VICI® Valco Instruments Co. Inc.
VICI AG International

# GAS PURIFICATION

## Overview



Gas purity is essential in any application requiring extreme sensitivity. Contaminant traps and gas purifiers for specific gases dramatically reduce the levels of contaminants, enhance the purity of lower grade helium, and help ensure instrument stability, reproducibility, and lower maintenance costs.

### Purifiers for specific gases

Purifiers from VICI Metronics are designed to go in-line with the carrier or detector gas supply. These include models which were original equipment gas purifiers for the Agilent Mass Spec and LC Mass Spec.

Also available are VICI Valco heated helium and nitrogen purifiers, for peak purification performance.

- Air
- Carbon dioxide
- Helium
- Hydrogen
- Methane
- Nitrogen

### Specialized purifiers

We also offer purifiers for special applications, such as chemical ionizatin MS, and nitrogen for LC/MS or from a nitrogen generator. Our liquid carbon dioxide purification technology can result in significant cost savings.

- For nitrogen for LC/MS
- For nitrogen generators
- For chemical ionizatin MS
- For liquid carbon dioxide
- Heated helium purifiers
- Heated nitrogen purifiers

**Contaminant traps**

For applications with a single contaminant of interest, high capacity contaminant specific traps are your best option, since they generally have four times as much capacity for the specific contaminant as a gas specific purifier.

- Hydrocarbon traps
- Mercury traps
- Moisture traps
- Oxygen traps
- Sulfur traps

Top

**SEE ALSO**

- More products for GC

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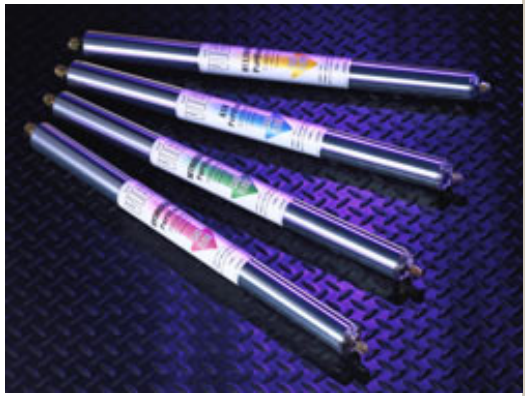
# GAS PURIFICATION

## Gas Specific Purifiers from VICI Metronics





- Original equipment in Agilient® Mass Spec and LC Mass Spec
- Provide point-of-use gas purification of helium, hydrogen, methane, nitrogen, carbon dioxide, or air
- Reduce gas impurities from high PPM to low PPB levels
- Decrease baseline noise and increase GC/MS sensitivity
- Replace three traps with one purifier

Gas purification is critical to GC performance. Several types of contaminants are detrimental - notably moisture, hydrocarbons, and oxygen. VICI Metronics gas purifier modules are designed to be placed in-line with the GC carrier or detector gas supply to remove these contaminants from the analytical gases prior to their entering the GC.

Gas purification is optimized by a multiple bed format. Each bed functions at a lower contaminant concentration, resulting in a series of contaminant concentration gradients across the length of the gas purifier.
See illustration. ›

VICI Metronics gas purifiers dramatically reduce contaminant levels and absorb a greater variety of contaminants than other gas purification products. Advanced materials and design features guarantee that the modules will produce gases that are at least a factor of ten higher than a 99.9999% "chromatography grade" cylinder of gas when the purifier is supplied by a 99.995% cylinder. See chart. › The cost difference between the two grades of gas will pay for the cost of the gas purifier several times over during its operating life.

| Gas | Fitting size | Product No. |
|---|---|---|
| Helium | 1/8" | P100-1* |
| | 1/4" | P100-2 |
| Hydrogen | 1/8" | P200-1 |
| | 1/4" | P200-2 |
| Nitrogen | 1/8" | P300-1 |

| | | |
|---|---|---|
| Air | 1/8" | P400-1 |
| | 1/4" | P400-2 |
| Methane | 1/8" | P500-1 |
| | 1/4" | P500-2 |
| Carbon dioxide | 1/8" | P600-1 |
| | 1/4" | P600-2 |

* Original equipment for Agilent Mass Spec and LC Mass Spec (Agilent part# 5182-3467)
** Original equipment for Agilent Mass Spec and LC Mass Spec (Agilent part# G1946-80047)

Top

**MORE INFORMATION**

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Table of PPB at outlet for six typical contaminants
- Printable data sheet

**SPECIFICATIONS**

Max inlet pressure:
1000 psi; Recommended flow:
500 mL/min

**SAFETY NOTE**

Not to be used for purification of oxygen

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# GAS PURIFICATION

## Specialized Purifiers



### For nitrogen for LC/MS

VICI Metronics nitrogen purifiers are optimized for the high flow nitrogen gas supply used on LC/MS instruments. A nitrogen purifier module placed in line with the nitrogen gas delivery system removes moisture, hydrocarbons, halocarbons, and oxygen, retaining them for the operating life of the purifier.

- Product information

### For nitrogen generators

The purifier for nitrogen generators reduces most contaminant levels from many parts per million to levels that are below the lower limit of analytical detection, and absorbs a larger number and a greater variety of contaminants than other commonly used adsorptive materials.

- Product information

### For chemical ionization MS

In response to the increase in commercial availability of instrumentation for Chemical Ionization Mass Spectroscopy, VICI Metronics has developed a purifier designed specifically for the unique demands of the field.

- Product information

### For liquid carbon dioxide

VICI Metronics has developed a $CO_2$ purification technology which can take Coleman grade $CO_2$ and produce SFC/SFE grade $CO_2$ at the point of use, resulting in significant cost savings.

- Product information

### Heated helium and nitrogen purifiers

The purification substrate in VICI Valco ga
ac
is

**SEE ALSO**

- Valco heated helium purifiers and nitrogen purifiers
- Liquid carbon dioxide purifiers
- Nitrogen purifier for LC/MS
- Purifier for nitrogen from a nitrogen generator
- Purifier for CI/MS

purifiers can be used safely in industrial applications with minimal precautions. The miniature version of each purifier is designed to be installed in a GC's flow path immediately upstream of the injector.

- Helium purifiers
- Nitrogen purifiers

Top

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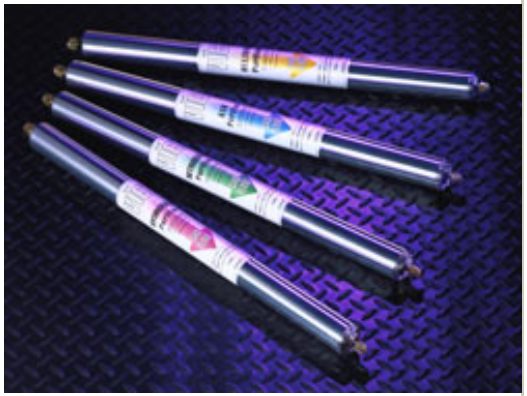
# GAS PURIFICATION

## Contaminant Traps from VICI Metronics



- Ultra-high capacity for the contaminant of interest
- Application specific, gas independent
- Capable of higher flow rates than our gas specific purifiers

For applications with a single contaminant of interest, high capacity contaminant specific traps are your best option, since they generally have four times as much capacity for the specific contaminant as a purifier. This translates to a capacity that exceeds twelve standard type "A" tanks of gas or the equivalent of over 300,000 liters of gas at standard temperature and pressure.



| Trapped contaminant | Fitting size | Length | Product No. |
|---|---|---|---|
| Hydrocarbons | 1/8" | 22.5" | T200-1 |
| | 1/4" | 22.5" | T200-2 |
| Mercury | 1/8" | 12" | T700-1 |
| | 1/4" | 12" | T700-2 |
| Moisture | 1/8" | 22.5" | T100-1 |
| | 1/4" | 22.5" | T100-2 |
| Oxygen | 1/8" | 22.5" | T300-1 |
| | 1/4" | 22.5" | T300-2 |
| Sulfur | 1/8" | 12" | T400-1 |
| | | 22.5" | T401-1 |
| | 1/4" | 12" | T400-2 |
| | | 22.5" | T401-2 |

**MORE INFORMATION**

- Contact us to find out more about VICI Metronics

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# GAS PURIFICATION

## Gas Purifiers for Agilent Instruments



*Original equipment for Agilent Mass Spec and LC Mass Spec*

Metronics helium and nitrogen purifiers were supplied for many years as original equipment with the Agilent Mass Spec and LC Mass Spec. The same units are still available from VICI Metronics.

| Purifier | Agilent Product No. | VICI Product No. |
|---|---|---|
| Helium/inert, 1/8" fittings | 5182-3467 | P100-1 |
| Nitrogen, 1/4" fittings | G1946-80047 | P300-2 |

**MORE INFORMATION**

- Contact Metronics to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Table of PPB at outlet for six typical contaminants
- Printable data sheet

purification of oxygen

**SAFETY NOTE**

Not to be used for

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# GAS PURIFICATION

## Heated Helium Purifiers from VICI Valco Instruments



Note: *These heated helium purifiers are unsurpassed at removing nitrogen. For applications which can tolerate slightly more nitrogen, unheated* ***Metronics helium purifiers*** *offer an economical option.*

Carrier gas purity is essential in any application requiring extreme sensitivity. Impurities limit detector sensitivity and can even destroy capillary columns. The Valco helium purifier (HP2) provides "point-of-use" gas purification of helium or other noble gases, such as Ar, Ne, Kr, and Xe, to sub-ppm levels of reactive gaseous impurities.

Based on 10 ppm total inlet impurities, outlet impurities are less than 10 ppb for $H_2O$, $H_2$, $O_2$, $N_2$, NO, $NH_3$, CO, $CO_2$, and $CH_4$. Other impurities removed include $CF_4$, $CCl_4$, $SiH_4$, and light hydrocarbons.

The purification substrate is a non-evaporable heat-activated gettering alloy. This stable alloy is contained in a welded assembly, so the purifiers can be used safely in industrial applications with minimal precautions. When the getter is heated, the oxide film on the particle surface is eliminated, allowing helium to diffuse into the bulk of the getter particles. The purifier features a self-regulating design which maintains the getter material at the optimum temperature and eliminates the possibility of thermal runaway.


The miniature version is designed to be installed in a gas chromatograph's flow path immediately upstream of the injector. The HPM 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.

Purifers include a universal power supply.

| Description | Voltage | Product No. |
|---|---|---|
| HEATED HELIUM PURIFIERS | | |
| Standard size | 110 VAC | HP2 |
| | 230 VAC | HP2-220 |
| Miniature | 110 VAC | HPM |
| | 230 VAC | HPM-220 |
| REPLACEMENT POWER SUPPLY | | |
| For standard and miniature purifiers | 110 VAC | PS24VDC-CE |
| | 230 VAC | PS24VDC-CE-220 |
| REPLACEMENT GETTER ASSEMBLY | | |
| For standard purifier only | | I-23572HP2 |

Top

**MORE INFORMATION**

- Declaration of CE compliance
- User manual
- User manual for miniature version

**MAX OPERATING PRESSURE**

1000 psig

**DISPOSING OF SPENT GETTER CARTRIDGES**

Contact VICI to obtain a return authorization number. The packaged getter cartridge should be clearly marked "Traps for Disposal".

**SEE ALSO**

- VICI Metronics unhea helium purifier modu

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# GAS PURIFICATION

## **Heated Nitrogen Purifiers** from VICI Valco Instruments



Note: *These heated nitrogen purifiers are the only ones which remove methane. For applications which can tolerate methane, unheated* ***Metronics nitrogen purifiers*** *offer an economical option.*

Carrier gas purity is essential in any application requiring extreme sensitivity. Impurities limit detector sensitivity and can even destroy capillary columns. The Valco nitrogen purifier provides "point-of-use" purification to sub-ppm levels of reactive gaseous impurities.

Based on 10 ppm total inlet impurities, outlet impurities are less than 10 ppb for $H_2O$, $H_2$, $O_2$, NO, $NH_3$, CO, $CO_2$, and $CH_4$. Other impurities removed include $CF_4$, $CCl_4$, $SiH_4$, and light hydrocarbons. He, Ne, Ar, Kr, Xe, and Rn are *not* removed.

The purification substrate is a non-evaporable heat-activated gettering alloy. This stable alloy is contained in a welded assembly, so the purifiers can be used safely in industrial applications with minimal precautions. When the getter is heated, the oxide film on the particle surface is eliminated, allowing nitrogen to diffuse into the bulk of the getter particles. The purifier features a self-regulating design which maintains the getter material at the optimum temperature and eliminates the possibility of thermal runaway.


The miniature version is designed to be installed in a gas chromatograph's flow path immediately upstream of the injector. The 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.

Purifers include a universal power supply.

| Description | Voltage | Product No. |
|---|---|---|
| HEATED NITROGEN PURIFIERS | | |
| Standard size | 110 VAC | NP2 |
| | 230 VAC | NP2-220 |
| Miniature | 110 VAC | NPM |
| | 230 VAC | NPM-220 |
| REPLACEMENT POWER SUPPLY | | |
| For standard and miniature purifiers | 110 VAC | PS24VDC-CE |
| | 230 VAC | PS24VDC-CE-220 |
| REPLACEMENT GETTER ASSEMBLY | | |
| For standard purifier only | | I-23572NP2 |

Top

**MORE INFORMATION**

- Declaration of CE compliance
- User manual
- User manual for miniature version

**MAX OPERATING PRESSURE**

1000 psig

**DISPOSING OF SPENT GETTER CARTRIDGES**

Contact VICI to obtain a return authorization number. The packaged getter cartridge should be clearly marked "Traps for Disposal".

**SEE ALSO**

- VICI Metronics unhe
  nitrogen purifier mo

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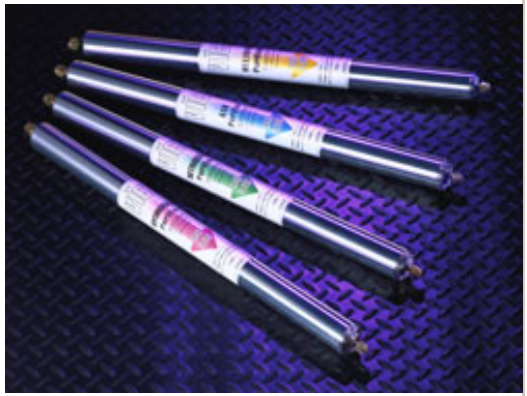
# GAS PURIFICATION

## Air Purifiers from VICI Metronics



- Reduce gas impurities from high PPM to low PPB levels
- Decrease baseline noise and increase GC/MS sensitivity
- Replace three traps with one purifier



Gas purification is critical to GC performance. Several types of contaminants in air are detrimental - notably moisture and hydrocarbons.

Gas purification is optimized by a multiple bed format. Each bed functions at a lower contaminant concentration, resulting in a series of contaminant concentration gradients across the length of the gas purifier.
See illustration. ›

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | P400-1 |
| 1/4" | 22.5" | P400-2 |

- Fittings and gas purity
- Table of PPB at outlet for six typical contaminants
- Printable data sheet
- MSDS

### SPECIFICATIONS

Max inlet pressure:
1000 psi; Recommended flow:
500 mL/min

### SAFETY NOTE

Not to be used for purification of oxygen

### MORE INFORMATION

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.

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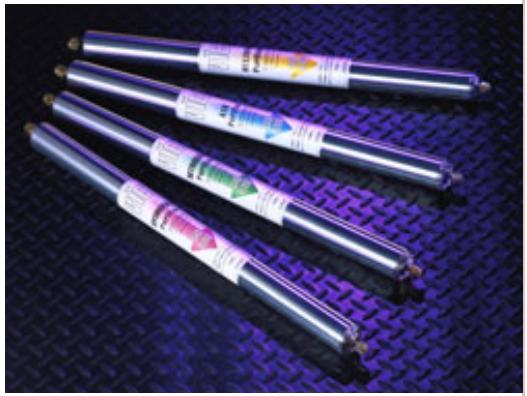
# GAS PURIFICATION

## Carbon Dioxide Gas Purifier for High Purity Applications



- Outperforms carbon-based hydrocarbon traps
- Larger number and variety of contaminants removed
- Optimized for the high flows of process equipment



These modules, designed to be placed in-line with the $CO_2$ gas supply, use patented adsorptive materials to capture and retain a broad spectrum of hydrocarbons, halocarbons, and other contaminants that can be present in your $CO_2$ gas delivery system. The contaminants are retained for the operating life of the purifier, which is typically good for four tanks of $CO_2$.

Performance is optimized by incorporating a multiple bed format so that each successive bed functions at a lower contaminant concentration. The result is a series of contaminant concentration gradients across the length of the module.
See illustration.

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | P600-1 |
| 1/4" | 22.5" | P600-2 |

1887.
- Fittings and gas purity
- Printable data sheet

### SPECIFICATIONS

Max inlet pressure:
1000 psi; Recommended flow:
500 mL/min

Top

### MORE INFORMATION

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-

### SEE ALSO

- Liquid carbon dioxide purifiers

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# GAS PURIFICATION

## Helium Purifiers



### Helium purifier modules from VICI Metronics

Purifiers from VICI Metronics are designed to go in-line with the carrier or detector gas supply. These include models which were original equipment gas purifiers for the Agilent Mass Spec and LC Mass Spec.

- Product information

### Heated helium purifiers from VICI Valco Instruments

Also available in a compact miniature version, these heated helium purifiers are unsurpassed at removing nitrogen. For applications which can tolerate slightly more nitrogen, unheated Metronics helium purifiers offer an economical gas purification option.

- Product information

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# GAS PURIFICATION

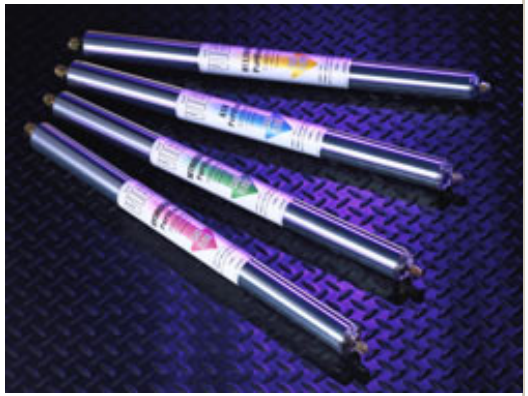
## Hydrogen Purifiers from VICI Metronics



### MORE INFORMATION

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.

- Reduce gas impurities from high PPM to low PPB levels
- Decrease baseline noise and increase GC/MS sensitivity
- Replace three traps with one purifier



Gas purification is critical to GC performance. Several types of contaminants are detrimental - notably moisture, hydrocarbons, and oxygen. VICI Metronics gas purifier modules are designed to be placed in-line with the GC carrier or detector gas supply to remove these contaminants from the analytical gases prior to their entering the GC.

VICI Metronics gas purifiers dramatically reduce contaminant levels and absorb a greater variety of contaminants than other gas purification products. Gas purification is optimized by a multiple bed format. Each bed functions at a lower contaminant concentration, resulting in a series of contaminant concentration gradients across the length of the gas purifier. See illustration. ›

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | P200-1 |
| 1/4" | 22.5" | P200-2 |

- Fittings and gas purity
- Table of PPB at outlet for six typical contaminants
- Printable data sheet
- MSDS

### SPECIFICATIONS

Max inlet pressure:
1000 psi; Recommended flow:
500 mL/min

### SAFETY NOTE

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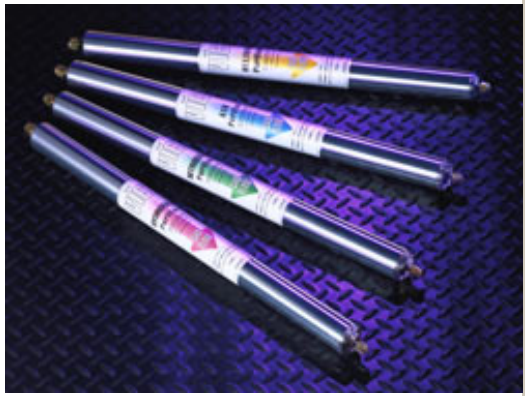
# GAS PURIFICATION

## Methane Purifiers from VICI Metronics



- Reduce gas impurities from high PPM to low PPB levels
- Decrease baseline noise and increase GC/MS sensitivity
- Replace three traps with one purifier



Gas purification is critical to GC performance. Several types of contaminants are detrimental - notably moisture, hydrocarbons, and oxygen. VICI Metronics gas purifier modules are designed to be placed in-line with the GC carrier or detector gas supply to remove these contaminants from the analytical gases prior to their entering the GC.

VICI Metronics gas purifiers dramatically reduce contaminant levels and absorb a greater variety of contaminants than other gas purification products. Gas purification is optimized by a multiple bed format. Each bed functions at a lower contaminant concentration, resulting in a series of contaminant concentration gradients across the length of the gas purifier. See illustration. ›

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | P500-1 |
| 1/4" | 22.5" | P500-2 |


- Fittings and gas purity
- Table of PPB at outlet for six typical contaminants
- Printable data sheet
- MSDS


### SPECIFICATIONS

Max inlet pressure:
1000 psi; Recommended flow:
500 mL/min

### SAFETY NOTE

Not to be used for purification of oxygen

### SEE ALSO

- Purifier for CI/MS

### MORE INFORMATION

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.

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# GAS PURIFICATION

## Nitrogen Purifiers



### Nitrogen purifier modules from VICI Metronics

Purifiers from VICI Metronics are designed to go in-line with the carrier or detector gas supply. These include models which were original equipment gas purifiers for the Agilent Mass Spec and LC Mass Spec.

- Product information

### Heated nitrogen purifiers from VICI Valco Instruments

Also available in a compact miniature version, these heated nitrogen purifiers are the only ones which remove methane. For applications which can tolerate methane, unheated Metronics nitrogen purifiers offer an economical gas purification option.

- Product information

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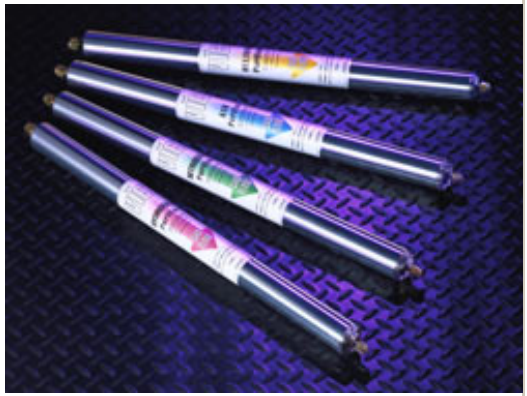
# GAS PURIFICATION

## Purifier for CI/MS Applications from VICI Metronics



- 1/8" compression fittings
- 1000 psig pressure rating
- Compatible with most CI gases
- Welded stainless steel body



The use of Chemical Ionization Mass Spectroscopy has increased in recent years, with instrumentation to perform this sensitive analytical technique now available commercially. In response to this growth, VICI Metronics has developed a gas purifier designed specifically for the unique demands of chemical ionization.

Several types of contaminants are detrimental to CI performance - notably moisture, heavy hydrocarbons, halocarbons, and oxygen. A Metronics CI purifier module placed in line with the gas delivery system removes these contaminants, reducing levels from many parts per million to levels that are below the lower limit of analytical detection, and retains them for the operating life of the purifier. (Recommended replacement is after three bottles of gas, or if detector baseline drift and noise become apparent.)

A very high capacity has been engineered into the gas purifier by using several different materials for gross contaminant removal and additional materials for the removal of trace amounts of the contaminants. Three separate adsorption chemistries are incorporated into the operating design of the gas purifier to ensure the optimal capacity and efficiency. This successive bad format insures high capacity as well as a very high efficiency for the removal of contaminants that can be present in even high purity methane.
See illustration. ›

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | P500-1 |

call toll-free (877) 737-1887.

- Fittings and gas purity
- Printable data sheet

**SPECIFICATIONS**

Max inlet pressure:
1000 psi;
Max recommended flow:

**MORE INFORMATION**

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can

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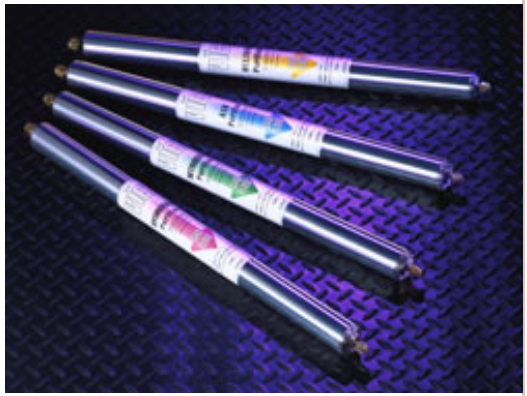
# GAS PURIFICATION

## Nitrogen Purifier for LC/MS Applications from VICI Metronics



- Designed to purify nitrogen gas produced from liquid nitrogen
- Decrease baseline noise and increase GC/MS sensitivity
- Reduce background noise and ghost peaks



VICI Metronics nitrogen purifiers are optimized for the high flow nitrogen gas supply used on LC/MS instruments. Several types of contaminants are detrimental to LC/MS performance - notably moisture, hydrocarbons, and halocarbons. A Metronics nitrogen purifier module placed in line with the nitrogen gas delivery system removes these contaminants, retaining them for the operating life of the purifier.

The purifier reduces most contaminant levels from many parts per million to levels that are below the lower limit of analytical detection, and absorbs a larger number and a greater variety of contaminants than other commonly used adsorptive materials. In particular, the Metronics nitrogen purifier has been shown to out perform the carbon-based hydrocarbon traps previously used for this application.

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | P310-1 |
| 1/4" | 22.5" | P310-2 |

**MORE INFORMATION**

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Printable data sheet
- MSDS

**SPECIFICATIONS**

Max inlet pressure:
1000 psi;
Max flow:
12 L/min

**SAFETY NOTE**

This purifier is designed to be used with nitrogen gas produced from liquid nitrogen, or with nitrogen gas containing less than 500 ppm of oxygen. If this product is used on a stream with a high oxygen content, it may get hot enough to cause injury. Use our Purifier for Nitrogen Generators to purify high oxygen content nitrogen.

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# GAS PURIFICATION



## Purifier for Nitrogen Produced by Nitrogen Generators



- Specifically designed to purify nitrogen produced from nitrogen generators
- Decrease baseline noise and increase GC/MS sensitivity
- Reduce background noise and ghost peaks

VICI Metronics nitrogen purifiers are optimized for the high flow nitrogen gas supply used on LC/MS instruments. Several types of contaminants are detrimental to LC/MS performance - notably moisture, hydrocarbons, and halocarbons. A Metronics nitrogen purifier module placed in line with the nitrogen gas delivery system removes these contaminants, retaining them for the operating life of the purifier.

The purifier reduces most contaminant levels from many parts per million to levels that are below the lower limit of analytical detection, and absorbs a larger number and a greater variety of contaminants than other commonly used adsorptive materials. In particular, the Metronics nitrogen purifier has been shown to out perform the carbon-based hydrocarbon traps previously used for this application.

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | P350-1 |
| 1/4" | 22.5" | P350-2 |

**SPECIFICATIONS**

Max inlet pressure:
1000 psi;
Max flow:
12 L/min

**SAFETY NOTE**

This purifier is designed to be used with nitrogen gas produced from liquid nitrogen, or with nitrogen gas containing less than 500 ppm of oxygen. If this product is used on a stream with a high oxygen content, it may get hot enough to cause injury. Use our Purifier for Nitrogen Generators to purify high oxygen content nitrogen.

**MORE INFORMATION**

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Printable data sheet
- MSDS

**SPECIFICATIONS**

Max inlet pressure:
1000 psi; Max flow:
12L/min

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# GAS PURIFICATION

## Liquid Carbon Dioxide Purifier from VICI Metronics



- Produce SFC/SFE grade $CO_2$ from Coleman grade $CO_2$
- Remove oxygen, moisture, sulfur compounds, halocarbons, and most hydrocarbons

In applications such as environmental testing, food analysis, and pigment analysis, the unique solvating properties of $CO_2$ at its triple point (super-critical stage) are exploited in the extraction of compounds from difficult matrices. Since any contaminants that may be present in the $CO_2$ will be concentrated in the sample, only ultra-pure $CO_2$ is acceptable for this type of work.

VICI Metronics has developed a new $CO_2$ purification technology (patent pending) which can take Coleman grade $CO_2$ and produce SFC/SFE grade $CO_2$ at the point of use, resulting in significant cost savings. Removal of oxygen, moisture, sulfur compounds, halocarbons, and most hydrocarbons are all accomplished with this unified $CO_2$ purification technology.

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | P700-1 |
| 1/4" | 22.5" | P700-2 |

Top

**MORE INFORMATION**

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.
- MSDS

**SEE ALSO**

- Carbon dioxide gas purifiers

VICI® Valco Instruments Co. Inc.
VICI AG International

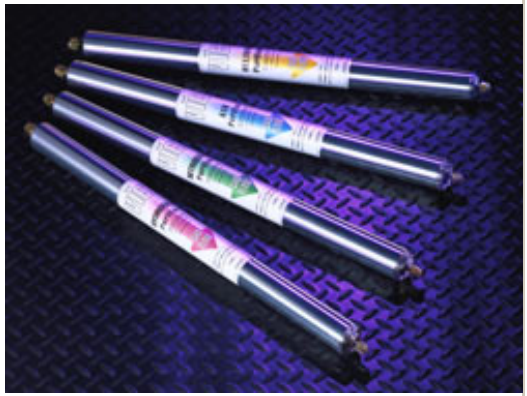
# GAS PURIFICATION

## Hydrocarbon Traps from VICI Metronics



- Removes non-methane hydrocarbons from any non-reactive gas
- Also removes halocarbons

The proprietary sorbent materials used in our high capacity hydrocarbon trap far out-perform the standard materials used for this application. The sorbent is extremely hydrophobic, so no capacity is lost in a moist gas stream. Studies have shown that this material is the most efficient and has the highest capacity for non-methane hydrocarbons of any sorbent material commercially available.



| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | T200-1 |
| 1/4" | 22.5" | T200-2 |

### MORE INFORMATION

- Contact us to find out more about VICI Metronics contaminant traps. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Printable data sheet
- MSDS

### SPECIFICATIONS

Max inlet pressure:
1000 psi; Recommended flow:
500 mL/min

Valco Instruments Co. Inc.
VICI AG International

# GAS PURIFICATION

## Mercury Traps from VICI Metronics



- Removes mercury from any non-reactive gas

The VICI Metronics mercury trap utilizes a proprietary adsorbent to remove trace mercury vapor from gas streams. This trap will ensure better "zero's," and can even be used after your mercury analyzer to prevent any trace mercury from venting to the environment. Connections are made with 1/8" or 1/4" stainless steel compression fittings. Both versions are rated for a maximum pressure of 1000 psi, with a maximum flow rate of 20 lpm.

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 12" | T700-1 |
| 1/4" | 12" | T700-2 |

### MORE INFORMATION

- Contact us to find out more about VICI Metronics contaminant traps. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Printable data sheet
- MSDS

### SPECIFICATIONS

Max inlet pressure:
1000 psi; Recommended max flow:
20 L/min

Valco Instruments Co. Inc.
VICI AG International

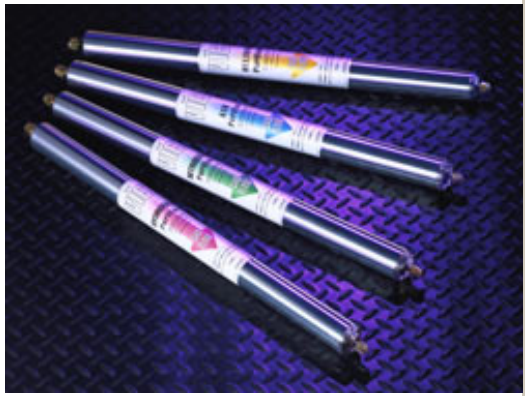
# GAS PURIFICATION

## Moisture Traps from VICI Metronics



- Removes moisture from any non-reactive gas
- Removes $H_2O$, plus some CO and $CO_2$

These high capacity moisture traps are designed to provide additional capacity for moisture removal in critical applications where moisture is the contaminant of concern. The successive bed format of this moisture trap combines both very high capacity materials in the inlet with very high efficiency materials in the outlet. This approach to moisture removal far out performs any other moisture trapping technology.



| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | T100-1 |
| 1/4" | 22.5" | T100-2 |

### MORE INFORMATION

- Contact us to find out more about VICI Metronics contaminant traps. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Printable data sheet
- MSDS

### SPECIFICATIONS

Max inlet pressure:
1000 psi; Recommended flow:
500 mL/min

VICI® Valco Instruments Co. Inc.
VICI AG International

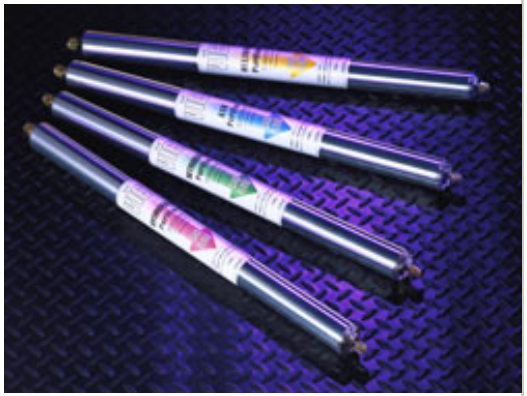
# GAS PURIFICATION

## Oxygen Traps from VICI Metronics



- Removes oxygen from any non-reactive gas
- Also removes some moisture

These high capacity oxygen traps employ a time proven oxygen scavenging materials technology. A high surface area reduced metal is used to irreversibly bind any free oxygen present in the gas - a state of the art technique used in industrial and electronics applications throughout the world.



| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | T300-1 |
| 1/4" | 22.5" | T300-2 |

### MORE INFORMATION

- Contact us to find out more about VICI Metronics contaminant traps. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Printable data sheet
- MSDS

### SPECIFICATIONS

Max inlet pressure:
1000 psi; Recommended flow:
500 mL/min

VICI® Valco Instruments Co. Inc.
VICI AG International

# GAS PURIFICATION

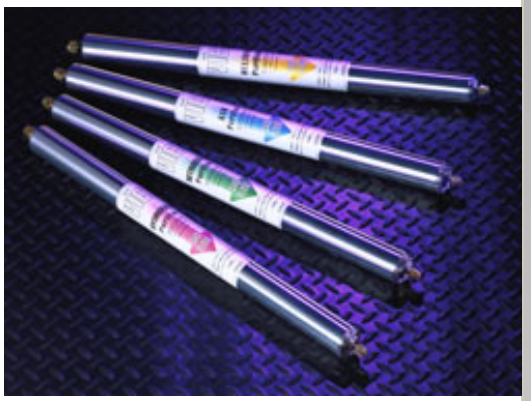
## Sulfur Traps from VICI Metronics



- Removes all sulfur-containing compounds from any non-reactive gas
- Also removes halocarbons and most non-methane hydrocarbons

This unique trap was developed to support sulfur analyzers. For low level detection, the removal of all sulfur compounds present in the supply gas is essential.

This trap will also improve the performance and catalyst lifetime of zero air instruments, since the catalysts used are prone to poisoning from halocarbons and sulfur compounds.



| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 12" | T400-1 |
| | 22.5" | T401-1* |
| 1/4" | 12" | T400-2 |
| | 22.5" | T401-2* |

* Special order

### MORE INFORMATION

- Contact us to find out more about VICI Metronics contaminant traps. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Printable data sheet
- MSDS

### SPECIFICATIONS

Max inlet pressure:
1000 psi; Recommended flow:
500 mL/min

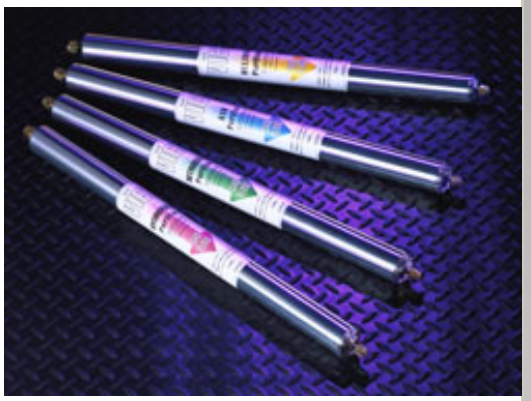
VICI® Valco Instruments Co. Inc.
VICI AG International

# GAS PURIFICATION

## Helium Purifiers from VICI Metronics



- Original equipment in Agilent® Mass Spec and LC Mass Spec
- Reduce gas impurities from high PPM to low PPB levels
- Decrease baseline noise and increase GC/MS sensitivity
- Replace three traps with one purifier



Gas purification is critical to GC performance. Several types of contaminants are detrimental - notably moisture, hydrocarbons, and oxygen. VICI Metronics gas purifier modules are designed to be placed in-line with the GC carrier or detector gas supply to remove these contaminants from the analytical gases prior to their entering the GC.

Gas purification is optimized by a multiple bed format. Each bed functions at a lower contaminant concentration, resulting in a series of contaminant concentration gradients across the length of the gas purifier.
See illustration. ›

VICI Metronics gas purifiers dramatically reduce contaminant levels and absorb a greater variety of contaminants than other gas purification products. Advanced materials and design features guarantee that the modules will produce gases that are at least a factor of ten higher than a 99.9999% "chromatography grade" cylinder of gas when the purifier is supplied by a 99.995% cylinder. See chart. › The cost difference between the two grades of gas will pay for the cost of the gas purifier several times over during its operating life.

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | P100-1* |
| 1/4" | 22.5" | P100-2 |

* Original equipment for Agilent Mass Spec and LC Mass Spec (Agilent part# 5182-3467)

### MORE INFORMATION

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Table of PPB at outlet for six typical contaminants
- Printable data sheet
- MSDS

### SPECIFICATIONS

Max inlet pressure: 1000 psi; Recommended flow: 500 mL/min

### SEE ALSO

- Heated helium purifiers from VICI Valco Instruments

### SAFETY NOTE

Not to be used for purification of oxygen

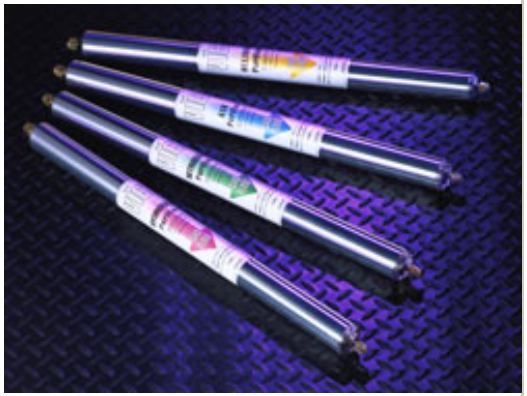
Valco Instruments Co. Inc.
VICI AG International

# GAS PURIFICATION

## Nitrogen Purifiers from VICI Metronics



- Original equipment in Agilent® Mass Spec and LC Mass Spec
- Reduce gas impurities from high PPM to low PPB levels
- Decrease baseline noise and increase GC/MS sensitivity
- Replace three traps with one purifier



Gas purification is critical to GC performance. Several types of contaminants are detrimental - notably moisture, hydrocarbons, and oxygen. VICI Metronics gas purifier modules are designed to be placed in-line with the GC carrier or detector gas supply to remove these contaminants from the analytical gases prior to their entering the GC.

VICI Metronics gas purifiers dramatically reduce contaminant levels and absorb a greater variety of contaminants than other gas purification products. Gas purification is optimized by a multiple bed format. Each bed functions at a lower contaminant concentration, resulting in a series of contaminant concentration gradients across the length of the gas purifier. See illustration.

| Fitting size | Length | Product No. |
|---|---|---|
| 1/8" | 22.5" | P300-1 |
| 1/4" | 22.5" | P300-2* |

* Original equipment for Agilent Mass Spec and LC Mass Spec (Agilent part# G1946-80047)

### MORE INFORMATION

- Contact us to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Table of PPB at outlet for six typical contaminants
- Printable data sheet
- MSDS

### SPECIFICATIONS

Max inlet pressure:
1000 psi; Recommended flow:
500 mL/min

### SAFETY NOTE

Not to be used for purification of oxygen

### SEE ALSO

- Valco heated nitrogen purifiers
- Nitrogen purifier for LC/MS
- Purifier for nitrogen from a nitrogen generator

Valco Instruments Co. Inc.
VICI AG International

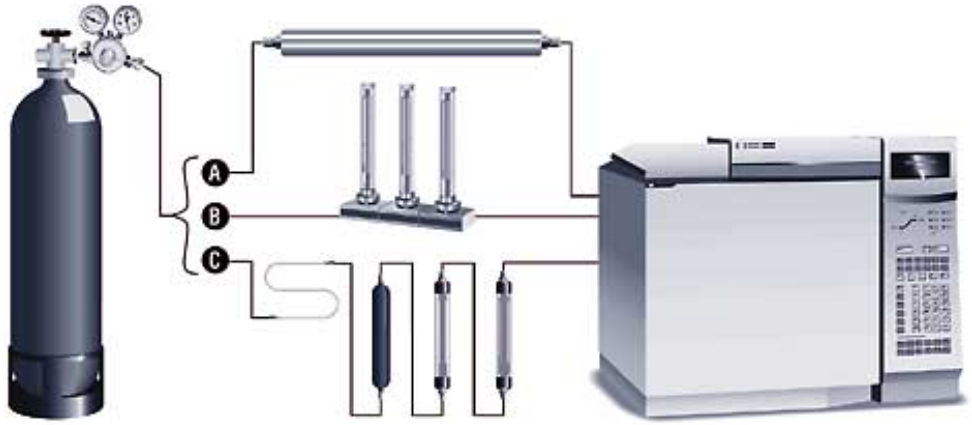
# GAS PURIFICATION

## Fittings and Gas Purity



Basically, the point to remember is "the fewer the better". Every connection in your gas delivery system has the potential for leaks; the more fittings you have, the greater the potential. In the illustration below, several gas purification options are depicted:

- The Metronics gas specific purifier minimizes the number of fittings. Total fittings: 2
- The "Manifold System" has two compression fittings for the system and one organic O-ring seal for each cartridge. Total fittings: at least 5
- A typical "Contaminant Trap" configuration has several components. Before the gas supply even enters the GC there are at least 4 modules. Total fittings: at least 8




**MORE INFORMATION**

- Contact Metronics to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.

Valco Instruments Co. Inc.
VICI AG International

# GAS PURIFICATION

## Gas Specific Purifiers - PPB at Outlet



Based on 50 ppm nominal inlet concentration level

| Purifier | CO | $CO_2$ | $O_2$ | $H_20$ | Sulfur compounds | Non-methane hydrocarbons |
|---|---|---|---|---|---|---|
| Helium | <1 | <1 | <1 | <1 | <1 | <3 |
| Hydrogen | <1 | <1 | <1 | <1 | <1 | <3 |
| Air | | | | <1 | | <3 |
| Methane | <1 | <1 | <1 | <1 | <1 | <3 |
| Nitrogen | <1 | <1 | <1 | <1 | <1 | <3 |

**MORE INFORMATION**

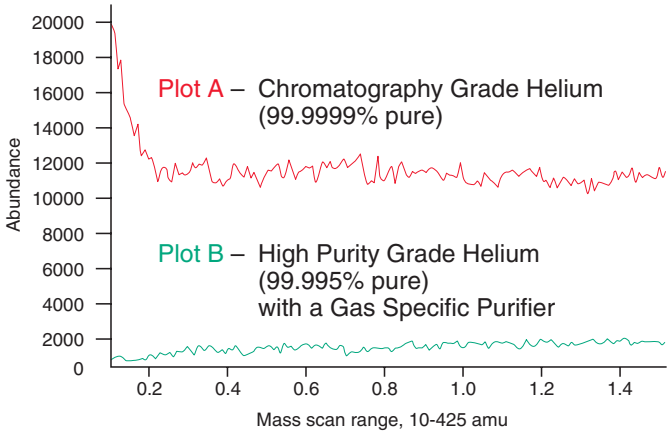
- Contact Metronics to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.
- Fittings and gas purity
- Printable data sheet

# Gas Specific Purifiers and Contaminant Traps

- Reduce gas impurities from high PPM to low PPB levels
- Decrease baseline noise and increase GC/MS sensitivity
- Replace three traps with one purifier

## Description

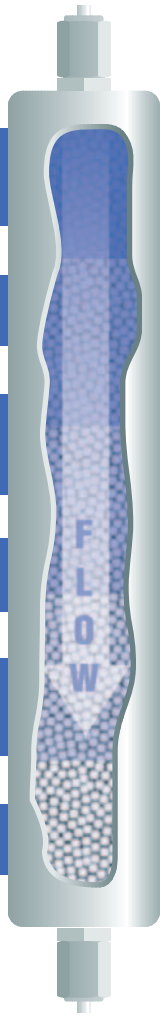
Several types of contaminants are detrimental to GC performance – notably moisture, hydrocarbons, and oxygen. VICI Metronics gas-specific purifier modules are designed to be placed in-line with the GC carrier or detector gas supply to remove these contaminants from the analytical gases prior to entering the GC. The modules dramatically reduce contaminant levels and absorb a greater variety of contaminants than other products.




Performance is optimized by a multiple bed format. Each bed functions at a lower contaminant concentration, resulting in a series of contaminant concentration gradients across the length of the module. Advanced materials and design features guarantee that the modules will produce gases that are at least a factor of ten higher than a 99.9999% "chromatography grade" cylinder of gas when the purifier is supplied by a 99.995% cylinder. The cost difference between the two grades of gas will pay for the cost of the purifier several times over during its operating life.

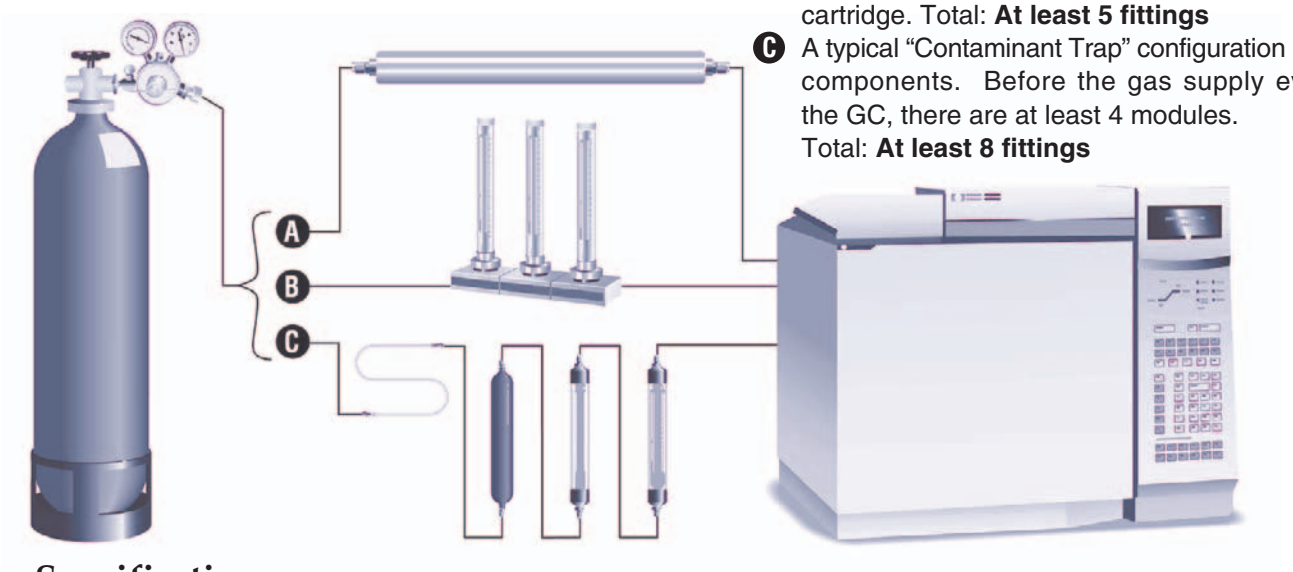
**Our successive bed format achieves the highest purity gas commercially available**

- **Two very high capacity hydrocarbon and moisture sorbents at the inlet for effective contaminant removal**
- **Unique proprietary broad spectrum sorbent material for multiple contaminant removal**
- **Two oxygen scavenging materials for both high capacity and high efficiency $O_2$ removal**
- **Multiple bed format to allow several step reduction in contaminants**
- **Removal of $H_2O$, $O_2$, halocarbons, hydrocarbons, CO, $CO_2$, $H_2$, and sulfur containing compounds with a single purifier**
- **Very high efficiency sorbents at the outlet for trace contaminant removal**



## Fittings: the Fewer the Better

Every connection in your gas delivery system has the potential for leaks; the more fittings you have, the greater the potential. In the illustration below, several gas purification options are depicted:




**A** The VICI Metronics Gas Specific Purifier minimizes the number of fittings. Total: **2 fittings**

**B** The "Manifold System" has two compression fittings for the system and one organic O-ring seal for each cartridge. Total: **At least 5 fittings**

**C** A typical "Contaminant Trap" configuration has several components. Before the gas supply even enters the GC, there are at least 4 modules. Total: **At least 8 fittings**

## Specifications

Length ..... 52.3 cm (21")
Diameter ..... 3.8 cm (1.5")
Maximum inlet pressure ..... 6895 kPa (1000 psi)
Maximum recommended flow ..... 500 ml/min

Pressure drop, 827 kPa (120 psi) inlet, at a flow of 0 to 500 ml/min ..... < 0.20 psi
Compression end fittings ..... 1/8" or 1/4"
Shipping weight .....1,300 g (3.04 lb)

## Selection Guide and Ordering Information

| Product Description | Product no. | Fitting | PPB at outlet, based on 50 PPM nominal inlet concentration level | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | CO | $CO_2$ | $O_2$ | $H_2O$ | Sulfur compounds | NMHC* |
| Helium purifier | P-100-1<br>P-100-2 | 1/8"<br>1/4" | <1 | <1 | <1 | <1 | <1 | <3 |
| Hydrogen purifier | P-200-1<br>P-200-2 | 1/8"<br>1/4" | <1 | <1 | <1 | <1 | <1 | <3 |
| Nitrogen purifier | P-300-1<br>P-300-2 | 1/8"<br>1/4" | <1 | <1 | <1 | <1 | <1 | <3 |
| Nitrogen purifier for LC/MS apps | P-310-1<br>P-310-2 | 1/8"<br>1/4" | | | | <25 | <25 | <25 |
| Purifier for nitrogen generators | P-350-1<br>P-350-2 | 1/8"<br>1/4" | | | | <25 | <25 | <25 |
| Air purifier | P-400-1<br>P-400-2 | 1/8"<br>1/4" | | | | <1 | | <3 |
| Moisture trap | T-100-1<br>T-100-2 | 1/8"<br>1/4" | | | | <1 | | |
| Hydrocarbon trap | T-200-1<br>T-200-2 | 1/8"<br>1/4" | | | | | | <3 |
| Oxygen trap | T-300-1<br>T-300-2 | 1/8"<br>1/4" | | | <1 | <1 | | |
| Sulfur trap | T-400-1 | 1/8" | | | | <1 | <1 | |
| Methane purifier | P-500-1 | 1/8" | <1 | <1 | <1 | <1 | <1 | <3 |

*NMHC = non-methane hydrocarbons


VICI® Metronics
tel: 360 697-9199
fax: 360 697-6682
purifiers@vici.com

VICI AG International
tel: Int + 41 41 925-6200
fax: Int + 41 41 925-6201
info@vici.ch


US customers call toll-free (877) 737-1887

# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Moisture Trap**

**Company Name:**

VICI® Metronics Inc
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
1-877-737-1887 or 1-360-697-9199

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Aluminum oxide (non-fibrous) | 1344-28-1 | < 45 | 10 mg/m$^3$ | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Silicon oxide (synthetic) | 7631-86-9 | < 40 | 10 mg/m$^3$ Inhalable<br>3 mg/m$^3$ Respirable | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable fraction |
| Sodium oxide | 1313-59-3 | < 10 | N/E | N/E |
| Magnesium oxide | 1309-48-4 | < 5 | 10 mg/m$^3$ Fume | 15 mg/m$^3$ Fume, total particulate |
| Quartz | 14808-60-7 | < 1 | 0.05 mg/m$^3$ Respirable dust | 10 mg/m$^3$ Total dust<br>3.3 mg/m$^3$ Respirable dust |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system. Quartz may cause cancer.

### Potential Health Effects

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* May cause skin irritation with repeated or prolonged exposure.

*Eye Contact:* Dust and/or product may cause eye discomfort and/or irritation seen as tearing and reddening.

*Ingestion:* This product is considered to have a low order of oral toxicity.

*Inhalation:* Inhalation of product and/or dust may cause irritation of the respiratory system.

*Target Organ:* Prolonged or repeated exposure may cause lung injury or cancer.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*

Silicon oxide (synthetic) - Not classifiable as human carcinogen. (Group 3)
Crystaline silica inhaled in the form of quartz from occupational sources is carcinogenic to humans. (Group 1)

*U.S. National Toxicology Program (NTP)*

Not Regulated
Quartz - Known Human Carcinogen.

*U.S. Occupational Safety and Health Administration (OSHA)*

Neither the product nor the component(s) are classified or regulated.

## 4 First Aid Measures

*Skin Contact:* Wash affected area with soap and water. If irritation develops, obtain medical attention.

*Eye Contact:* Flush with water for at least 15 minutes. If irritation occurs, obtain medical attention.

*Ingestion:* Do not induce vomiting. Obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If respiratory problems develop, obtain medical attention.

*Notes to Physician:* Hydrocarbons and other materials that contact the product during normal use can be retained on the product. The retained materials may be hazardous. Identify the retained material and treat accordingly.

## 5 Fire Fighting Measures

*Flash Point:* Unused material will not burn.

*Extinguishing Media:* Use media appropriate for surrounding fire.

*Fire and Explosion Hazards:* Used material may contain materials of a hazardous nature. The user of this product must identify the hazards of the retained material and inform the fire fighters of these hazards.

## 6 Accidental Release Measures

*Large Spill:* Isolate the affected areas. Confine entry into the affected area to those persons properly protected. Special attention should be given to eye, skin, and respiratory protection because recovery of dry product is expected to generate dust. Sweep, shovel, or vacuum spilled product into appropriate containers. (Do not use a vacuum if material has contacted a hydrocarbon material.)

*Small Spill:* Sweep or vacuum spilled product into appropriate container. (Do not use a vacuum if material has contacted a hydrocarbon.) Product should be disposed in accordance with all applicable government regulations. See section 13 of MSDS, Disposal Information.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached and natural ventilation is inadequate, use mechanical ventilation, other engineering controls, or a toxic dust respirator (in USA - NIOSH/MSHA approved) to prevent inhalation of product dust.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Safety glasses or goggles as necessary to prevent eye contact.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

| | |
|---|---|
| *Appearance:* | Material is in a sealed container |
| *Odor:* | None |
| *pH:* | Not applicable |
| *% Volatile:* | Not applicable |
| *Pour Point:* | Not applicable |
| *Viscosity:* | Not applicable |
| *Vapor Density:* | Not applicable |
| *Specific Gravity:* | Not applicable |
| *Apparent Bulk Density:* | 0.7 ± 0.1 g/cc |
| *Solubility in Water:* | Negligible |
| *Boiling Point:* | Not applicable |
| *Freezing Point:* | Not applicable |
| *Melting Point:* | Not applicable |
| *Vapor Pressure* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable. |
| *Conditions to Avoid:* | None known. |
| *Hazardous Decomposition Products:* | Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use. |
| *Hazardous Polymerization:* | Will not occur. |
| *Incompatible Materials:* | Contact with acids may cause leaching of metals. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | An oral $LD_{50}$ is not available for this product. |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data for this product. |

**Additional Toxicological Information:**

| | |
|---|---|
| *Aluminum oxide:* | Inhalation of finely divided particles may cause lung damage. Intrapleural $TD_{LO}$: 90 mg/kg (rat). Implant $TD_{LO}$: 200 mg/kg (rat). $TD_{LO}$ is Toxic Dose Low. |
| *Silicon oxide:* | Exposure can cause lung disease called silicosis, with cough and shortness of breath. |

## 12 Ecological Information

No data is available for the product.

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

## 14 Transportation Information

| | |
|---|---|
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

—None—

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

—None—

***State Community Right-to-Know Legislation***

The following component(s) of this product are regulated under California's Proposition 65:

This product contains quartz, known in the State of California to cause cancer.

## European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

| | |
|---|---|
| Aluminum oxide (non-fibrous) | 2156916 |
| Silicon oxide (synthetic) | 2315454 |
| Sodium oxide | 2152089 |
| Magnesium oxide | 2151719 |
| Quartz | 2388784 |

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

No Dangerous Goods Label Required.

## Canada

*Canadian Hazard Products Act:*

This product is classified as a material causing other toxic effects, carcinogenicity - Class D, Division 2, Subdivision 1, under regulations pursuant to the Federal Hazardous Products Act (*e.g.* WHMIS).

*Revision 3*

| | |
|---|---|
| **Summary of Changes:** | Updated for three-year review cycle |
| **I.D./Form:** | MS0007 |
| **Supersedes:** | March 1996 |

*Revision 4*

| | |
|---|---|
| **Summary of Changes:** | Section 1 |
| **I.D./Form:** | MS0007 |
| **Supersedes:** | December 2005 |

*Revision 5*

| | |
|---|---|
| **Summary of Changes:** | Section 1 |
| **I.D./Form:** | MS0007 |
| **Supersedes:** | November 2008 |

HMIS™ - Hazardous Materials Identification System

| **HMIS™ Ratings** | |
|---|---|
| HEALTH | 1* |
| FLAMMABILITY | 0 |
| REACTIVITY | 0 |

0 - minimal hazard
1 - slight hazard
2 - moderate hazard
3 - serious hazard
4 - severe hazard
* - may cause cancer

# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Hydrocarbon Trap**

**Company Name:**

VICI® Metronics Inc
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
1-877-737-1887 or 1-360-697-9199

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Silicon oxide (synthetic) | 7631-86-9 | < 80 | 10 mg/m$^3$ Inhalable<br>3 mg/m$^3$ Respirable | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable fraction |
| Aluminum oxide (non-fibrous) | 1344-28-1 | < 23 | 10 mg/m$^3$ | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Aluminosilicate | 1327-36-2 | < 20 | 10 mg/m$^3$ Inhalable dust<br>3 mg/m$^3$ Respirable dust | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Potassium oxide | 12136-45-7 | < 5 | N/E | N/E |
| Sodium oxide | 1313-59-3 | < 5 | N/E | N/E |
| Water | 7732-18-5 | < 5 | N/E | N/E |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system.

### Potential Health Effects

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* May cause skin irritation with repeated or prolonged exposure.

*Eye Contact:* Dust and/or product may cause eye discomfort and/or irritation seen as tearing and reddening.

*Ingestion:* This product is considered to have a low order of oral toxicity.

*Inhalation:* Inhalation of product and/or dust may cause irritation of the respiratory system.

*Target Organ:* Prolonged or repeated exposure may cause lung injury.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*
Silicon oxide (synthetic) - Not classifiable as human carcinogen (Group 3)

*U.S. National Toxicology Program (NTP)*
Not Regulated

*U.S. Occupational Safety and Health Administration (OSHA)*
Neither the product nor the component(s) are classified or regulated.

## 4 First Aid Measures

*Skin Contact:* Wash affected area with soap and water. If irritation develops, obtain medical attention.

*Eye Contact:* Flush with water for at least 15 minutes. If irritation occurs, obtain medical attention.

*Ingestion:* Do not induce vomiting. Obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If respiratory problems develop, obtain medical attention.

*Notes to Physician:* Hydrocarbons and other materials that contact the product during normal use can be retained on the product. The retained materials may be hazardous. Identify the retained material and treat accordingly.

## 5 Fire Fighting Measures

*Flash Point:* Unused material will not burn.

*Extinguishing Media:* Use media appropriate for surrounding fire.

*Fire and Explosion Hazards:* Used material may contain materials of a hazardous nature. The user of this product must identify the hazards of the retained material and inform the fire fighters of these hazards.

## 6 Accidental Release Measures

*Large Spill:* Isolate the affected areas. Confine entry into the affected area to those persons properly protected. Special attention should be given to eye, skin and respiratory protection because recovery of dry product is expected to generate dust. Sweep, shovel, or vacuum spilled product into appropriate containers. (Do not use a vacuum if material has contacted a hydrocarbon material.)

*Small Spill:* Sweep or vacuum spilled product into appropriate container. (Do not use a vacuum if material has contacted a hydrocarbon.) Product should be disposed in accordance with all applicable government regulations. See section 13 of MSDS, Disposal Information.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached and natural ventilation is inadequate, use mechanical ventilation, other engineering controls, or a toxic dust respirator (in USA - NIOSH/MSHA approved) to prevent inhalation of product dust.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Safety glasses or goggles as necessary to prevent eye contact.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

| | |
|---|---|
| *Appearance:* | Material is in a sealed container |
| *Odor:* | None |
| *pH:* | Not applicable |
| *% Volatile:* | Not applicable |
| *Pour Point:* | Not applicable |
| *Viscosity:* | Not applicable |
| *Vapor Density:* | Not applicable |
| *Specific Gravity:* | Not applicable |
| *Apparent Bulk Density:* | 0.7 ± 0.1 g/cc |
| *Solubility in Water:* | Negligible |
| *Boiling Point:* | Not applicable |
| *Freezing Point:* | Not applicable |
| *Melting Point:* | Not applicable |
| *Vapor Pressure* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable. |
| *Conditions to Avoid:* | None known. |
| *Hazardous Decomposition Products:* | Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use. |
| *Hazardous Polymerization:* | Will not occur. |
| *Incompatible Materials:* | Contact with acids may cause leaching of metals. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | An oral $LD_{50}$ is not available for this product. |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data for this product. |

**Additional Toxicological Information:**

| | |
|---|---|
| *Aluminum oxide:* | Inhalation of finely divided particles may cause lung damage. Intrapleural $TD_{LO}$: 90 mg/kg (rat). Implant $TD_{LO}$: 200 mg/kg (rat). $TD_{LO}$ is Toxic Dose Low. |
| *Silicon oxide:* | Exposure can cause lung disease called silicosis, with cough and shortness of breath. |

## 12 Ecological Information

No data is available for the product.

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

## 14 Transportation Information

| | |
|---|---|
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

—None—

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

—None—

***State Community Right-to-Know Legislation***

The following component(s) of this product are regulated under California's Proposition 65:

—None—

## European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

| | |
|---|---|
| Silicon oxide (synthetic) | 2315454 |
| Aluminum oxide (non-fibrous) | 2156916 |
| Aluminosilicate | 2154751 |
| Potassium oxide | 2352276 |
| Sodium oxide | 2152089 |
| Water | 2317912 |

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

No Dangerous Goods Label Required.

## Canada

*Canadian Hazard Products Act:*

This product is not classified as a controlled product under regulations pursuant to the federal Hazardous Product Act (*e.g.* WHMIS).

*Revision 2*

| | |
|---|---|
| **Summary of Changes:** | Sections 2, 15 |
| **I.D./Form:** | MS0009 |
| **Supersedes:** | March 1996 |

*Revision 3*

| | |
|---|---|
| **Summary of Changes:** | Section 1 |
| **I.D./Form:** | MS0009 |
| **Supersedes:** | December 2005 |

HMIS™ - Hazardous Materials Identification System

| **HMIS™ Ratings** | |
|---|---|
| HEALTH | 1 |
| FLAMMABILITY | 0 |
| REACTIVITY | 0 |

0 - minimal hazard
1 - slight hazard
2 - moderate hazard
3 - serious hazard
4 - severe hazard

# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Oxygen Trap**

**Company Name:**

VICI® Metronics Inc
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
1-877-737-1887 or 1-360-697-9199

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Copper | 7440-50-8 | < 50 | 1 mg/m$^3$ Dust and mist as CU | 1 mg/m$^3$ Dust and mist as CU |
| Zinc oxide | 1314-13-2 | < 30 | | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust as Al |
| Aluminum oxide (non-fibrous) | 1344-28-1 | < 30 | 10 mg/m$^3$ | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust as Al |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system.

### Potential Health Effects

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* Prolonged or repeated exposures may cause dermatitis or an allergic skin reaction.

*Skin Absorption:* This product will probably not be absorbed through human skin.

*Eye Contact:* Dust and/or product may cause eye discomfort and/or irritation seen as tearing and reddening.

*Ingestion:* This product is slightly toxic by ingestion.

*Inhalation:* Inhalation of product and/or dust may cause irritation of the respiratory system.

*Target Organ:* Prolonged or repeated exposure may cause lung injury or cancer.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*

??

*U.S. National Toxicology Program (NTP)*

??

*U.S. Occupational Safety and Health Administration (OSHA)*

??

## 4 First Aid Measures

*Skin Contact:* Wash affected area with soap and water. If irritation develops, obtain medical attention.

*Eye Contact:* Flush with water for at least 15 minutes. If irritation occurs, obtain medical attention.

*Ingestion:* Drink one or two glasses of water. If gastrointestinal symptoms develop, obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If respiratory problems develop, obtain medical attention.

*Notes to Physician:* Hydrocarbons and other materials that contact the product during normal use can be retained on the product. The retained materials may be hazardous. Identify the retained material and treat accordingly.

## 5 Fire Fighting Measures

*Flash Point:* Unused material will not burn.

*Extinguishing Media:* Use media appropriate for surrounding fire.

*Fire and Explosion Hazards:* Used material may contain materials of a hazardous nature. The user of this product must identify the hazards of the retained material and inform the fire fighters of these hazards.

## 6 Accidental Release Measures

*Large Spill:* Isolate the affected areas. Confine entry into the affected area to those persons properly protected. Special attention should be given to eye, skin, and respiratory protection because recovery of dry product is expected to generate dust. Sweep, shovel, or vacuum spilled product into appropriate containers. (Do not use a vacuum if material has contacted a hydrocarbon material.)

*Small Spill:* Sweep or vacuum spilled product into appropriate container. (Do not use a vacuum if material has contacted a hydrocarbon.) Product should be disposed in accordance with all applicable government regulations. See section 13 of MSDS, Disposal Information.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached and natural ventilation is inadequate, use mechanical ventilation, other engineering controls, or a toxic dust respirator (in USA - NIOSH/MSHA approved) to prevent inhalation of product dust.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Safety glasses or goggles as necessary to prevent eye contact.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

| | |
|---|---|
| *Appearance:* | Material is in a sealed container |
| *Odor:* | None |
| *pH:* | Not applicable |
| *% Volatile:* | 0% |
| *Pour Point:* | Not applicable |
| *Viscosity:* | Not applicable |
| *Vapor Density:* | Not applicable |
| *Specific Gravity:* | Not applicable |
| *Apparent Bulk Density:* | 59 - 62 lbs/ft$^3$ |
| *Solubility in Water:* | Insoluble |
| *Boiling Point:* | Not applicable |
| *Freezing Point:* | Not applicable |
| *Melting Point:* | Not applicable |
| *Vapor Pressure* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable. |
| *Conditions to Avoid:* | None known. |
| *Hazardous Decomposition Products:* | Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use. |
| *Hazardous Polymerization:* | Will not occur. |
| *Incompatible Materials:* | Do not expose to gas streams with an oxygen content above 550 ppm. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | Low oral toxicity, but ingestion may cause irritation of the gastrointestinal tract. May cause headache, nausea, and vomiting. An oral $LD_{50}$ is not available for this product.<br>Copper oxide: $LD_{50}$ is > 2000 mg/kg (rat)<br>Zinc oxide: $LD_{50}$ is > 5000 mg/kg (rat)<br>Aluminum oxide: $LD_{50}$ is > 2000 mg/kg (rat) |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data for this product. |

**Additional Toxicological Information:**

*Aluminum oxide:* Inhalation of finely divided particles may cause lung damage. Intrapleural $TD_{LO}$: 90 mg/kg (rat). Implant $TD_{LO}$: 200 mg/kg (rat). $TD_{LO}$ is Toxic Dose Low.

## 12 Ecological Information

This product is essentially insoluble in water. Although this product is not a hazardous waste under RCRA, 40 CFR 261, because of environmental concerns, care should be taken to minimize release to the environment. (See Section 13, Disposal Considerations.)

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

## 14 Transportation Information

| | |
|---|---|
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

—None—

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

Aluminum oxide
Copper oxide
Zinc oxide

***State Community Right-to-Know Legislation***

The following component(s) of this product are regulated under California's Proposition 65:

—None—

## European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

| | |
|---|---|
| Aluminum oxide (non-fibrous) | 2156916 |
| Copper oxide | 2152691 |
| Zinc oxide | 2152225 |

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

| | |
|---|---|
| R43 | May cause sensitization by skin contact. |
| R45 | May cause cancer. |
| S22 | Do not breathe dust. |
| S37/39 | Wear suitable gloves and eye/face protection. |
| T | Toxic |

## Canada

*Canadian Hazard Products Act:*

This product is classified as a material causing other toxic effects, carcinogenicity - Class D, Division 2, Subdivision A, under regulations pursuant to the Federal Hazardous Products Act (*e.g.* WHMIS).

*Revision 2*

| | |
|---|---|
| **Summary of Changes:** | Updated for three-year review cycle. |
| **I.D./Form:** | MS0001 |
| **Supersedes:** | February 1996 |

*Revision 3*

| | |
|---|---|
| **Summary of Changes:** | Section 2. |
| **I.D./Form:** | MS0001 |
| **Supersedes:** | December 2006 |

*Revision 4*

| | |
|---|---|
| **Summary of Changes:** | Section 1. |
| **I.D./Form:** | MS0001 |
| **Supersedes:** | July 2007 |

HMIS™ - Hazardous Materials Identification System

| **HMIS™ Ratings** | |
|---|---|
| HEALTH | 1* |
| FLAMMABILITY | 0 |
| REACTIVITY | 0 |

0 - minimal hazard
1 - slight hazard
2 - moderate hazard
3 - serious hazard
4 - severe hazard
* - may cause cancer

# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Sulfur Trap**

**Company Name:**

VICI® Metronics Inc
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
11-877-737-1887 or 1-360-697-9199

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Silicon oxide (synthetic) | 7631-86-9 | < 60 | 10 mg/m³ Inhalable<br>3 mg/m³ Respirable | 15 mg/m³ Total dust<br>5 mg/m³ Respirable fraction |
| Aluminum oxide (non-fibrous) | 1344-28-1 | < 50 | 10 mg/m³ | 15 mg/m³ Total dust<br>5 mg/m³ Respirable dust |
| Copper | 7440-50-8 | < 50 | 1 mg/m³ (TWA) for copper dusts and mists as Cu | 1 mg/m³ (TWA) for copper dusts and mists as Cu |
| Sodium oxide | 1313-59-3 | < 10 | N/E | N/E |
| Zinc oxide | 1314-13-2 | < 10 | 15 mg/m³ for total dust | 10 mg/m³ total dust |
| Water | 7732-18-5 | < 5 | N/E | N/E |
| Silver oxide | 20667-12-3 | < 2 | 0.01 mg/m³ as Ag | 0.01 mg/m³ as Ag |
| Iron oxide | 1309-37-1 | < 2 | 5 mg/m³ as Fe dust and fume | 10 mg/m³ as Fe dust and fume |
| Magnesium oxide | 1309-48-4 | < 2 | 10 mg/m³ Fume | 15 mg/m³ Fume, total particulate |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system.

### Potential Health Effects

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* Exposure to Copper may cause allergic skin reactions.

*Eye Contact:* Dust and/or product may cause eye discomfort and/or irritation seen as tearing and reddening.

*Ingestion:* This product is considered to have a low order of oral toxicity.

*Inhalation:* Inhalation of product and/or dust may cause irritation of the respiratory system.

*Target Organ:* If the sealed container is opened, prolonged or repeated exposure may cause lung injury.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*

Silicon oxide (synthetic) - Not classifiable as human carcinogen (Group 3)
Iron oxide - Not classifiable as human carcinogen (Group 3).

*U.S. National Toxicology Program (NTP)*

Not Regulated

*U.S. Occupational Safety and Health Administration (OSHA)*

Neither the product nor the component(s) are classified or regulated.

## 4 First Aid Measures

*Skin Contact:* Wash affected area with soap and water. If irritation develops, obtain medical attention.

*Eye Contact:* Flush with water for at least 15 minutes. If irritation occurs, obtain medical attention.

*Ingestion:* Do not induce vomiting. Obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If respiratory problems develop, obtain medical attention.

*Notes to Physician:* Hydrocarbons and other materials that contact the product during normal use can be retained on the product. The retained materials may be hazardous. Identify the retained material and treat accordingly.

## 5 Fire Fighting Measures

*Flash Point:* Unused material will not burn.

*Extinguishing Media:* Use media appropriate for surrounding fire.

*Fire and Explosion Hazards:* Used material may contain materials of a hazardous nature. The user of this product must identify the hazards of the retained material and inform the fire fighters of these hazards.

## 6 Accidental Release Measures

*Large Spill:* Isolate the affected areas. Confine entry into the affected area to those persons properly protected. Special attention should be given to eye, skin and respiratory protection because recovery of dry product is expected to generate dust. Sweep, shovel, or vacuum spilled product into appropriate containers. (Do not use a vacuum if material has contacted a hydrocarbon material.)

*Small Spill:* Sweep or vacuum spilled product into appropriate container. (Do not use a vacuum if material has contacted a hydrocarbon.) Product should be disposed in accordance with all applicable government regulations. See section 13 of MSDS, Disposal Information.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached and natural ventilation is inadequate, use mechanical ventilation, other engineering controls, or a toxic dust respirator (in USA - NIOSH/MSHA approved) to prevent inhalation of product dust.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Safety glasses or goggles as necessary to prevent eye contact.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

| | |
|---|---|
| *Appearance:* | Material is in a sealed container |
| *Odor:* | None |
| *pH:* | Not applicable |
| *% Volatile:* | Not applicable |
| *Pour Point:* | Not applicable |
| *Viscosity:* | Not applicable |
| *Vapor Density:* | Not applicable |
| *Specific Gravity:* | Not applicable |
| *Apparent Bulk Density:* | Not available |
| *Solubility in Water:* | Negligible |
| *Boiling Point:* | Not applicable |
| *Freezing Point:* | Not applicable |
| *Melting Point:* | Not applicable |
| *Vapor Pressure* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable. |
| *Conditions to Avoid:* | The addition of moisture (water) without flooding can cause rise in temperature from heat of adsorption. Contact with skin might result in burns. |
| *Hazardous Decomposition Products:* | Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use. |
| *Hazardous Polymerization:* | Will not occur. |
| *Incompatible Materials:* | Sudden contact with high concentrations of chemicals having high heats of adsorption such as olefins, HC1, etc. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | An oral $LD_{50}$ is not available for this product. |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data for this product. |

**Additional Toxicological Information:**

| | |
|---|---|
| *Aluminum oxide:* | Inhalation of finely divided particles may cause lung damage. Intrapleural $TD_{LO}$: 90 mg/kg (rat). Implant $TD_{LO}$: 200 mg/kg (rat). $TD_{LO}$ is Toxic Dose Low. |
| *Silicon oxide:* | Exposure can cause lung disease called silicosis, with cough and shortness of breath. |

## 12 Ecological Information

No data is available for the product.

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

## 14 Transportation Information

| | |
|---|---|
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

Silver (and Silver Compounds) - RQ is 1000 lbs.

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

Silver Compounds

## European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

| | |
|---|---|
| R43 | May cause sensitization by skin contact. |
| S45 | In case of accident or if you feel unwell, seek medical advice immediately. |
| S53 | Avoid exposure - obtain special instruction before use. |

## Canada

*Canadian Hazard Products Act:*

This product is not classified as a controlled product under regulations pursuant to the federal Hazardous Product Act (*e.g.* WHMIS).

*Revision 4*

| | |
|---|---|
| **Summary of Changes:** | Section 2 |
| **I.D./Form:** | MS0012 |
| **Supersedes:** | November 2005 |

*Revision 5*

| | |
|---|---|
| **Summary of Changes:** | Section 1 |
| **I.D./Form:** | MS0012 |
| **Supersedes:** | July 2007 |

*Revision 6*

| | |
|---|---|
| **Summary of Changes:** | Section 1 |
| **I.D./Form:** | MS0012 |
| **Supersedes:** | November 2008 |

HMIS™ - Hazardous Materials Identification System

| **HMIS™ Ratings** | |
|---|---|
| HEALTH | 1 |
| FLAMMABILITY | 0 |
| REACTIVITY | 0 |

0 - minimal hazard
1 - slight hazard
2 - moderate hazard
3 - serious hazard
4 - severe hazard

# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Mercury Trap**

**Company Name:**

VICI® Metronics Inc
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
1-877-737-1887 or 1-360-697-9199

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Silicon oxide (synthetic) | 7631-86-9 | < 60 | 10 mg/m$^3$ Inhalable<br>3 mg/m$^3$ Respirable | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable fraction |
| Aluminum oxide (non-fibrous) | 1344-28-1 | < 50 | 10 mg/m$^3$ | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Sodium oxide | 1313-59-3 | < 10 | N/E | N/E |
| Potassium oxide | 12136-45-7 | < 5 | N/E | N/E |
| Calcium oxide | 1305-78-8 | < 2 | 2 mg/m$^3$ | 5 mg/m$^3$ |
| Iron oxide | 1309-37-1 | < 2 | 5 mg/m$^3$ as Fe dust and fume | 10 mg/m$^3$ as Fe dust and fume |
| Magnesium oxide | 1309-48-4 | < 2 | 10 mg/m$^3$ Fume | 15 mg/m$^3$ Fume, total particulate |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system.

### Potential Health Effects

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* Exposure to Copper may cause allergic skin reactions.

*Eye Contact:* Dust and/or product may cause eye discomfort and/or irritation seen as tearing and reddening.

*Ingestion:* This product is considered to have a low order of oral toxicity.

*Inhalation:* Inhalation of product and/or dust may cause irritation of the respiratory system.

*Target Organ:* If the sealed container is opened, prolonged or repeated exposure may cause lung injury.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*

Silicon oxide (synthetic) - Not classifiable as human carcinogen (Group 3)
Iron oxide - Not classifiable as human carcinogen (Group 3).

*U.S. National Toxicology Program (NTP)*

Not Regulated

*U.S. Occupational Safety and Health Administration (OSHA)*

Neither the product nor the component(s) are classified or regulated.

## 4 First Aid Measures

*Skin Contact:* Wash affected area with soap and water. If irritation develops, obtain medical attention.

*Eye Contact:* Flush with water for at least 15 minutes. If irritation occurs, obtain medical attention.

*Ingestion:* Do not induce vomiting. Obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If respiratory problems develop, obtain medical attention.

*Notes to Physician:* Hydrocarbons and other materials that contact the product during normal use can be retained on the product. The retained materials may be hazardous. Identify the retained material and treat accordingly.

## 5 Fire Fighting Measures

*Flash Point:* Unused material will not burn.

*Extinguishing Media:* Use media appropriate for surrounding fire.

*Fire and Explosion Hazards:* Used material may contain materials of a hazardous nature. The user of this product must identify the hazards of the retained material and inform the fire fighters of these hazards.

## 6 Accidental Release Measures

*Large Spill:* Isolate the affected areas. Confine entry into the affected area to those persons properly protected. Special attention should be given to eye, skin and respiratory protection because recovery of dry product is expected to generate dust. Sweep, shovel, or vacuum spilled product into appropriate containers. (Do not use a vacuum if material has contacted a hydrocarbon material.)

*Small Spill:* Sweep or vacuum spilled product into appropriate container. (Do not use a vacuum if material has contacted a hydrocarbon.) Product should be disposed in accordance with all applicable government regulations. See section 13 of MSDS, Disposal Information.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached and natural ventilation is inadequate, use mechanical ventilation, other engineering controls, or a toxic dust respirator (in USA - NIOSH/MSHA approved) to prevent inhalation of product dust.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Safety glasses or goggles as necessary to prevent eye contact.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

| | |
|---|---|
| *Appearance:* | Material is in a sealed container |
| *Odor:* | None |
| *pH:* | Not applicable |
| *% Volatile:* | Not applicable |
| *Pour Point:* | Not applicable |
| *Viscosity:* | Not applicable |
| *Vapor Density:* | Not applicable |
| *Specific Gravity:* | Not applicable |
| *Apparent Bulk Density:* | Not available |
| *Solubility in Water:* | Negligible |
| *Boiling Point:* | Not applicable |
| *Freezing Point:* | Not applicable |
| *Melting Point:* | Not applicable |
| *Vapor Pressure* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable. |
| *Conditions to Avoid:* | The addition of moisture (water) without flooding can cause rise in temperature from heat of adsorption. Contact with skin might result in burns. |
| *Hazardous Decomposition Products:* | Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use. |
| *Hazardous Polymerization:* | Will not occur. |
| *Incompatible Materials:* | Sudden contact with high concentrations of chemicals having high heats of adsorption such as olefins, HC1, etc. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | An oral $LD_{50}$ is not available for this product. |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data for this product. |

**Additional Toxicological Information:**

| | |
|---|---|
| *Aluminum oxide:* | Inhalation of finely divided particles may cause lung damage. Intrapleural $TD_{LO}$: 90 mg/kg (rat). Implant $TD_{LO}$: 200 mg/kg (rat). $TD_{LO}$ is Toxic Dose Low. |
| *Silicon oxide:* | Exposure can cause lung disease called silicosis, with cough and shortness of breath. |

## 12 Ecological Information

No data is available for the product.

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

## 14 Transportation Information

| | |
|---|---|
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## 15 Regulatory Information

### United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

Silver (and Silver Compounds) - RQ is 1000 lbs.

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

Silver Compounds

### European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

| | |
|---|---|
| R43 | May cause sensitization by skin contact. |
| S45 | In case of accident or if you feel unwell, seek medical advice immediately. |
| S53 | Avoid exposure - obtain special instruction before use. |

### Canada

*Canadian Hazard Products Act:*

This product is not classified as a controlled product under regulations pursuant to the federal Hazardous Product Act (*e.g.* WHMIS).

## 16 Other Information

*Revision 4*

| | |
|---|---|
| **Summary of Changes:** | Section 2 |
| **I.D./Form:** | MS0014 |
| **Supersedes:** | November 2005 |

*Revision 5*

| | |
|---|---|
| **Summary of Changes:** | Section 1 |
| **I.D./Form:** | MS0014 |
| **Supersedes:** | April 2008 |

HMIS™ - Hazardous Materials Identification System

| **HMIS™ Ratings** | |
|---|---|
| HEALTH | 0 |
| FLAMMABILITY | 0 |
| REACTIVITY | 0 |

0 - minimal hazard
1 - slight hazard
2 - moderate hazard
3 - serious hazard
4 - severe hazard

VICI

**Valco Instruments Co. Inc.**

CE

## Declaration of Conformity

Manufacturer: Valco Instruments Co. Inc.
7811 Westview Drive
Houston, Texas 77055 USA
Telephone: (713) 688-9345
Fax: (713) 688-3948
Email: valco@vici.com

*Valco Instruments Co. Inc. declares that the product specified herein*

Product name: $He/N_2$ Gas Purifier
Model number: HP2, HPM, NP2, NPM
Product options: All

*in accordance with the directive:* 73/23/EEC
89/336/EEC

*is in compliance with the following:*

Product Safety Standards: EN61010-1:2001
EMC Standards: EN61326:A1:1998 + A2:2001

International contact: VICI AG (Valco International)
Parkstrasse 2
CH-6214 Schenkon
Switzerland
Telephone: Int + 41-41-925-6200
Fax: Int + 41-41-925-6201
Email: info@vici.ch

S. D. Stearns, president

8-19-2004
Date

VICI

Valco Instruments Co. Inc.

# Helium Purifier and Nitrogen Purifier Instruction Manual

For item numbers:
HP2
HP2-220
NP2
NP2-220
I-23572HP2
I-23572NP2




HP2w.p65
Rev. 1/11
Printed in USA

# Introduction

The Valco Helium Purifier (HP2) and Nitrogen Purifier (NP2) provide "point-of-use" carrier gas purification to sub-ppm levels of gaseous impurities. Designed originally for the Valco Trace Gas Analysis system with its Helium Ionization Detectors, the Helium Purifier provides point-of-use ultrahigh-purity helium for use in any chromatographic application requiring high-quality helium or other noble gas (Ar, Ne, Kr, Xe). The Nitrogen Purifier was developed for use with our Electron Capture Detector.

## Specifications

| | Helium Purifier (HP2) | Nitrogen Purifier (NP2) |
|---|---|---|
| **Gases purified** | He, Ne, Ar, Kr, Xe, Rn | He, Ne, Ar, Kr, Xe, Rn, $N_2$ |
| **Max. operating pressure** | 1000 psig | 1000 psig |
| **Max. operating temperature** | 400°C | 400°C |
| **Max. flow rate** | 1 liter/min | 1 liter/min |
| **Impurities removed** | Outlet impurities less than 10 ppb $H_2O$, $H_2$, $O_2$, $N_2$, NO, $NH_3$, CO, and $CO_2$, based on 10 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 $H_2O$, $H_2$, $O_2$, NO, $NH_3$, CO, and $CO_2$, based on 10 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 $N_2$ |

**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.**

## Theory of Operation

The purification substrate in the Valco purifiers is a non-evaporable gettering alloy, with a nominal composition of zirconium, vanadium, and iron. This 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 HP2) or nitrogen (for the NP2).

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. Therefore the Valco purifiers have been designed to operate at a fixed temperature gradient which yields a long life span and high efficiency and insures that any hydrogen generated will be trapped.

Accurate temperatures at the inlet (380-400°C) and at the outlet (170-190°C) are maintained with the use of a precision 24 VDC power supply.

## 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

**The power supply is critical for safe and proper operation of this unit. It is therefore recommended that the purifer be used only with the power supply received with it.**

# 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 specifications of the purifier.

## Installation

The Valco HP2 and NP2 are two part systems comprised of the purifier and the power supply. The purifier must be installed in a vertical position to eliminate the possibility of channeling. 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. Connect the input line (tagged INLET) to a carrier gas cylinder with a high purity regulator. (Save the caps to seal the purifier whenever you remove it from the system.)
2. Purge the system for 15 to 30 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.**

3. Connect the barrel connector of the power supply to the purifier.
4. Connect the power supply to mains (115/230 VAC). The LED on the power supply should come on to confirm power output.
5. Connect the purifier output line to the chromatographic system's carrier gas input line using a 1/16" union (Valco Product Number ZU1).

## Activation

When the purifier reaches operating temperature (usually in about 2½ hours) the getter will be activated. Once the getter is activated, active gaseous impurities such as $H_2$, $O_2$, $H_2O$, CO, and $CO_2$ (plus $N_2$ for the HP2) 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. However, hydrogen sorption occurs below 250°C, achieved through the temperature gradient of the trap assembly.

## 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 HP2 or NP2 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 several hours for the the getter oven to cool. After the oven 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 open or modify the trap assembly.**

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 cartridges can be ordered from Valco using the product numbers below.

*For an HP2:* I-23572HP2
*For an NP2:* I-23572NP2

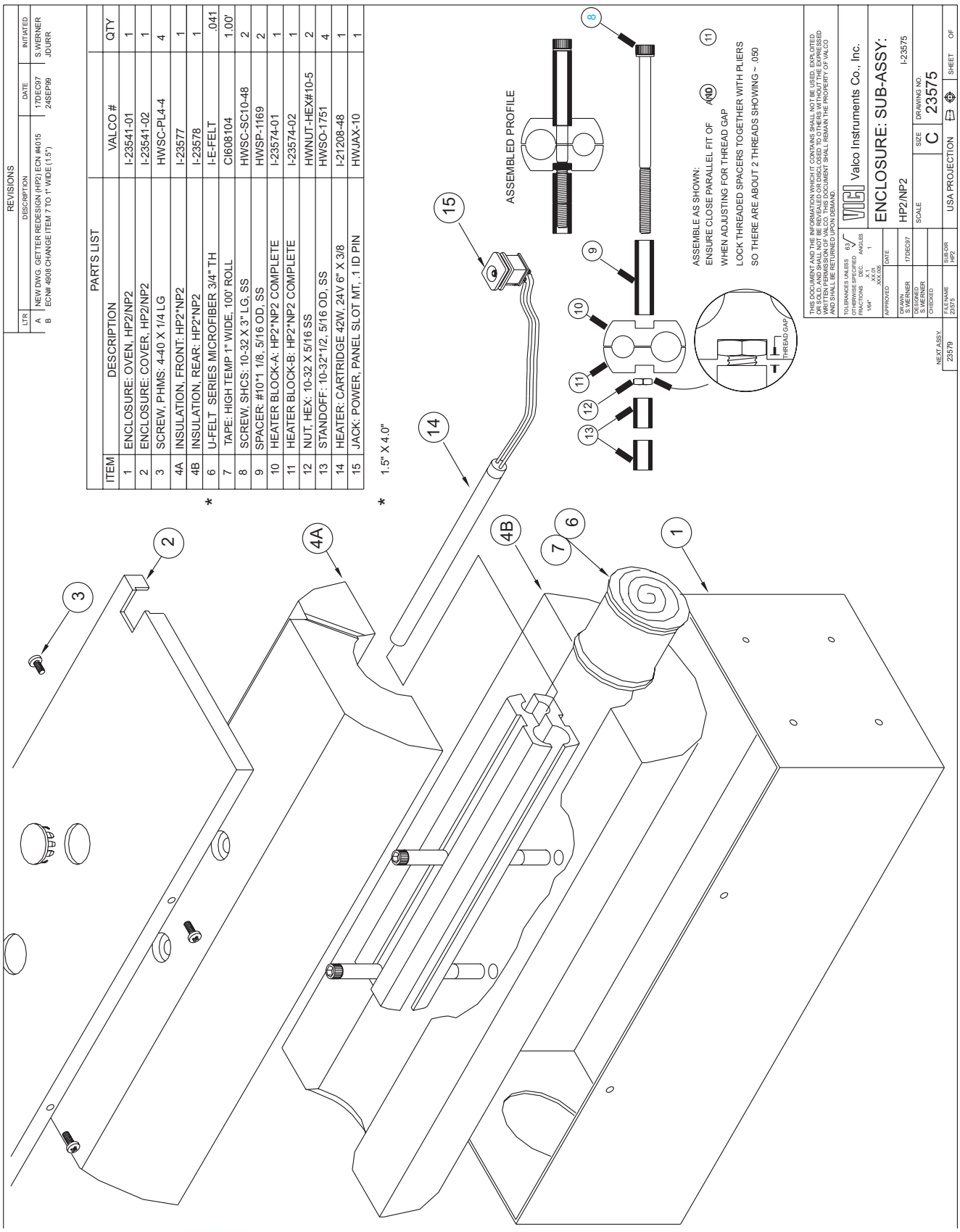
## Replacing the Getter Cartridge

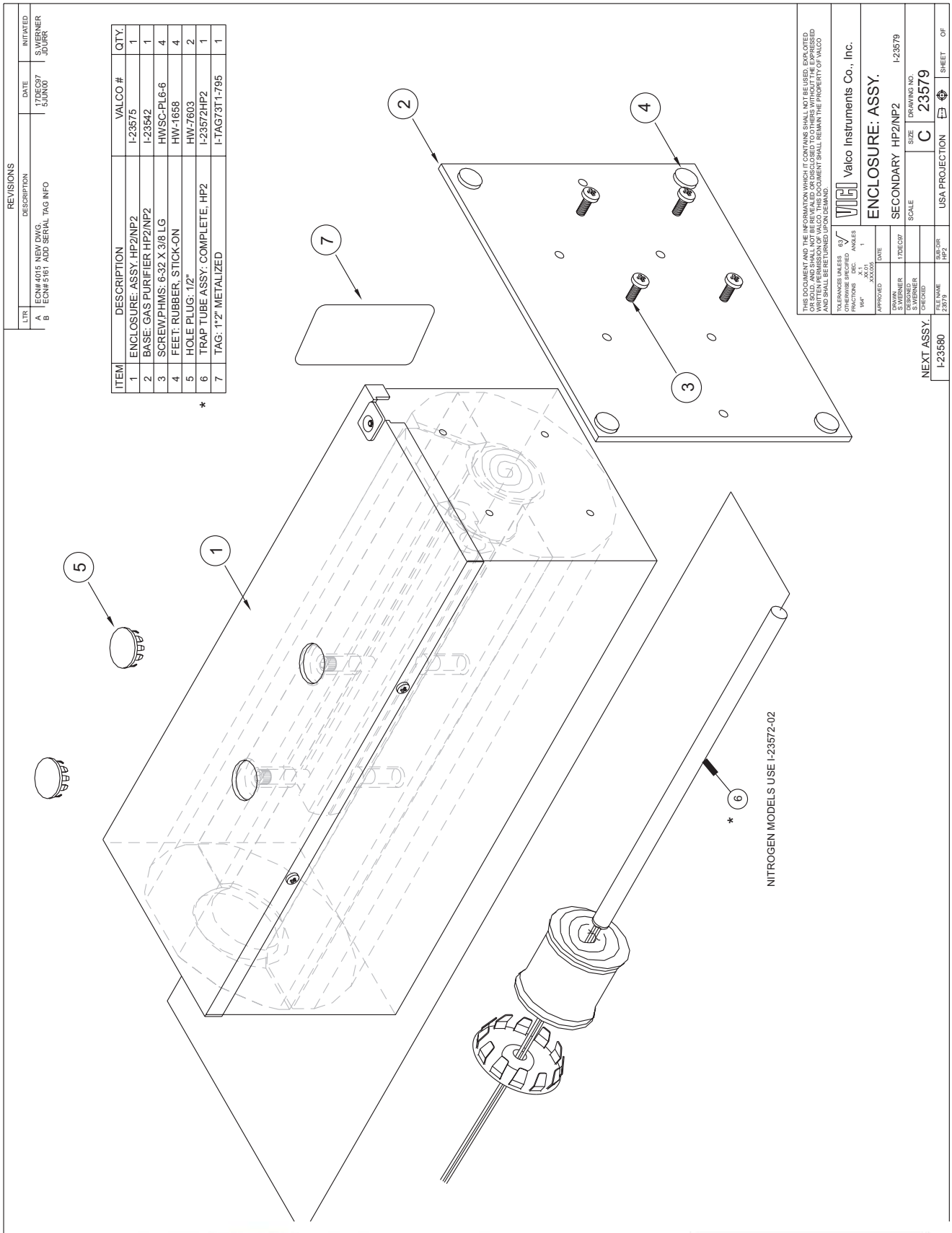
1. Disconnect the power supply from the purifier, but leave the helium flow on.
2. Allow at least two hours for the purifier to cool.
3. Using a thin-edged screwdriver or knife, remove the two hole plugs from the side of the unit and one from the top.
4. The side holes allow access to the two screws which secure the trap. With a 5/32" allen wrench, turn each screw counterclockwise one to two rotations.
5. If the trap is still too hot to the touch, allow more cooling time. If it can be handled, pull it out through the hole in the top of the unit.
6. Disconnect the output line at the fitting, and cap it to allow the trap to pressurize.
7. Have a second cap at the ready. Disconnect the input line at the fitting, and cap it immediately.
8. Insert the new trap, making sure the insulation and feed-through hole plug are snug against the top of the trap. Push the trap assembly down until the feed-through hole plug is resting on the top of the unit.
9. Tighten both allen screws, making sure the trap does not move.
10. Snap in the feed-through hole plug, and both the side hole plugs.
11. Refer to the **Installation** section at the top of page 3 to get the system back in operation.

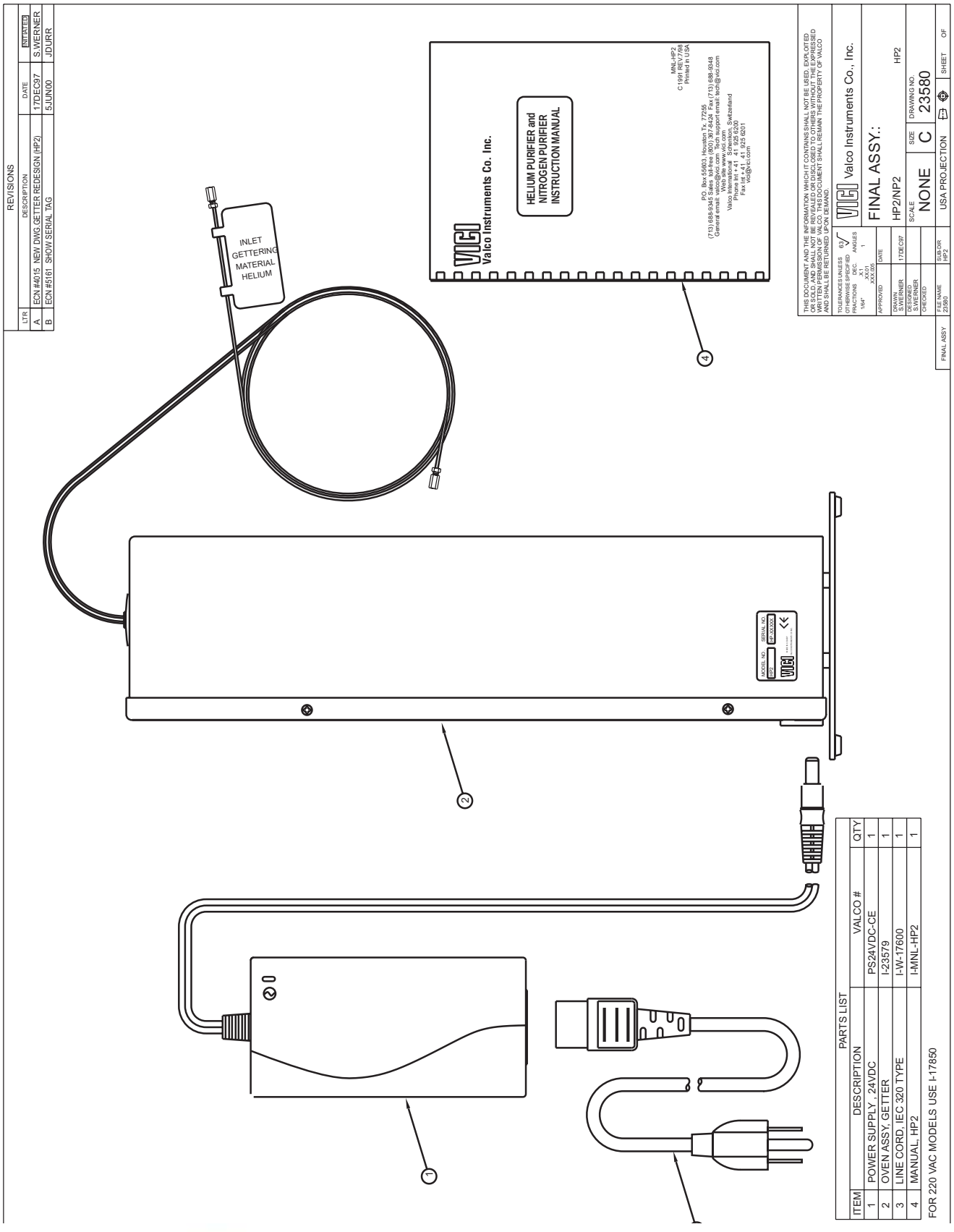
## Disposing of Spent Getter Cartridges

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

# Technical Drawings







# 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, resuiting from, or relating in any manner to these goods***

This Limited Warranty does not cover defects, damage, or nonconformity 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 nonauthorized 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.

VICI

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
Printed in USA

# Table of Contents

# 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 $CO_2$ and $H_2O$.

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 (HP2) | Nitrogen Purifier (NP2) |
|---|---|---|
| **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 $H_2O$, $H_2$, $O_2$, $N_2$, NO, $NH_3$, CO, and $CO_2$, based on 10 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 $H_2O$, $H_2$, $O_2$, NO, $NH_3$, CO, and $CO_2$, based on 10 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 $O_2$, $H_2O$, CO, and $CO_2$ (plus $N_2$ 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.

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, resuiting 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.

# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Air Purifier**

**Company Name:**

VICI® Metronics Inc
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
1-877-737-1887 or 1-360-697-9199

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Silicon oxide (synthetic) | 7631-86-9 | < 45 | 10 mg/m$^3$ Inhalable<br>3 mg/m$^3$ Respirable | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable fraction |
| Aluminum oxide (non-fibrous) | 1344-28-1 | < 32 | 10 mg/m$^3$ | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Sodium oxide | 1313-59-3 | < 15 | N/E | N/E |
| Aluminosilicate | 1327-36-2 | < 10 | 10 mg/m$^3$ Inhalable dust<br>3 mg/m$^3$ Respirable dust | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Magnesium oxide | 1309-48-4 | < 3 | 10 mg/m$^3$ Fume | 15 mg/m$^3$ Fume,<br>total particulate |
| Potassium oxide | 12136-45-7 | < 2 | N/E | N/E |
| Water | 7732-18-5 | < 2 | N/E | N/E |
| Quartz | 14808-60-7 | < 1 | 0.05 mg/m$^3$ Respirable dust | 10 mg/m$^3$ Total dus<br>3.3 mg/m$^3$ Respirable dust |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system. Quartz may cause cancer.

### Potential Health Effects

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* May cause skin irritation with repeated or prolonged exposure.

*Eye Contact:* Dust and/or product may cause eye discomfort and/or irritation seen as tearing and reddening.

*Ingestion:* This product is considered to have a low order of oral toxicity.

*Inhalation:* Inhalation of product and/or dust may cause irritation of the respiratory system.

*Target Organ:* Prolonged or repeated exposure may cause lung injury or cancer.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*

Silicon oxide (synthetic) - Not classifiable as human carcinogen (Group 3)
Crystalline silica inhaled in the form of quartz from occupational sources is carcinogenic to humans. (IARC Group 1).

*U.S. National Toxicology Program (NTP)*

Not Regulated
Quartz - Known Human Carcinogen

*U.S. Occupational Safety and Health Administration (OSHA)*

Neither the product nor the component(s) are classified or regulated.

## 4 First Aid Measures

*Skin Contact:* Wash affected area with soap and water. If irritation develops, obtain medical attention.

*Eye Contact:* Flush with water for at least 15 minutes. If irritation occurs, obtain medical attention.

*Ingestion:* Do not induce vomiting. Obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If respiratory problems develop, obtain medical attention.

*Notes to Physician:* Hydrocarbons and other materials that contact the product during normal use can be retained on the product. The retained materials may be hazardous. Identify the retained material and treat accordingly.

## 5 Fire Fighting Measures

*Flash Point:* Unused material will not burn.

*Extinguishing Media:* Use media appropriate for surrounding fire.

*Fire and Explosion Hazards:* Used material may contain materials of a hazardous nature. The user of this product must identify the hazards of the retained material and inform the fire fighters of these hazards.

## 6 Accidental Release Measures

*Large Spill:* Isolate the affected areas. Confine entry into the affected area to those persons properly protected. Special attention should be given to eye, skin, and respiratory protection because recovery of dry product is expected to generate dust. Sweep, shovel or vacuum spilled product into appropriate containers. (Do not use a vacuum if material has contacted a hydrocarbon material.)

*Small Spill:* Sweep or vacuum spilled product into appropriate container. (Do not use a vacuum if material has contacted a hydrocarbon.) Product should be disposed in accordance with all applicable government regulations. See section 13 of MSDS, Disposal Information.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached and natural ventilation is inadequate, use mechanical ventilation, other engineering controls, or a toxic dust respirator (in USA - NIOSH/MSHA approved) to prevent inhalation of product dust.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Safety glasses or goggles as necessary to prevent eye contact.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

| | |
|---|---|
| *Appearance:* | Material is in a sealed container |
| *Odor:* | None |
| *pH:* | Not applicable |
| *% Volatile:* | Not applicable |
| *Pour Point:* | Not applicable |
| *Viscosity:* | Not applicable |
| *Vapor Density:* | Not applicable |
| *Specific Gravity:* | Not applicable |
| *Apparent Bulk Density:* | 0.7 ± 0.1 g/cc |
| *Solubility in Water:* | Negligible |
| *Boiling Point:* | Not applicable |
| *Freezing Point:* | Not applicable |
| *Melting Point:* | Not applicable |
| *Vapor Pressure* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable. |
| *Conditions to Avoid:* | None known. |
| *Hazardous Decomposition Products:* | Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use. |
| *Hazardous Polymerization:* | Will not occur. |
| *Incompatible Materials:* | Contact with acids may cause leaching of metals. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | An oral $LD_{50}$ is not available for this product. |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data for this product. |

**Additional Toxicological Information:**

| | |
|---|---|
| *Aluminum oxide:* | Inhalation of finely divided particles may cause lung damage. Intrapleural $TD_{LO}$: 90 mg/kg (rat). Implant $TD_{LO}$: 200 mg/kg (rat). $TD_{LO}$ is Toxic Dose Low. |
| *Silicon oxide:* | Exposure can cause lung disease called silicosis, with cough and shortness of breath. |

## 12 Ecological Information

No data is available for the product.

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

## 14 Transportation Information

| | |
|---|---|
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

—None—

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

—None—

## European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

| | |
|---|---|
| Silicon oxide (synthetic) | 2315454 |
| Aluminum oxide (non-fibrous) | 2156916 |
| Sodium oxide | 2152089 |
| Aluminosilicate | 2154751 |
| Magnesium oxide | 2151719 |
| Potassium oxide | 2352276 |
| Water | 2317912 |
| Quartz | 2388784 |

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

No Dangerous Goods Label Required.

## Canada

*Canadian Hazard Products Act:*

This product is not classified as a controlled product under regulations pursuant to the federal Hazardous Product Act (*e.g.* WHMIS).

*Revision 2*

| | |
|---|---|
| **Summary of Changes:** | Sections 2, 15 |
| **I.D./Form:** | MS0011 |
| **Supersedes:** | March 1996 |

*Revision 3*

| | |
|---|---|
| **Summary of Changes:** | Section 1 |
| **I.D./Form:** | MS0011 |
| **Supersedes:** | December 2005 |

Revision 4

| | |
|---|---|
| **Summary of Changes:** | Sections 1, 15 (EU) |
| **I.D./Form:** | MS0011 |
| **Supersedes:** | November 2008 |

HMIS™ - Hazardous Materials Identification System

| **HMIS™ Ratings** | |
|---|---|
| HEALTH | 1* |
| FLAMMABILITY | 0 |
| REACTIVITY | 0 |

0 - minimal hazard
1 - slight hazard
2 - moderate hazard
3 - serious hazard
4 - severe hazard
* - may cause cancer

Analytical Components & Systems

VICI Metronics

# Carbon Dioxide Gas Purifier for High Purity Applications

- Outperforms carbon-based hydrocarbon traps
- Larger number and variety of contaminants removed
- Optimized for the high flows of process equipment

## Description

VICI Metronics gas purifier modules are designed to be placed in-line with the $CO_2$ gas supply. Patented adsorptive materials capture and retain a broad spectrum of hydrocarbons, halocarbons, and other contaminants that can be present in your $CO_2$ gas delivery system. The contaminants are retained for the operating life of the purifier.

The gas purifier modules offer dramatic reductions in most contaminant levels and adsorb a larger number and variety of contaminants than other commonly used adsorptive materials. The performance is optimized by incorporating a multiple bed format so that each successive bed functions at a lower contaminant concentration. The result is a series of contaminant concentration gradients across the length of the $CO_2$ purifier module.

The $CO_2$ gas purifier has been optimized for the high flow $CO_2$ gas supply used on process equipment, and has been shown to outperform the carbon-based hydrocarbon traps previously used for this application. A module is typically good for four tanks of $CO_2$.

**Two very high capacity hydrocarbon and moisture sorbents at the inlet for effective contaminant removal**

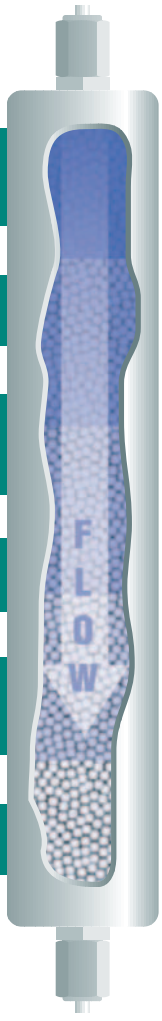
**Unique proprietary broad spectrum sorbent material for multiple contaminant removal**

**Two oxygen scavenging materials for both high capacity and high efficiency $O_2$ removal**

**Multiple bed format to allow several step reduction in contaminants**

**Removal of $H_2O$, $O_2$, halocarbons, hydrocarbons, CO, $H_2$, and sulfur containing compounds with a single purifier**

**Very high efficiency sorbents at the outlet for trace contaminant removal**



# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Helium, Hydrogen, and Nitrogen Purifiers**

**Company Name:**

VICI® Metronics Inc
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
1-877-737-1887 or 1-360-697-9199

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Silicon oxide (synthetic) | 7631-86-9 | < 60 | 10 mg/m$^3$ Inhalable<br>3 mg/m$^3$ Respirable | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable fraction |
| Aluminum oxide (non-fibrous) | 1344-28-1 | < 40 | 10 mg/m$^3$ | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Copper | 7440-50-8 | < 30 | 1 mg/m$^3$ Dust & mist as Cu | 1 mg/m$^3$ Dust & mist as Cu |
| Zinc Oxide | 1314-13-2 | < 15 | | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust as Al |
| Sodium oxide | 1313-59-3 | < 5 | N/E | N/E |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system. Cobalt and cobalt compounds are classified as possible human carcinogens. Quartz may cause cancer.

### Potential Health Effects

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* Prolonged or repeated exposures may cause dermatitis or an allergic skin reaction.

*Eye Contact:* Dust and/or product may cause eye discomfort and/or irritation seen as tearing and reddening.

*Ingestion:* This product is slightly toxic by ingestion.

*Inhalation:* Inhalation of product and/or dust may cause irritation of the respiratory system.

*Target Organ:* Prolonged or repeated exposure may cause lung injury or cancer.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*
Silicon oxide (synthetic) - Not classifiable as human carcinogen (Group 3)

*U.S. National Toxicology Program (NTP)*
Not Regulated

*U.S. Occupational Safety and Health Administration (OSHA)*
Not Regulated

## 4 First Aid Measures

*Skin Contact:* Wash affected area with soap and water. If irritation develops, obtain medical attention.

*Eye Contact:* Flush with water for at least 15 minutes. If irritation occurs, obtain medical attention.

*Ingestion:* Do not induce vomiting. Obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If respiratory problems develop, obtain medical attention.

*Notes to Physician:* Hydrocarbons and other materials that contact the product during normal use can be retained on the product. The retained materials may be hazardous. Identify the retained material and treat accordingly.

## 5 Fire Fighting Measures

*Flash Point:* Unused material will not burn.

*Extinguishing Media:* Use media appropriate for surrounding fire.

*Fire and Explosion Hazards:* Used material may contain materials of a hazardous nature. The user of this product must identify the hazards of the retained material and inform the fire fighters of these hazards.

## 6 Accidental Release Measures

*Large Spill:* Isolate the affected areas. Confine entry into the affected area to those persons properly protected. Special attention should be given to eye, skin, and respiratory protection because recovery of dry product is expected to generate dust. Sweep, shovel or vacuum spilled product into appropriate containers. (Do not use a vacuum if material has contacted a hydrocarbon material.)

*Small Spill:* Sweep or vacuum spilled product into appropriate container. (Do not use a vacuum if material has contacted a hydrocarbon.) Product should be disposed in accordance with all applicable government regulations. See section 13 of MSDS, Disposal Information.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached and natural ventilation is inadequate, use mechanical ventilation, other engineering controls, or a toxic dust respirator (in USA - NIOSH/MSHA approved) to prevent inhalation of product dust.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Safety glasses or goggles as necessary to prevent eye contact.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

| | |
|---|---|
| *Appearance:* | Material is in a sealed container |
| *Odor:* | None |
| *pH:* | Not applicable |
| *% Volatile:* | Not applicable |
| *Pour Point:* | Not applicable |
| *Viscosity:* | Not applicable |
| *Vapor Density:* | Not applicable |
| *Specific Gravity:* | Not applicable |
| *Apparent Bulk Density:* | 0.7 ± 0.2 g/cc |
| *Solubility in Water:* | Negligible |
| *Boiling Point:* | Not applicable |
| *Freezing Point:* | Not applicable |
| *Melting Point:* | Not applicable |
| *Vapor Pressure* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable. |
| *Conditions to Avoid:* | None known. |
| *Hazardous Decomposition Products:* | Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use. |
| *Hazardous Polymerization:* | Will not occur. |
| *Incompatible Materials:* | Contact with acids may cause leaching of metals. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | An oral $LD_{50}$ is not available for this product. |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data for this product. |

**Additional Toxicological Information:**

| | |
|---|---|
| *Aluminum oxide:* | Inhalation of finely divided particles may cause lung damage. Intrapleural $TD_{LO}$: 90 mg/kg (rat). Implant $TD_{LO}$: 200 mg/kg (rat). $TD_{LO}$ is Toxic Dose Low. |
| *Silicon oxide:* | Exposure can cause lung disease called silicosis, with cough and shortness of breath. |

## 12 Ecological Information

No data is available for the product.

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

## 14 Transportation Information

| | |
|---|---|
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

—None—

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

Copper compounds

***State Community Right-to-Know Legislation***

The following component(s) of this product are regulated under California's Proposition 65:

—None—

## European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

| | |
|---|---|
| Aluminum oxide (non-fibrous) | 2156916 |
| Silicon oxide (synthetic) | 2315454 |
| Copper oxide | 2152691 |
| Zinc oxide | 2152225 |
| Sodium oxide | 2152089 |

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

| | |
|---|---|
| R43 | May cause sensitization by skin contact. |
| S24 | Avoid contact with skin. |
| S36/37/39 | Wear suitable protective clothing, gloves, and eye/face protection. |
| Xi | Irritant |

## Canada

*Canadian Hazard Products Act:*

This product is not classified as a controlled product under regulations pursuant to the federal Hazardous Product Act (*e.g.* WHMIS).

*Revision 3*

**Summary of Changes:** Sections 2, 3, 13, 15 (U.S.)
**I.D./Form:** MS0004
**Supersedes:** October 2001

*Revision 4*

**Summary of Changes:** Section 2
**I.D./Form:** MS0004
**Supersedes:** April 2006

*Revision 5*

**Summary of Changes:** Section 1
**I.D./Form:** MS0004
**Supersedes:** July 2007

*Revision 6*

**Summary of Changes:** Section 1, 15 (EU)
**I.D./Form:** MS0004
**Supersedes:** November 2008

HMIS™ - Hazardous Materials Identification System

| **HMIS™ Ratings** | |
|---|---|
| HEALTH | 1 |
| FLAMMABILITY | 0 |
| REACTIVITY | 0 |

0 - minimal hazard
1 - slight hazard
2 - moderate hazard
3 - serious hazard
4 - severe hazard
* - may cause cancer

# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Methane Purifier**

**Company Name:**

VICI® Metronics Inc
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
1-877-737-1887 or 1-360-697-9199

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Silicon oxide (synthetic) | 7631-86-9 | < 60 | 10 mg/m$^3$ Inhalable<br>3 mg/m$^3$ Respirable | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable fraction |
| Aluminum oxide (non-fibrous) | 1344-28-1 | < 40 | 10 mg/m$^3$ | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Copper | 7440-50-8 | < 30 | 1 mg/m$^3$ Dust & mist as Cu | 1 mg/m$^3$ Dust & mist as Cu |
| Zinc Oxide | 1314-13-2 | < 15 | | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust as Al |
| Sodium oxide | 1313-59-3 | < 5 | N/E | N/E |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system. Cobalt and cobalt compounds are classified as possible human carcinogens. Quartz may cause cancer.

### Potential Health Effects

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* Prolonged or repeated exposures may cause dermatitis or an allergic skin reaction.

*Eye Contact:* Dust and/or product may cause eye discomfort and/or irritation seen as tearing and reddening.

*Ingestion:* This product is slightly toxic by ingestion.

*Inhalation:* Inhalation of product and/or dust may cause irritation of the respiratory system.

*Target Organ:* Prolonged or repeated exposure may cause lung injury or cancer.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*
Silicon oxide (synthetic) - Not classifiable as human carcinogen (Group 3)

*U.S. National Toxicology Program (NTP)*
Not Regulated

*U.S. Occupational Safety and Health Administration (OSHA)*
Not Regulated

## 4 First Aid Measures

*Skin Contact:* Wash affected area with soap and water. If irritation develops, obtain medical attention.

*Eye Contact:* Flush with water for at least 15 minutes. If irritation occurs, obtain medical attention.

*Ingestion:* Do not induce vomiting. Obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If respiratory problems develop, obtain medical attention.

*Notes to Physician:* Hydrocarbons and other materials that contact the product during normal use can be retained on the product. The retained materials may be hazardous. Identify the retained material and treat accordingly.

## 5 Fire Fighting Measures

*Flash Point:* Unused material will not burn.

*Extinguishing Media:* Use media appropriate for surrounding fire.

*Fire and Explosion Hazards:* Used material may contain materials of a hazardous nature. The user of this product must identify the hazards of the retained material and inform the fire fighters of these hazards.

## 6 Accidental Release Measures

*Large Spill:* Isolate the affected areas. Confine entry into the affected area to those persons properly protected. Special attention should be given to eye, skin, and respiratory protection because recovery of dry product is expected to generate dust. Sweep, shovel or vacuum spilled product into appropriate containers. (Do not use a vacuum if material has contacted a hydrocarbon material.)

*Small Spill:* Sweep or vacuum spilled product into appropriate container. (Do not use a vacuum if material has contacted a hydrocarbon.) Product should be disposed in accordance with all applicable government regulations. See section 13 of MSDS, Disposal Information.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached and natural ventilation is inadequate, use mechanical ventilation, other engineering controls, or a toxic dust respirator (in USA - NIOSH/MSHA approved) to prevent inhalation of product dust.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Safety glasses or goggles as necessary to prevent eye contact.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

| | |
|---|---|
| *Appearance:* | Material is in a sealed container |
| *Odor:* | None |
| *pH:* | Not applicable |
| *% Volatile:* | Not applicable |
| *Pour Point:* | Not applicable |
| *Viscosity:* | Not applicable |
| *Vapor Density:* | Not applicable |
| *Specific Gravity:* | Not applicable |
| *Apparent Bulk Density:* | 0.7 ± 0.2 g/cc |
| *Solubility in Water:* | Negligible |
| *Boiling Point:* | Not applicable |
| *Freezing Point:* | Not applicable |
| *Melting Point:* | Not applicable |
| *Vapor Pressure* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable. |
| *Conditions to Avoid:* | None known. |
| *Hazardous Decomposition Products:* | Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use. |
| *Hazardous Polymerization:* | Will not occur. |
| *Incompatible Materials:* | Contact with acids may cause leaching of metals. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | An oral $LD_{50}$ is not available for this product. |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data for this product. |

**Additional Toxicological Information:**

| | |
|---|---|
| *Aluminum oxide:* | Inhalation of finely divided particles may cause lung damage. Intrapleural $TD_{LO}$: 90 mg/kg (rat). Implant $TD_{LO}$: 200 mg/kg (rat). $TD_{LO}$ is Toxic Dose Low. |
| *Silicon oxide:* | Exposure can cause lung disease called silicosis, with cough and shortness of breath. |

## 12 Ecological Information

No data is available for the product.

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

## 14 Transportation Information

| | |
|---|---|
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

—None—

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

Copper compounds

***State Community Right-to-Know Legislation***

The following component(s) of this product are regulated under California's Proposition 65:

—None—

## European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

| | |
|---|---|
| Aluminum oxide (non-fibrous) | 2156916 |
| Silicon oxide (synthetic) | 2315454 |
| Copper oxide | 2152691 |
| Zinc oxide | 2152225 |
| Sodium oxide | 2152089 |

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

| | |
|---|---|
| R43 | May cause sensitization by skin contact. |
| S24 | Avoid contact with skin. |
| S36/37/39 | Wear suitable protective clothing, gloves, and eye/face protection. |
| Xi | Irritant |

## Canada

*Canadian Hazard Products Act:*

This product is not classified as a controlled product under regulations pursuant to the federal Hazardous Product Act (*e.g.* WHMIS).

HMIS™ - Hazardous Materials Identification System

| HMIS™ Ratings | |
|---|---|
| HEALTH | 1 |
| FLAMMABILITY | 0 |
| REACTIVITY | 0 |

0 - minimal hazard
1 - slight hazard
2 - moderate hazard
3 - serious hazard
4 - severe hazard
* - may cause cancer

Valco Instruments Co. Inc.
VICI AG International

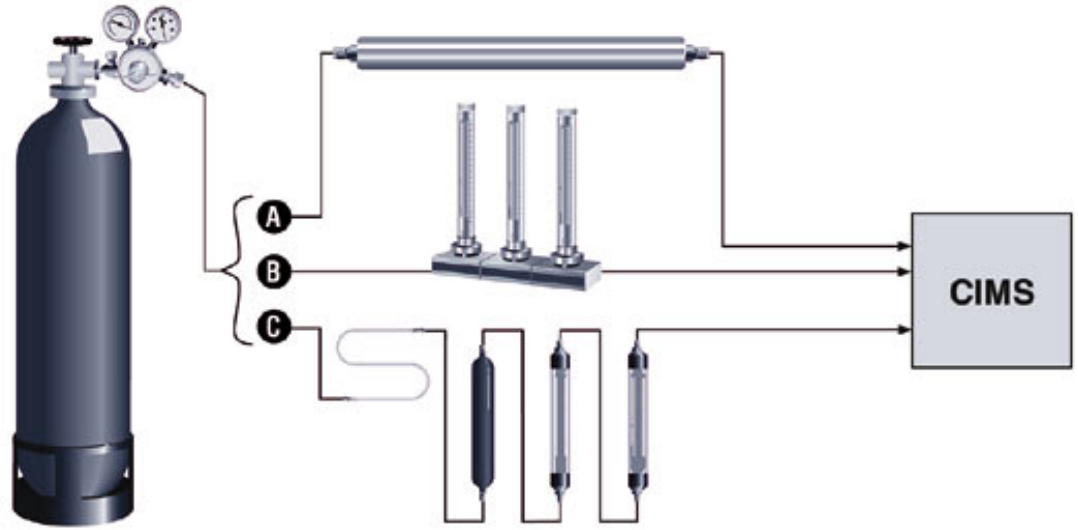
# GAS PURIFICATION

## Fittings and Gas Purity



Basically, the point to remember is "the fewer the better". Every connection in your gas delivery system has the potential for leaks; the more fittings you have, the greater the potential. In the illustration below, several gas purification options are depicted:

- The Metronics gas specific purifier minimizes the number of fittings. Total fittings: 2
- The "Manifold System" has two compression fittings for the system and one organic O-ring seal for each cartridge. Total fittings: at least 5
- A typical "Contaminant Trap" configuration has several components. Before the gas supply even enters the GC there are at least 4 modules. Total fittings: at least 8




**MORE INFORMATION**

- Contact Metronics to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.

VICI Analytical Components & Systems

VICI Metronics

# Gas Purifier for CI/MS Applications

- 1/8" compression fittings
- 1000 psig pressure rating
- Compatible with most CI gases
- Welded stainless steel body

## Description

The use of Chemical Ionization Mass Spectroscopy has increased in recent years, with instrumentation to perform this sensitive analytical technique now availalbe commercially. In response to this growth, VICI Metronics has developed a gas purifier designed specifically for the unique demands of chemical ionization.

Several types of contaminants are detrimental to CI performance – notably moisture, heavy hydrocarbons, halocarbons, and oxygen. A Metronics CI purifier module placed in line with the gas delivery system removes these contaminants, reducing levels from many parts per million to levels that are below the lower limit of analytical detection, and retains them for the operating life of the purifier. (Recommended replacement is after three bottles of gas, or if detector baseline drift and noise become apparent.)

## Successive Beds for Peak Performance

A very high capacity has been engineered into the gas purifier by using several different materials for gross contaminant removal and additional materials for the removal of trace amounts of the contaminants. Three separate adsorption chemistries are incorporated into the operating design of the gas purifier to insure the optimal capacity and efficiency. This successive bad format insures high capacity as well as a very high efficiency for the removal of contaminants that can be present in even high purity methane.

**Our successive bed format achieves the highest purity gas commercially available**

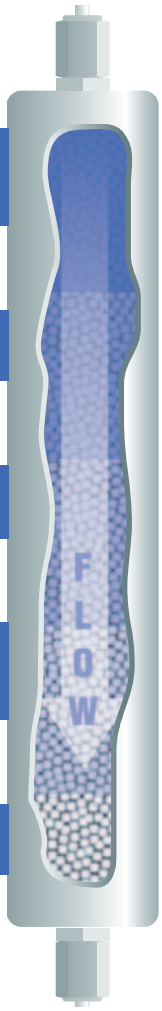
**Two very high capacity hydrocarbon and moisture sorbents at the inlet for effective contaminant removal**

**Unique proprietary broad spectrum sorbent material for multiple contaminant removal**

**Multiple bed format to allow several step reduction in contaminants**

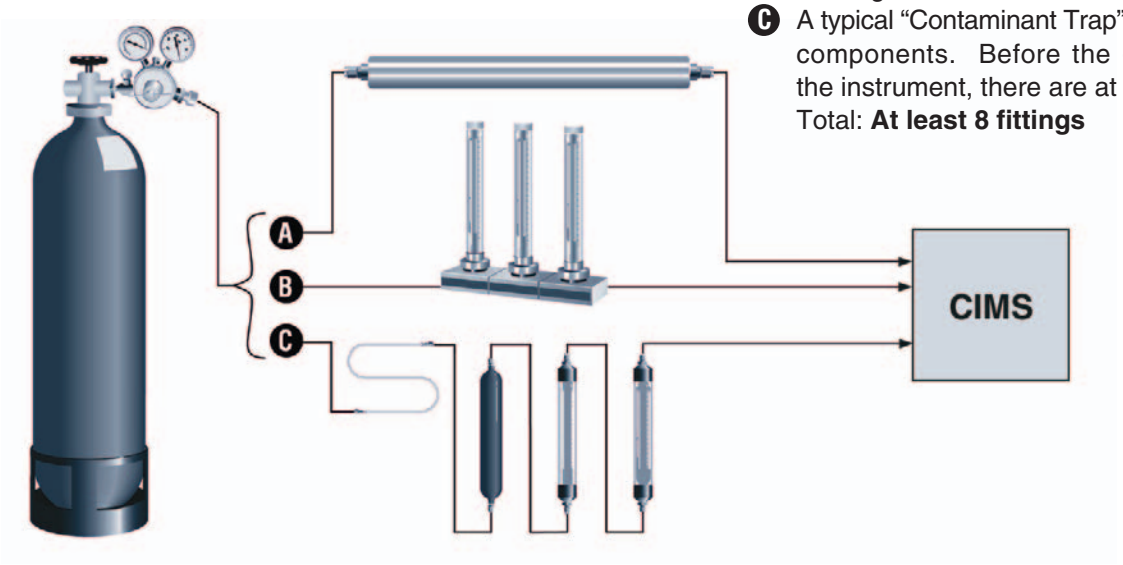
**Removal of $H_2O$, $O_2$, halocarbons, hydrocarbons, CO, $CO_2$, $H_2$, and sulfur containing compounds with a single purifier**

**Very high efficiency sorbents at the outlet for trace contaminant removal**



## Fittings: the Fewer the Better

Every connection in your gas delivery system has the potential for leaks; the more fittings you have, the greater the potential. In the illustration below, several gas purification options are depicted:




**A** The VICI Metronics nitrogen purifier minimizes the number of fittings. Total: **2 fittings**

**B** The "Manifold System" has two compression fittings for the system and one organic O-ring seal for each cartridge. Total: **At least 5 fittings**

**C** A typical "Contaminant Trap" configuration has several components. Before the gas supply even enters the instrument, there are at least 4 modules. Total: **At least 8 fittings**

## Specifications

Length ..... 30.5 cm (12")
Diameter ..... 3.8 cm (1.5")
Maximum inlet pressure ..... 6895 kPa (1000 psi)
Maximum recommended flow ..... 500 ml/min

Pressure drop, 862 kPa (125 psi) inlet, at a flow of 0 to 500 ml/min ..... <0.20 psi
End fittings ..... 1/8" compression
Shipping weight .....800 g (1.76 lb)

## Selection Guide and Ordering Information

| Product Description | Product no. | Fitting | PPB at outlet, based on 50 PPM nominal inlet concentration level | | |
|---|---|---|---|---|---|
| | | | $O_2$ | $H_2O$ | Sulfur compounds |
| CI purifier | P-500-1 | 1/8" | <1 | <1 | <1 |

# Nitrogen Gas Purifier for LC/MS Applications

- Designed to purify nitrogen gas produced from liquid nitrogen
- Decrease baseline noise and increase LC/MS sensitivity
- Reduce background noise and ghost peaks

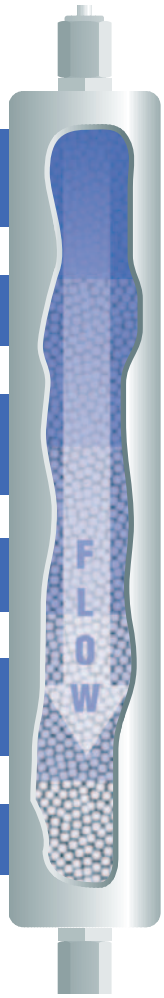
## Description

VICI Metronics nitrogen purifiers are optimized for the high flow nitrogen gas supply used on LC/MS instruments. Several types of contaminants are detrimental to LC/MS performance – notably moisture, hydrocarbons, halocarbons, and oxygen. A Metronics nitrogen purifier module placed in line with the nitrogen gas delivery system removes these contaminants, retaining them for the operating life of the purifier.

The purifier reduces most contaminant levels from many parts per million to levels that are below the lower limit of analytical detection, and absorbs a larger number and a greater variety of contaminants than other commonly used adsorptive materials. In particular, the Metronics nitrogen purifier has been shown to out perform the carbon-based hydrocarbon traps previously used for this application.

**Caution:**
This purifier is designed to be used with nitrogen gas produced from liquid nitrogen, or with nitrogen gas containing less than 500 ppm of oxygen. If this product is used on a stream with a high oxygen content, it may get hot enough to cause injury. Use our Purifier for Nitrogen Generators (P-350-1 and P-350-2) to purify high oxygen content nitrogen.

**Our successive bed format achieves the highest purity gas commercially available**




**Two very high capacity hydrocarbon and moisture sorbents at the inlet for effective contaminant removal**

**Unique proprietary broad spectrum sorbent material for multiple contaminant removal**

**Two oxygen scavenging materials for both high capacity and high efficiency $O_2$ removal**

**Multiple bed format to allow several step reduction in contaminants**

**Removal of $H_2O$, $O_2$, halocarbons, hydrocarbons, CO, $CO_2$, $H_2$, and sulfur containing compounds with a single purifier**

**Very high efficiency sorbents at the outlet for trace contaminant removal**

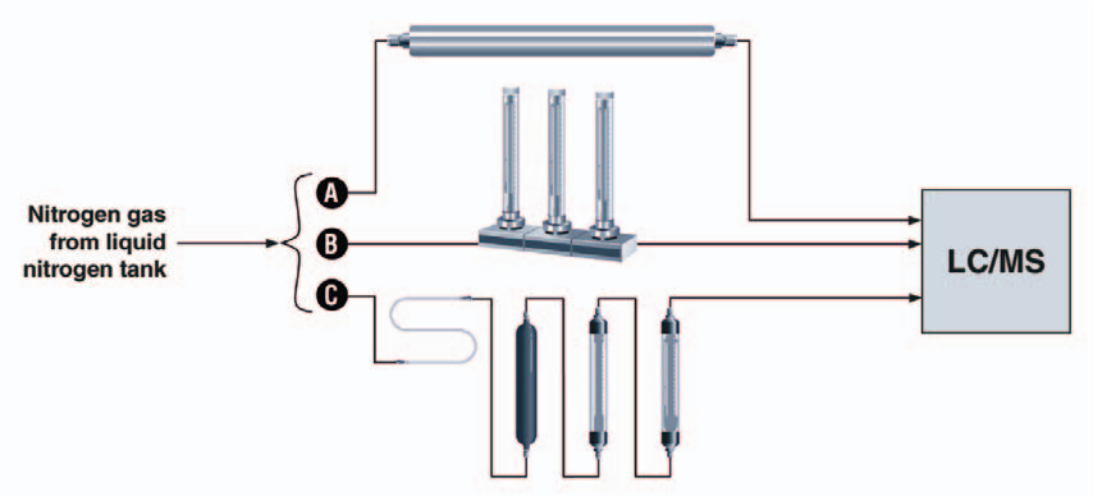
## Fittings: the Fewer the Better

Every connection in your gas delivery system has the potential for leaks; the more fittings you have, the greater the potential. In the illustration below, several gas purification options are depicted:

**A** The VICI Metronics nitrogen purifier minimizes the number of fittings. Total: **2 fittings**

**B** The "Manifold System" has two compression fittings for the system and one organic O-ring seal for each cartridge. Total: **At least 5 fittings**

**C** A typical "Contaminant Trap" configuration has several components. Before the gas supply even enters the instrument, there are at least 4 modules. Total: **At least 8 fittings**




## Specifications

Length ..... 53.3 cm (21")
Diameter..... 3.8 cm (1.5")
Maximum inlet pressure ..... 6895 kPa (1000 psi)
Maximum recommended flow ..... 12 L/min

Pressure drop, 862 kPa (125 psi) inlet,
at a flow of 0 to 500 ml/min ..... <0.20 psi
Compression end fittings ..... 1/8" or 1/4"
Shipping weight .....1300 g (3.04 lb)

## Ordering Information

| Product Description | Fitting | Product no. |
|---|---|---|
| Nitrogen purifier for LC/MS applications | 1/8" | P-310-1 |
| | 1/4" | P-310-2 |

# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Nitrogen Purifier for LC/MS**

**Company Name:**

VICI® Metronics Inc
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
1-877-737-1887 or 1-360-697-9199

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Silicon oxide (synthetic) | 7631-86-9 | < 45 | 10 mg/m$^3$ Inhalable<br>3 mg/m$^3$ Respirable | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable fraction |
| Aluminum oxide (non-fibrous) | 1344-28-1 | < 32 | 10 mg/m$^3$ | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Sodium oxide | 1313-59-3 | < 15 | N/E | N/E |
| Aluminosilicate | 1327-36-2 | < 10 | 10 mg/m$^3$ Inhalable dust<br>3 mg/m$^3$ Respirable dust | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Magnesium oxide | 1309-48-4 | < 3 | 10 mg/m$^3$ Fume | 15 mg/m$^3$ Fume,<br>total particulate |
| Potassium oxide | 12136-45-7 | < 2 | N/E | N/E |
| Water | 7732-18-5 | < 2 | N/E | N/E |
| Quartz | 14808-60-7 | < 1 | 0.05 mg/m$^3$ Respirable dust | 10 mg/m$^3$ Total dus<br>3.3 mg/m$^3$ Respirable dust |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system. Quartz may cause cancer.

### Potential Health Effects

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* May cause skin irritation with repeated or prolonged exposure.

*Eye Contact:* Dust and/or product may cause eye discomfort and/or irritation seen as tearing and reddening.

*Ingestion:* This product is considered to have a low order of oral toxicity.

*Inhalation:* Inhalation of product and/or dust may cause irritation of the respiratory system.

*Target Organ:* Prolonged or repeated exposure may cause lung injury or cancer.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*

Silicon oxide (synthetic) - Not classifiable as human carcinogen (Group 3)
Crystalline silica inhaled in the form of quartz from occupational sources is carcinogenic to humans. (IARC Group 1).

*U.S. National Toxicology Program (NTP)*

Not Regulated
Quartz - Known Human Carcinogen

*U.S. Occupational Safety and Health Administration (OSHA)*

Neither the product nor the component(s) are classified or regulated.

## 4 First Aid Measures

*Skin Contact:* Wash affected area with soap and water. If irritation develops, obtain medical attention.

*Eye Contact:* Flush with water for at least 15 minutes. If irritation occurs, obtain medical attention.

*Ingestion:* Do not induce vomiting. Obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If respiratory problems develop, obtain medical attention.

*Notes to Physician:* Hydrocarbons and other materials that contact the product during normal use can be retained on the product. The retained materials may be hazardous. Identify the retained material and treat accordingly.

## 5 Fire Fighting Measures

*Flash Point:* Unused material will not burn.

*Extinguishing Media:* Use media appropriate for surrounding fire.

*Fire and Explosion Hazards:* Used material may contain materials of a hazardous nature. The user of this product must identify the hazards of the retained material and inform the fire fighters of these hazards.

## 6 Accidental Release Measures

*Large Spill:* Isolate the affected areas. Confine entry into the affected area to those persons properly protected. Special attention should be given to eye, skin, and respiratory protection because recovery of dry product is expected to generate dust. Sweep, shovel or vacuum spilled product into appropriate containers. (Do not use a vacuum if material has contacted a hydrocarbon material.)

*Small Spill:* Sweep or vacuum spilled product into appropriate container. (Do not use a vacuum if material has contacted a hydrocarbon.) Product should be disposed in accordance with all applicable government regulations. See section 13 of MSDS, Disposal Information.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached and natural ventilation is inadequate, use mechanical ventilation, other engineering controls, or a toxic dust respirator (in USA - NIOSH/MSHA approved) to prevent inhalation of product dust.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Safety glasses or goggles as necessary to prevent eye contact.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

| | |
|---|---|
| *Appearance:* | Material is in a sealed container |
| *Odor:* | None |
| *pH:* | Not applicable |
| *% Volatile:* | Not applicable |
| *Pour Point:* | Not applicable |
| *Viscosity:* | Not applicable |
| *Vapor Density:* | Not applicable |
| *Specific Gravity:* | Not applicable |
| *Apparent Bulk Density:* | 0.7 ± 0.1 g/cc |
| *Solubility in Water:* | Negligible |
| *Boiling Point:* | Not applicable |
| *Freezing Point:* | Not applicable |
| *Melting Point:* | Not applicable |
| *Vapor Pressure* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable. |
| *Conditions to Avoid:* | None known. |
| *Hazardous Decomposition Products:* | Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use. |
| *Hazardous Polymerization:* | Will not occur. |
| *Incompatible Materials:* | Contact with acids may cause leaching of metals. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | An oral $LD_{50}$ is not available for this product. |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data for this product. |

**Additional Toxicological Information:**

| | |
|---|---|
| *Aluminum oxide:* | Inhalation of finely divided particles may cause lung damage. Intrapleural $TD_{LO}$: 90 mg/kg (rat). Implant $TD_{LO}$: 200 mg/kg (rat). $TD_{LO}$ is Toxic Dose Low. |
| *Silicon oxide:* | Exposure can cause lung disease called silicosis, with cough and shortness of breath. |

## 12 Ecological Information

No data is available for the product.

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

## 14 Transportation Information

| | |
|---|---|
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

—None—

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

—None—

## European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

| | |
|---|---|
| Silicon oxide (synthetic) | 2315454 |
| Aluminum oxide (non-fibrous) | 2156916 |
| Sodium oxide | 2152089 |
| Aluminosilicate | 2154751 |
| Magnesium oxide | 2151719 |
| Potassium oxide | 2352276 |
| Water | 2317912 |
| Quartz | 2388784 |

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

No Dangerous Goods Label Required.

## Canada

*Canadian Hazard Products Act:*

This product is not classified as a controlled product under regulations pursuant to the federal Hazardous Product Act (*e.g.* WHMIS).

HMIS™ - Hazardous Materials Identification System

| HMIS™ Ratings | |
|---|---|
| HEALTH | 1* |
| FLAMMABILITY | 0 |
| REACTIVITY | 0 |

0 - minimal hazard
1 - slight hazard
2 - moderate hazard
3 - serious hazard
4 - severe hazard
* - may cause cancer

VICI® Valco Instruments Co. Inc.
VICI AG International

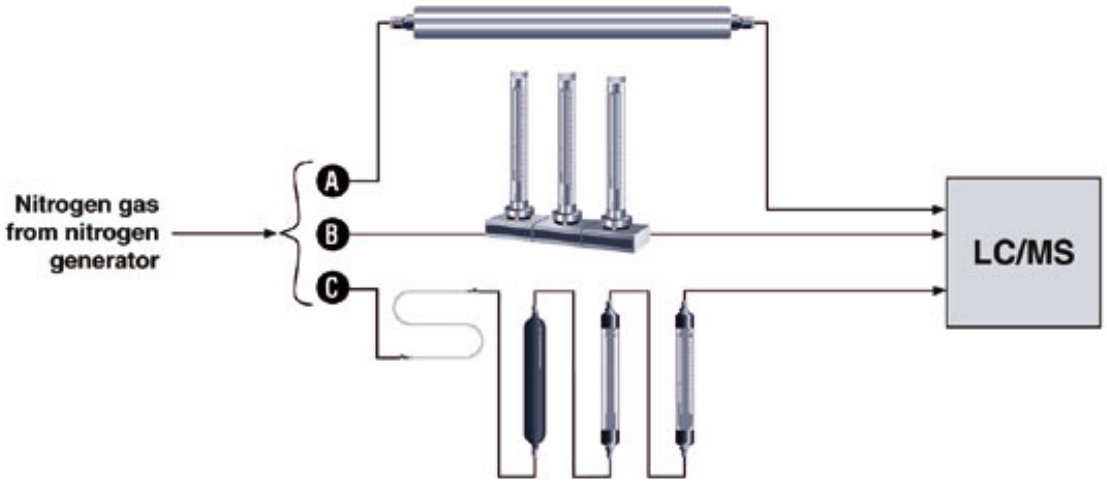
# GAS PURIFICATION

## Fittings and Gas Purity



Basically, the point to remember is "the fewer the better". Every connection in your gas delivery system has the potential for leaks; the more fittings you have, the greater the potential. In the illustration below, several gas purification options are depicted:

- The Metronics gas specific purifier minimizes the number of fittings. Total fittings: 2
- The "Manifold System" has two compression fittings for the system and one organic O-ring seal for each cartridge. Total fittings: at least 5
- A typical "Contaminant Trap" configuration has several components. Before the gas supply even enters the GC there are at least 4 modules. Total fittings: at least 8




**MORE INFORMATION**

- Contact Metronics to find out more about VICI Metronics gas purifiers. North American customers can call toll-free (877) 737-1887.

# Gas Purifier for Nitrogen Generators

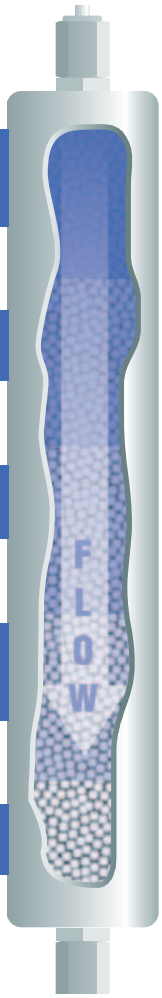
- Specifically designed to purify nitrogen produced from nitrogen generators
- Decrease baseline noise and increase LC/MS sensitivity
- Reduce background noise and ghost peaks

## Description

VICI Metronics nitrogen purifiers are optimized for the high flow nitrogen gas supply used on LC/MS instruments. Several types of contaminants are detrimental to LC/MS performance – notably moisture, hydrocarbons, and halocarbons. A Metronics nitrogen purifier module placed in line with the nitrogen gas delivery system removes these contaminants, retaining them for the operating life of the purifier.

The purifier reduces most contaminant levels from many parts per million to levels that are below the lower limit of analytical detection, and absorbs a larger number and a greater variety of contaminants than other commonly used adsorptive materials. In particular, the Metronics nitrogen purifier has been shown to out perform the carbon-based hydrocarbon traps previously used for this application.

**Our successive bed format achieves the highest purity gas commercially available**




**Two very high capacity hydrocarbon and moisture sorbents at the inlet for effective contaminant removal**

**Unique proprietary broad spectrum sorbent material for multiple contaminant removal**

**Multiple bed format to allow several step reduction in contaminants**

**Removal of $H_2O$, halocarbons, hydrocarbons, CO, $CO_2$, $H_2$, and sulfur containing compounds with a single purifier**

**Very high efficiency sorbents at the outlet for trace contaminant removal**

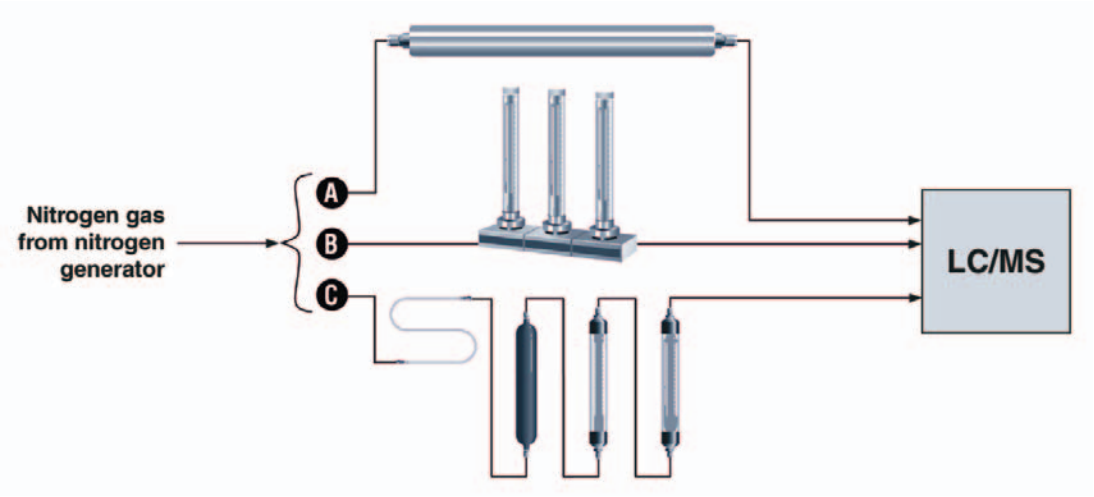
## Fittings: the Fewer the Better

Every connection in your gas delivery system has the potential for leaks; the more fittings you have, the greater the potential. In the illustration below, several gas purification options are depicted:

**A** The VICI Metronics nitrogen purifier minimizes the number of fittings. Total: **2 fittings**

**B** The "Manifold System" has two compression fittings for the system and one organic O-ring seal for each cartridge. Total: **At least 5 fittings**

**C** A typical "Contaminant Trap" configuration has several components. Before the gas supply even enters the instrument, there are at least 4 modules. Total: **At least 8 fittings**




## Specifications

Length ..... 53.3 cm (21")
Diameter..... 3.8 cm (1.5")
Maximum inlet pressure ..... 6895 kPa (1000 psi)
Maximum recommended flow ..... 12 L/min

Pressure drop, 827 kPa (120 psi) inlet,
at a flow of 0 to 500 ml/min ..... <0.20 psi
Compression end fittings ..... 1/8" or 1/4"
Shipping weight .....1300 g (3.04 lb)

## Ordering Information

| Product Description | Fitting | Product no. |
|---|---|---|
| Nitrogen purifier for nitrogen generators | 1/8" | P-350-1 |
| | 1/4" | P-350-2 |

# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Purifier for Nitrogen Generator**

**Company Name:**

VICI® Metronics Inc
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
1-877-737-1887 or 1-360-697-9199

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Silicon oxide (synthetic) | 7631-86-9 | < 45 | 10 mg/m$^3$ Inhalable<br>3 mg/m$^3$ Respirable | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable fraction |
| Aluminum oxide (non-fibrous) | 1344-28-1 | < 32 | 10 mg/m$^3$ | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Sodium oxide | 1313-59-3 | < 15 | N/E | N/E |
| Aluminosilicate | 1327-36-2 | < 10 | 10 mg/m$^3$ Inhalable dust<br>3 mg/m$^3$ Respirable dust | 15 mg/m$^3$ Total dust<br>5 mg/m$^3$ Respirable dust |
| Magnesium oxide | 1309-48-4 | < 3 | 10 mg/m$^3$ Fume | 15 mg/m$^3$ Fume,<br>total particulate |
| Potassium oxide | 12136-45-7 | < 2 | N/E | N/E |
| Water | 7732-18-5 | < 2 | N/E | N/E |
| Quartz | 14808-60-7 | < 1 | 0.05 mg/m$^3$ Respirable dust | 10 mg/m$^3$ Total dus<br>3.3 mg/m$^3$ Respirable dust |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system. Quartz may cause cancer.

### Potential Health Effects

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* May cause skin irritation with repeated or prolonged exposure.

*Eye Contact:* Dust and/or product may cause eye discomfort and/or irritation seen as tearing and reddening.

*Ingestion:* This product is considered to have a low order of oral toxicity.

*Inhalation:* Inhalation of product and/or dust may cause irritation of the respiratory system.

*Target Organ:* Prolonged or repeated exposure may cause lung injury or cancer.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*

Silicon oxide (synthetic) - Not classifiable as human carcinogen (Group 3)
Crystalline silica inhaled in the form of quartz from occupational sources is carcinogenic to humans. (IARC Group 1).

*U.S. National Toxicology Program (NTP)*

Not Regulated
Quartz - Known Human Carcinogen

*U.S. Occupational Safety and Health Administration (OSHA)*

Neither the product nor the component(s) are classified or regulated.

## 4 First Aid Measures

*Skin Contact:* Wash affected area with soap and water. If irritation develops, obtain medical attention.

*Eye Contact:* Flush with water for at least 15 minutes. If irritation occurs, obtain medical attention.

*Ingestion:* Do not induce vomiting. Obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If respiratory problems develop, obtain medical attention.

*Notes to Physician:* Hydrocarbons and other materials that contact the product during normal use can be retained on the product. The retained materials may be hazardous. Identify the retained material and treat accordingly.

## 5 Fire Fighting Measures

*Flash Point:* Unused material will not burn.

*Extinguishing Media:* Use media appropriate for surrounding fire.

*Fire and Explosion Hazards:* Used material may contain materials of a hazardous nature. The user of this product must identify the hazards of the retained material and inform the fire fighters of these hazards.

## 6 Accidental Release Measures

*Large Spill:* Isolate the affected areas. Confine entry into the affected area to those persons properly protected. Special attention should be given to eye, skin, and respiratory protection because recovery of dry product is expected to generate dust. Sweep, shovel or vacuum spilled product into appropriate containers. (Do not use a vacuum if material has contacted a hydrocarbon material.)

*Small Spill:* Sweep or vacuum spilled product into appropriate container. (Do not use a vacuum if material has contacted a hydrocarbon.) Product should be disposed in accordance with all applicable government regulations. See section 13 of MSDS, Disposal Information.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached and natural ventilation is inadequate, use mechanical ventilation, other engineering controls, or a toxic dust respirator (in USA - NIOSH/MSHA approved) to prevent inhalation of product dust.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Safety glasses or goggles as necessary to prevent eye contact.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

| | |
|---|---|
| *Appearance:* | Material is in a sealed container |
| *Odor:* | None |
| *pH:* | Not applicable |
| *% Volatile:* | Not applicable |
| *Pour Point:* | Not applicable |
| *Viscosity:* | Not applicable |
| *Vapor Density:* | Not applicable |
| *Specific Gravity:* | Not applicable |
| *Apparent Bulk Density:* | 0.7 ± 0.1 g/cc |
| *Solubility in Water:* | Negligible |
| *Boiling Point:* | Not applicable |
| *Freezing Point:* | Not applicable |
| *Melting Point:* | Not applicable |
| *Vapor Pressure* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable. |
| *Conditions to Avoid:* | None known. |
| *Hazardous Decomposition Products:* | Hydrocarbons and other materials that contact the product during normal use can be retained on the product. It is reasonable to expect that decomposition products will come from these retained materials of use. |
| *Hazardous Polymerization:* | Will not occur. |
| *Incompatible Materials:* | Contact with acids may cause leaching of metals. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | An oral $LD_{50}$ is not available for this product. |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data for this product. |

**Additional Toxicological Information:**

| | |
|---|---|
| *Aluminum oxide:* | Inhalation of finely divided particles may cause lung damage. Intrapleural $TD_{LO}$: 90 mg/kg (rat). Implant $TD_{LO}$: 200 mg/kg (rat). $TD_{LO}$ is Toxic Dose Low. |
| *Silicon oxide:* | Exposure can cause lung disease called silicosis, with cough and shortness of breath. |

## 12 Ecological Information

No data is available for the product.

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

## 14 Transportation Information

| | |
|---|---|
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

—None—

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

—None—

## European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

| | |
|---|---|
| Silicon oxide (synthetic) | 2315454 |
| Aluminum oxide (non-fibrous) | 2156916 |
| Sodium oxide | 2152089 |
| Aluminosilicate | 2154751 |
| Magnesium oxide | 2151719 |
| Potassium oxide | 2352276 |
| Water | 2317912 |
| Quartz | 2388784 |

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

No Dangerous Goods Label Required.

## Canada

*Canadian Hazard Products Act:*

This product is not classified as a controlled product under regulations pursuant to the federal Hazardous Product Act (*e.g.* WHMIS).

HMIS™ - Hazardous Materials Identification System

| HMIS™ Ratings | |
|---|---|
| HEALTH | 1* |
| FLAMMABILITY | 0 |
| REACTIVITY | 0 |

0 - minimal hazard
1 - slight hazard
2 - moderate hazard
3 - serious hazard
4 - severe hazard
* - may cause cancer

# MATERIAL SAFETY DATA SHEET

## 1 Product and Company Identification

**Product Name:** **Liquid $CO_2$ Purifier**

**Company Name:**

VICI Mat/Sen
*A division of VICI Metronics, Inc.*
26272 Twelve Trees Ln NW
Poulsbo, WA 98370

Emergency Contact Number
1-800-MATSEN-1 or 1-800-628-7361

## 2 Composition

| Ingredient | CAS No. | Wt% | ACGIH TLB-TWA | OSHA PEL-TWA |
|---|---|---|---|---|
| Silicon oxide (synthetic) | 7631-86-9 | < 50 | 10 mg/m³ Inhalable<br>3 mg/m³ Respirable | 15 mg/m³ Total dust<br>5 mg/m³ Respirable fraction |
| Carbon | 7440-44-0 | < 30 | None listed | None listed |
| Alumina | 1344-28-1 | < 25 | 10 mg/m³ Inhalable<br>3 mg/m³ Respirable | 15 mg/m³ Total dust<br>5 mg/m³ Respirable fraction |
| Aluminum Phosphate | 7784-30-7 | < 10 | 2 mg/m³ Inhalable | None listed |

*Abbreviations:*

N/E - None established
CAS - Chemical Abstracts Service
ACGIH - American Conference of Governmental Industrial Hygienists
TLV - Threshold Limit Value
OSHA - Occupational Safety and Health Administration - USA
TWA - Time Weighted Average
PEL - Permissible Exposure Limit
STEL - Short-Term Exposure Limit

## 3 Hazard Identification

### Emergency Overview

This product is in a sealed container. Exposure can only take place if the integrity of the container is compromised. In case the container is opened, the contained product can cause irritation to the eyes, skin, or upper respiratory system.

### Potential Health Effects

*Target Organ:* Prolonged or repeated exposure may cause lung injury or cancer.

*Primary Routes of Exposure:* The product is in a sealed container. As long as the container is not opened, exposure should not take place.

*Skin Contact:* May cause skin irritation with repeated or prolonged exposure.

*Eye Contact:* Dust may cause tearing, blurred vision, and photophobia. May cause chemical conjunctivitis and corneal damage.

*Ingestion:* May cause nausea, vomiting, abdominal pain, and increased salivation.

*Inhalation:* May cause lung damage. Olfactory fatigue may occur. Can produce delayed pulmonary edema. Inhalation of dust causes severe irritation of the upper respiratory trace, gastrointestinal disturbances, albuminuria, gradual loss of weight, and increasing weakness.

*Chronic:* Chronic inhalation may lead to decreased pulmonary function.

### Carcinogenicity Classification

*International Agency for Research on Cancer (LARC)*

?.

*U.S. National Toxicology Program (NTP)*

?

*U.S. Occupational Safety and Health Administration (OSHA)*

?

## 4 First Aid Measures

*Skin Contact:* Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Obtain medical attention if irritation develops or persists. Wash clothing before reuse.

*Eye Contact:* Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Obtain medical attention.

*Ingestion:* Do NOT induce vomiting. If victim is conscious and alert, give 2 - 4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Obtain medical attention.

*Inhalation:* Remove affected person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Obtain medical attention.

*Notes to Physician:* Treat symptomatically and supportively.

## 5 Fire Fighting Measures

*General Information:* As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire.

*Extinguishing Media:* For a large fire, use water spray, fog, or regular foam. For small fires, use dry chemical, carbon dioxide, sand, earth, water spray, or regular foam. Cool containers with flooding quantities of water until well after fire is out.

*Flash Point:* Not applicable.

*Autoignition Temperature:* 452°C (845.60°C)

## 5 *(con't)* Fire Fighting Measures

*Explosion Limits:* Upper: Not available
Lower: Not available

*NFPA Rating (estimated)* Health: 1; Flammability: 1; Instability: 0

## 6 Accidental Release Measures

*General Information:* Use proper personal protective equipment as indicated in Section 8.

*Spills/Leaks:* Remove all sources of ignition. Vacuum or sweep up material and place into a suitable disposal container. Scoop up with a nonsparking tool, then place into a suitable container for disposal. Avoid generating dusty conditions.

## 7 Handling and Storage

The product is in sealed containers. In the event the seal on the container is breached, store the product in tightly closed, properly labeled containers. Store out of direct sunlight. Store in dry area.

## 8 Exposure Controls and Personal Protection

*Engineering controls:* Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

*Respiratory Protection:* Product is in a sealed container. As long as the seal on the container is not breached, respiratory protection is not needed. If the container seal is breached, follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. When a respirator is necessary, use one approved by NIOSH or European Standard EN 149.

*Skin Protection:* Use gloves to avoid prolonged or repeated skin contact.

*Eye Protection:* Wear safety glasses or goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

*Clothing:* Wear appropriate protective clothing to minimize contact with skin.

## 9 Physical and Chemical Properties

These data do not represent technical or sales specifications.

*Physical state:* Material is in a sealed container

| | | | |
|---|---|---|---|
| *Appearance:* | Not applicable | *Boiling Point:* | Not applicable |
| *Odor:* | Not applicable | *Freezing/Melting Point:* | Not applicable |
| *pH:* | Not applicable | *Decomposition Temperature:* | Not applicable |
| *Vapor Pressure* | Not applicable | *Solubility:* | Not applicable |
| *Vapor Density:* | Not applicable | *Specific Gravity/Density:* | Not applicable |
| *Evaporation Rate:* | Not applicable | *Molecular Formula:* | Not applicable |
| *Viscosity:* | Not applicable | *Molecular Weight:* | Not applicable |

## 10 Stability

| | |
|---|---|
| *Stability:* | Stable under normal temperatures and pressures. |
| *Conditions to Avoid:* | Dust generation, moisture, excess heat. |
| *Hazardous Decomposition Products:* | Carbon monoxide, carbon dioxide. |
| *Hazardous Polymerization:* | Has not been reported. |
| *Incompatible Materials:* | Oxidizing agents, alkali metals, iron oxide, lead oxide, liquid oxygen, manganese oxide, metallic salts, chlorinated paraffins, dibenzoyl peroxide, 1,4-diazabicyclo-{2,2,2}-octane, molybdenum(IV) oxide, nitrobenzaldehyde, potassium hydroxide, sodium hydrogen carbonate. |

## 11 Toxicological Information

| | |
|---|---|
| *Acute Oral Toxicity:* | An oral $LD_{50}$ is not available for this product. |
| *Acute Dermal Toxicity:* | A dermal $LD_{50}$ is not available for this product. |
| *Acute Inhalation Toxicity:* | An inhalation $LC_{50}$ is not available for this product |
| *Irritation:* | No data available. |
| *Carcinogenicity:* | No data available. |
| *Epidemiology:* | No data available. |
| *Teratogenicity:* | No data available. |
| *Reproductive effects:* | No data available. |
| *Neurotoxicity:* | No data available. |
| *Mutagenicity:* | No data available. |
| *Other studies:* | No data available. |

## 12 Ecological Information

No data is available for the product.

## 13 Disposal Information

Dispose of the product in accordance with all applicable government regulations. This product (in its fresh unused state) is not listed by generic name or trademark name in the U.S. EPA's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Regulations and does not possess any of the four identifying characteristics of hazardous waste (ignitability, corrosivity, reactivity, or toxicity).

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. U.S. EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

**RCRA P-Series:** None listed.
**RCRA U-Series:** None listed

## 14 Transportation Information

| | |
|---|---|
| *Product Label:* | VICI Mat/Sen Liquid CO2 Purifier |
| *U.S. Department of Transportation Shipping Name:* | Not regulated. |
| *International Maritime Organization (IMO):* | Not regulated. |

## United States

***TSCA*** *(Toxic Substances Control Act):*

All the ingredients of this mixture are listed on the TSCA Chemical Substance Inventory.

***CERCLA*** *(Comprehensive Environmental Response, Compensation, and Liability Act) Reportable Quantity:*

The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):

—None—

***SARA*** *(Superfund Amendments and Reauthorization Act of 1986) Title III:*

**Section 302** (Extremely Hazardous Substances):

The following component(s) of this product is/are subject to the emergency planning provisions of 40 CFR 355 when there are amounts equal or greater than the Threshold Planning Quantity (TPQ):

—None—

**Section 313** (Toxic Chemicals):

The following component(s) have been specified as Toxic Chemicals under SARA Section 313 and may be subject to the Toxic Release Inventory (TRI) reporting requirements under 40 CFR 372:

Alumina: 1344-28-1

## European Union (EU)

*European Inventory of Existing Commercial Chemical Substances:*

All components of this preparation are included in EINECS/ELINCS.

| | |
|---|---|
| Silicon oxide (synthetic) | 2315454 |
| Aluminum Phosphate | ?? |
| Alumina | ?? |
| Carbon | ?? |

*Council of European Communities Directive on Classification, Packaging and Labelling of Dangerous Substances/Preparation (67/548/EEC & 88/379/EEC):*

No Dangerous Goods Label Required.

Safety phrases: S24/25 Avoid contact with skin and eyes.

## Canada

*Canadian Hazard Products Act:*

This product is not classified as a controlled product under regulations pursuant to the federal Hazardous Product Act (*e.g.* WHMIS).

*Canadian Ingredient Disclosure List:*

Carbon
Alumina
Silicon Oxide

**Summary of Changes:** ??
**I.D./Form:** ??
**Supersedes:** ??

HMIS™ - Hazardous Materials Identification System