



Valco Instruments Co. Inc.

Miniature Helium Purifier and Nitrogen Purifier Instruction Manual

For item numbers:

HPM
HPM-220
NPM
NPM-220

HPM.p65

1/11

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Introduction

Virtually all commercial gas chromatographs contain certain components at levels which are unsuitable for low ppb universal analyses (although they may not be problematic for flame ionization and thermal conductivity detectors). For example, unheated molecular sieve traps are certain to contaminate the carrier gas with CO₂ and H₂O.

The VICI Miniature Helium Purifier (HPM) and Miniature Nitrogen Purifier (NPM) are designed to address this situation, providing “point-of-use” carrier gas purification to sub-ppm levels of gaseous impurities. When installed in a gas chromatograph’s flow path immediately upstream of the injector, the HPM/NPM will remove any contaminants introduced by flow controllers, elastomeric tube seals, pressure regulators, crude traps, or other system components that are not completely clean and leak-tight.

The GC’s actual carrier inlet should be supplied from the HP2 inert gas purifier which ships as part of the Valco pulsed discharge detector system. No other carrier purifiers, including oxygen, moisture, and hydrocarbon traps, should be used; they are likely to introduce one contaminant as they remove another.



WARNING!

This product is *not for use with oxygen* – either pure oxygen or gases with a significant proportion of oxygen. The purifier’s gettering alloy is *pyrophoric at operating temperature*. Use with significant amounts of oxygen can result in combustion of the material, potential damage to the surrounding area, and possible injury.

In no event shall Valco Instruments Co. Inc. be liable for any direct, indirect, special, incidental, or consequential damage, whether based on contract, tort, or any other legal theory and whether advised of the possibility of such damages.

Specifications

	Helium Purifier (HPM)	Nitrogen Purifier (NPM)
Gases purified	He, Ne, Ar, Kr, Xe, Rn	He, Ne, Ar, Kr, Xe, Rn, N ₂
Max. operating pressure	200 psig	200 psig
Max. operating temperature	400°C	400°C
Max. flow rate	30 cc/min	30 cc/min
Impurities removed	Outlet impurities less than 10 ppb H ₂ O, H ₂ , O ₂ , N ₂ , NO, NH ₃ , CO, and CO ₂ , based on 100 ppm total inlet impurities. Other impurities removed include CF ₄ , CCl ₄ , SiH ₄ , and hydrocarbons such as CH ₄	Outlet impurities less than 10 ppb H ₂ O, H ₂ , O ₂ , NO, NH ₃ , CO, and CO ₂ , based on 100 ppm total inlet impurities. Other impurities removed include CF ₄ , CCl ₄ , SiH ₄ , and hydrocarbons
Impurities not removed	He, Ne, Ar, Kr, Xe, and Rn	He, Ne, Ar, Kr, Xe, Rn, CH ₄ , and N ₂

Theory of Operation

The purification substrate in the Valco purifiers is a non-evaporable gettering alloy. The alloy must be heated so that the oxide layers on the particle surface are eliminated. This process must be performed under a vacuum or in at atmosphere of helium (for the HPM) or nitrogen (for the NPM).

Although the gettering alloy will purify even at ambient temperatures, raising the temperature vastly improves the life span and efficiency of the alloy. However, the elevated temperature causes hydrogen generation, which is trapped only at temperatures below 250°C. Accurate temperatures are maintained with the use of the precision 24 VDC power supply which is supplied with the HPM/NPM.

Power Supply Requirements

As stated on the purifier, the power supply must conform to EN 61010-1: Section F.2.1 Limited circuit. This section mandates that the power source must be limited to 42.4 VDC or less (open circuit). In addition, the energy must be limited by one of the following means:

- the current under any condition of load, including short circuit, is not more than 8A measured after 1 minute of operation
- the source is *rated* or set to limit its power to 150 VA under any condition of load
- an overload protector or circuit component opens to interrupt the power output at a lower value than 150 VA under any condition including short circuit

Installation and Operation

This procedure describes a chromatographic installation. Although that is not the only possible application, it is the most common. It is up to the user to determine whether the purifier is suitable for a particular application based upon the purifier's specifications.

Installation

The Valco HPM and NPM are two part systems comprised of the purifier and the power supply. The purifier can be installed in any position. For best results, do not modify the fittings or tubing lengths; small particles which might be generated by such modifications are difficult to remove and can restrict the flow.

1. Locate the HPM where the temperature will not exceed 40°C, and with at least a half inch of clearance around and above the purifier to prevent overheating.
2. Disconnect the carrier supply line immediately upstream of the injector and connect this line to the inlet of the purifier.
3. Connect the output line of the purifier to the injector.
4. Purge the system for 5 to 10 minutes at 20 to 30 mL/min to eliminate air from the getter material.



CAUTION: The getter material should never be heated when air is present.

5. Insert the barrel connector of the power supply into the purifier.
6. Connect the power supply to mains (115/230 VAC). The LED on the power supply should confirm power output.

Activation

When the purifier reaches operating temperature (usually in about 1 hour) the getter will be activated. Once the getter is activated, active gaseous impurities such as O₂, H₂O, CO, and CO₂ (plus N₂ for the HPM) are captured and chemisorbed on the getter surface. Only noble gas atoms are not affected. Once adsorbed, oxygen, carbon, and nitrogen atoms cannot be released by the getter material even at its melting point (1400°C), due to the formation of strong chemical bonds with the alloy atoms.

Hydrogen atoms behave quite differently, diffusing into the getter material bulk more quickly than the other atoms and becoming almost uniformly distributed within the bulk.

Operation

In normal operation the outside temperature of the purifier is warm, but should not be uncomfortable to the touch. The 24 VDC power supply maintains the purifier trap at a constant temperature, and should be located so that the illuminated LED can serve as a visual indicator of purifier operation.

Removing the HPM or NPM from the System

To remove the purifier from the carrier gas line:

1. Disconnect the power supply. Disconnect the output line from the instrument while maintaining carrier flow.
2. Allow about one hour for the purifier to cool. After it reaches ambient temperature, cap the output line and allow the purifier to be pressurized for several minutes.
3. Remove the input line and immediately cap it. This maintains a carrier gas atmosphere on the gettering substrate, increasing its lifetime.

To reinstall, follow the instructions in the **Installation** section at the top of page 3.

Routine Maintenance



Do not try to open or modify the purifier.

In normal usage there is no maintenance required on the purifier or power supply. If the purifier shows signs of saturation it will need replacement. Replacement purifiers can be ordered from Valco using the following product numbers:

For the helium purifier: HPM

For the nitrogen purifier: NPM

Disposing of the Purifier

Obtain a return authorization number from VICI by emailing tga@vici.com or calling 800-367-8424. The packaged purifier should be clearly marked "Traps for Disposal".

Warranty

This Limited Warranty gives the Buyer specific legal rights, and a Buyer may also have other rights that vary from state to state. For a period of 365 calendar days from the date of shipment, Valco Instruments Company, Inc. (hereinafter Seller) warrants the goods to be free from defect in material and workmanship to the original purchaser. During the warranty period, Seller agrees to repair or replace defective and/or nonconforming goods or parts without charge for material or labor, or, at the Seller's option, demand return of the goods and tender repayment of the price. Buyer's exclusive remedy is repair or replacement of defective and nonconforming goods, or, at Seller's option, the repayment of the price.

Seller excludes and disclaims any liability for lost profits, personal injury, interruption of service, or for consequential incidental or special damages arising out of, resulting from, or relating in any manner to these goods

This Limited Warranty does not cover defects, damage, or non-conformity resulting from abuse, misuse, neglect, lack of reasonable care, modification, or the attachment of improper devices to the goods. This Limited Warranty does not cover expendable items. This warranty is VOID when repairs are performed by a non-authorized service center or representative. For information about authorized service centers or representatives, write Customer Repairs, Valco Instruments Company, Inc, P.O. Box 55603, Houston, Texas 77255, or phone (713) 688-9345. At Seller's option, repairs or replacements will be made on site or at the factory. If repairs or replacements are to be made at the factory, Buyer shall return the goods prepaid and bear all the risks of loss until delivered to the factory. If Seller returns the goods, they will be delivered prepaid and Seller will bear all risks of loss until delivery to Buyer. Buyer and Seller agree that this Limited Warranty shall be governed by and construed in accordance with the laws of the State of Texas.

The warranties contained in this agreement are in lieu of all other warranties expressed or implied, including the warranties of merchantability and fitness for a particular purpose.

This Limited Warranty supercedes all prior proposals or representations oral or written and constitutes the entire understanding regarding the warranties made by Seller to Buyer. This Limited Warranty may not be expanded or modified except in writing signed by the parties hereto.