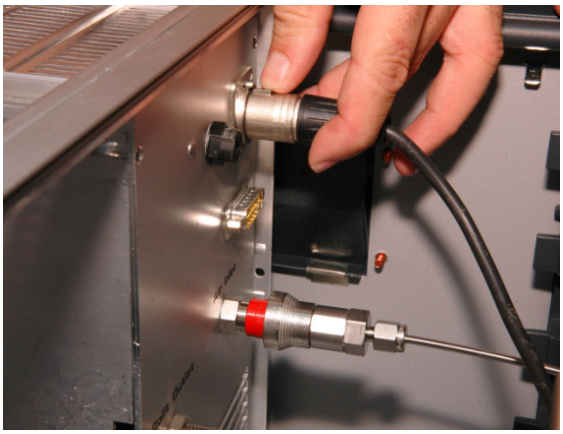


Figure 31 Plug power cable into socket

Connect the 1/8” tubing with the quick connect stub (blue circle) to the dry air outlet and the other 1/8” tubing with the quick connect body (red circle) to the wet air inlet.

Figure 32 Attach 1/8” tubing

Place water reservoir in the holder found to to the side of the Gen-Sys unit and attached the quick connects as shown in Figure 33.

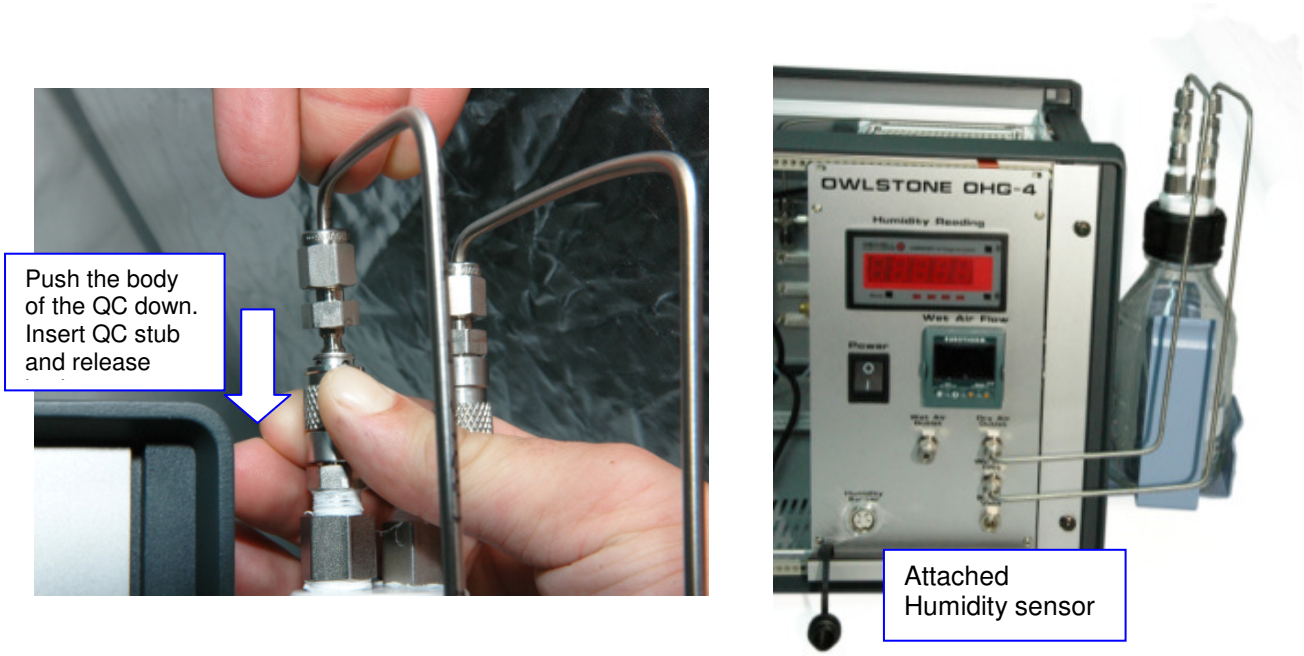


Figure 33 - Connect water reservoir and the hygrometer to the OHG-4

The OHG-4 is now installed

Installation of an OFC into the GEN-SYS

Referring to Figure 34 the air inlet, split outlet and power supply socket must be connected to the GEN-SYS to do this:

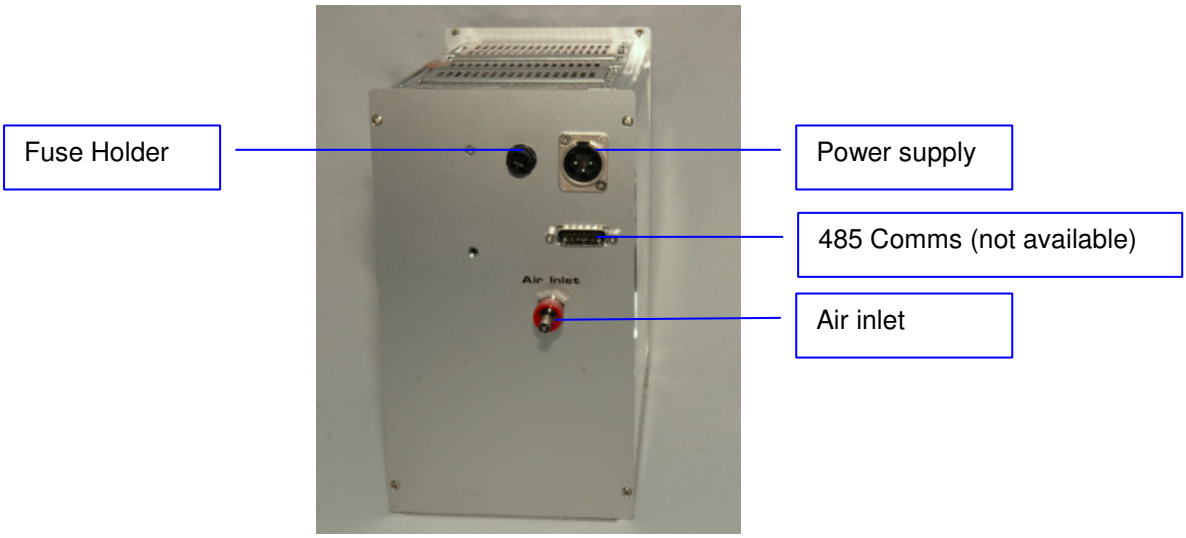


Figure 34 Back view of the OFC-1

Connect the quick connect value to the air inlet by pushing valve firmly on the inlet until a click is heard.

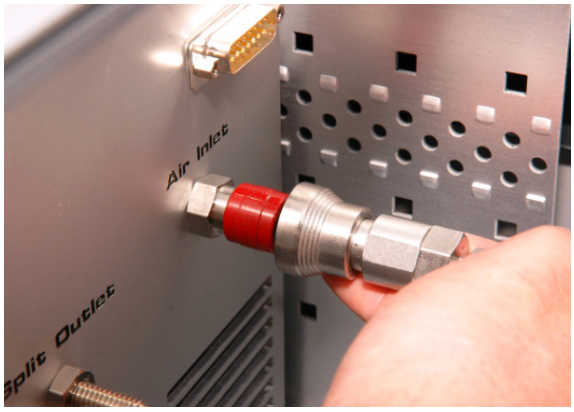


Figure 35 - Connect Quick Connect Valve

Plug power cable in to power socket

Figure 36 - Plug power cable into socket

The OFC-1 is now installed