

HELIUM PURIFIER & NITROGEN PURIFIER USER MANUAL

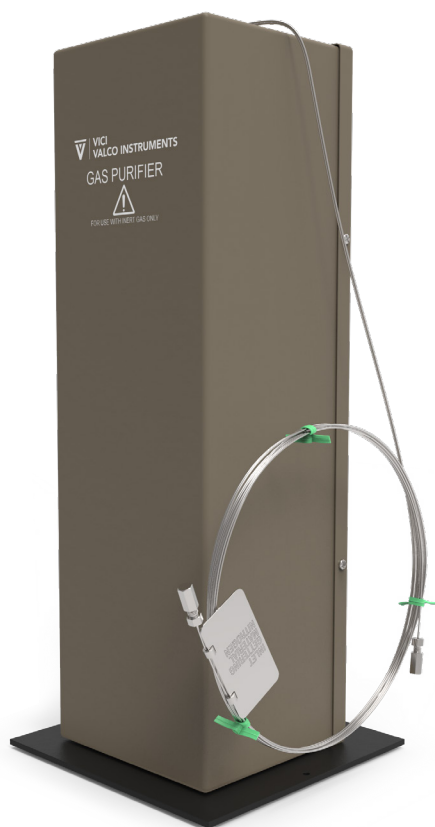


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REVISED 3/2022



APPLICABLE MODELS

This manual is applicable to the following models:

- HP2
- HP2-220
- NP2
- NP2-220
- I-23572HP2
- I-23572NP2

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VERSION HISTORY

VERSION	DATE	COMMENT/CHANGE
1.0	01/10/2021	Layout and initial release - VICI Gig Harbor Group
1.1	3/17/2022	Add Appendix A & B, update technical drawings page 7 thru 9 - VICI Gig Harbor Group

HELIUM PURIFIER & NITROGEN PURIFIER USER MANUAL



1. INTRODUCTION

1.1. Specifications

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 ultra high 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.

	HELIUM PURIFIER (HP2)	NITROGEN PURIFIER (NP2)
Gas 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 (752°F)	400°C (752°F)
Max. Flow Rate	1 L/min	1 L/min
Impurities Removed	Outlet impurities less than 10 ppb H ₂ O, H ₂ , O ₂ , N ₂ , NO, NH ₃ , CO, and CO ₂ , based on 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 ₂ O, 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, Rn	He, Ne, Ar, Kr, Xe, Rn, CH ₄ , 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.

1.2. 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 an 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.

1.3. 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 purifier be used only with the power supply received with it.

2. 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.

2.1. 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
3. Connect the barrel connector of the power supply to the purifier.



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

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).

2.2. 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 H₂, O₂, H₂O, CO, and CO₂ (plus N₂ 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.

2.3. 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.

2.4. 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 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 4.

3. ROUTINE MAINTENANCE



CAUTION: 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.

HP2	I-23572HP2
NP2	I-23572NP2

3.1. Replacing the Getter Cartridge

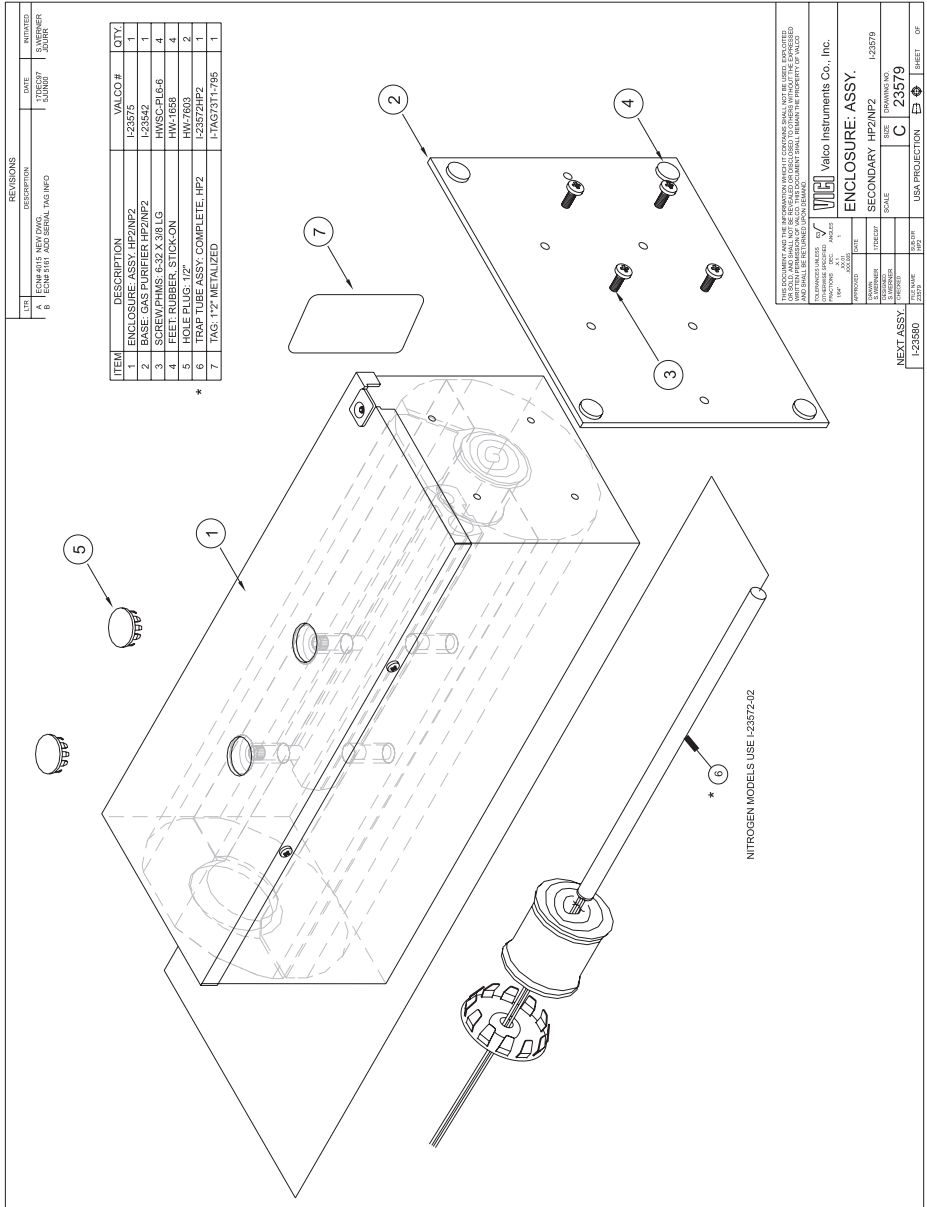
1. Disconnect the power supply from the purifier, but leave the helium flow on.
2. Allow at least two hours for the purifier to cool.
3. Using a thin-edged screwdriver or knife, remove the two-hole plugs from the side of the unit and one from the top.
4. The side holes allow access to the two screws 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 4 to get the system back in operation.

3.2. 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".

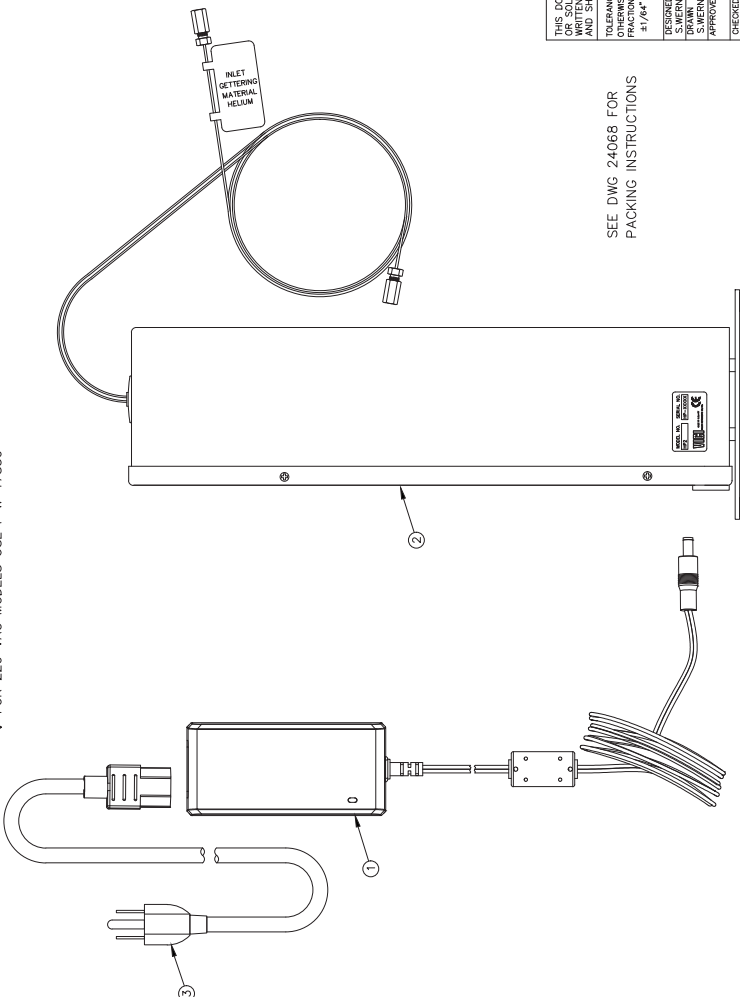
4.2. Secondary Assembly (23579)



4.3. Final Assembly HP2/NP2 (23580)

PARTS LIST			REVISONS						
ITEM	DESCRIPTION	VALCO #	QTY	LTR	DESCRIPTION	DATE	INITIATED	DATE	APPROVED
1	POWER SUPPLY: 24VDC 65W 100-240VAC MEGA	I-X-PS24VDC-M	1	A	ECN #4015 NEW DWG. CETER REDESIGN (HP2)	17DEC97	S.WERNER		
2	ENCL. ASSY: SECONDARY, HP2	I-23579	1	B	ECN #5011 NEW DWG. ADD PACKING NOTE	06JUN00	JOURR		
3	POWER CORD: IEC 320 TYPE	I-W-17600	1	C	ECN #4448 ADD UNIONS, PIN ZUI0F	11MAR03	JOURR		
4	UNION, ZDV: 1/16"*.029 w/ZF10F.303HX	ZUI0F	2	D	ECN #4485 CHG (I-X-PS24VDC)	13MART8	CHRISTY B		
5	MANUAL: OPERATION, HP2/NP2	MANUAL:HP/NP	1	E	ECN #4485 CHG (I-X-PS24VDC) I-X-PS24VDC-M				

*** FOR 220 VAC MODELS USE I-W-17850**



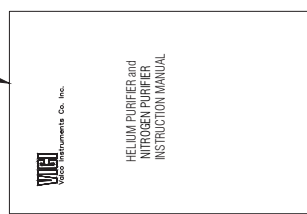
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INSTRUCTION MANUAL

SEE DWG 24-068 FOR
PACKING INSTRUCTIONS

THIS DOCUMENT AND THE INFORMATION WHICH IT CONTAINS SHALL NOT BE USED, EXERCISED OR SOLD, AND SHALL NOT BE REVEALED OR DISCLOSED TO OTHERS WITHOUT THE EXPRESSED WRITTEN PERMISSION OF VALCO. THIS DOCUMENT SHALL REMAIN THE PROPERTY OF VALCO AND SHALL BE RETURNED UPON DEMAND.

TOLERANCES UNLESS OTHERWISE SPECIFIED ARE ANGLES
FRACTIONS DEC. ANGLES
#1/64" .0005 .01
#1/32" .001 .01
#1/16" .002 .01
#1/8" .005 .01

DESIGNED: S. WERNER
DATE: 06JUN00
DRAWN: JOURR
DATE: 11MAR03
APPROVED: CHRIS B

DO NOT SCALE DRAWING

CHECKED: DATE: SCALE: NONE B SIZE: 23580

FILE NAME: SUB-DIR: USA PROJECTION: 1ST ANGLE SHEET

23580 TEdrawing

5. WARRANTY

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

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

This Limited Warranty does not cover defects, damage, or 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 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 supersedes 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.

APPENDIX A: SAFETY DATA SHEET - HP

According to American National Standard for Hazardous Industrial Chemicals (ANSI Z400.1-2004).

1. Product and Company Identification

Product Identifier

MSDS name: Zirconium-Vanadium-Iron Getter Granules
Product description: Zr-V-Fe getter granules are made of a metal alloy which contains zirconium, vanadium and iron. The material is flammable in air.

Recommended Use and Restrictions

Relevant identified uses: Getter, for the removal of residual gases to maintain a high vacuum level in a device, or the purification of gases by the removing of impurities.
Uses advised against: No data available

Supplier Details

VICI Valco Instruments
P.O. Box 55603
Houston, TX 77255 • USA
Phone: +1 713-688-9345
valco@vici.com

VICI AG International
Parkstrasse 2
CH-6214 Schenkon • Switzerland
Phone: +41 41 925 6200 |
info@vici.ch

Emergency telephone number

The National Poisons Emergency number of UNITED STATES OF AMERICA is 1-800-222-1222.

2. Hazards Identification

Emergency Overview Powdered Zirconium-Vanadium-Iron is flammable when used or stored near heat, sparks, open flame or any other sources of ignition.

OSHA Regulatory Status This product is classified as flammable solid.

Potential Health Effects

Eye: May cause eye irritation. (Powdered Zirconium-Vanadium-Iron)
Skin: May be harmful if absorbed through skin. May cause skin irritation. (Powdered Zirconium-Vanadium-Iron)
Ingestion: May be harmful if swallowed. (Powdered Zirconium-Vanadium-Iron)
Inhalation: May be harmful if inhaled. May cause respiratory tract irritation. (Powdered Zirconium-Vanadium-Iron)

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Most Important Symptoms and Effects

Labored breath, headache, coughing, nausea, and chest-pain. Inhalation of dust or particulates may cause irritation to the skin, eyes and mucuous membranes.

Acute Exposure: The signs and symptoms of skin contact with zirconium compounds may include small, reddish-brown papules in linear streaks on the abraded skin.

Chronic Exposure: The signs and symptoms of chronic exposure to zirconium or its compounds may include the development of pulmonary granulomas.

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH. ACGIH-A4 - Not Classifiable as a Human Carcinogen.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

Potential Environmental Effects

Not available.

3. Composition/Information on Ingredients

Description of the Product

The product consists of the granules of an alloy containing zirconium, vanadium and iron. It is flammable in air.

Product Name Zirconium-Vanadium-Iron Getter Granules
Ingredients

SUBSTANCE NAME	CAS NO.	EINECS NO.	MOLECULAR FORMULA	CONCENTRATION
Zirconium (non-pyrophoric)	7440-67-7	231-176-9	Zr	70%
Vanadium	7440-62-2	231-171-1	V	24.6%
Iron (elemental Iron)	7439-89-6	231-096-4	Fe	5.4%

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4. First Aid Measures

In case of eye contact:	With the eyelids held wide open, wash with plenty of water to flush dust or particulates from the eyes; obtain medical assistance.
In case of inhalation:	For overexposure to airborne fumes & particulates generated during various milling operations, remove exposed person to fresh air; if breathing is difficult or has stopped, administer artificial respiration or oxygen as indicated; seek medical attention immediately
In case of skin contact:	Wash off with soap and plenty of water. Consult a physician.
In case of ingestion:	Rinse mouth with water and induce vomiting if the affected person is conscious; obtain medical assistance at once.

Note to Physicians

Treat symptomatically and supportively. Treatment may vary with condition of victim and specifics of incident.

5. Fire Fighting Measures

Flammable Properties

Powder is flammable when used or stored near heat, sparks, open flame or any other sources of ignition.

Extinguishing Media

Suitable extinguishing media: Use dry sand, graphite powder, dry sodium chloride based extinguishers, G-1 or Met-L-X powder.

Unsuitable extinguishing media: Do not use water, foam or carbon dioxide.

Guidance to Firefighters

Specific hazards arising from the chemical:

Combustible. Reactions may cause fire or explosion.
Finely dispersed particles form explosive mixtures in air.
Open flames, electric sparks or electric discharges may cause ignition.
The material may form toxic vanadium oxides if burned in air.

Protective Equipment and precautions for firefighters:

Wear self contained breathing apparatus for fire-fighting if necessary.
All personnel must stay at a reasonable distance from burning material to avoid inhalation of combustion fumes.

6. Accidental Release Measures

Personal Precautions

Avoid dust formation. Ensure adequate ventilation. Evacuate personnel to safe areas.

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Environmental Precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. See section 8 for information on personal protection equipment.

Methods and Material for Containment and Cleaning Up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

Contain spillage, pick up with wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

Reference to Other Sections

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for information on disposal.

7. Handling and Storage

Handling

Do not handle getter material directly with bare skin: use plastic gloves or finger cots. Avoid accumulation of electrostatic charges. Machines must be grounded, and personnel should stand on anti-static mats.

Avoid handling the product in ambients which are too dry. Preferably, the relative humidity should be 70%.

Do not rub getter pieces against each other. Avoid the dispersion of fine getter particles.

Do not use a vacuum cleaner to gather up loose getter particles or dust.

Storage

Store or pack getter material only under vacuum or in an inert atmosphere.

Storage containers should be made of conducting materials.

Keep getter material away from flame or heat in an open atmosphere, and away from strong oxidants.

Avoid contact with mineral acids which may generate hydrogen gas.

8. Exposure Control/Personal Protection

Exposure Guidelines

Occupational Exposure Limit Values:

CAS # 7440-67-7 County of Origin	Occupational Exposure Limit Values	
	Long Term/Eight Hours	Short Term
Austria	5 mg/m ³ inhalable aerosol	
Belgium	5 mg/m ³	10 mg/m ³

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Canada - Quebec	5 mg/m ³	10 mg/m ³
Denmark	5 mg/m ³	10 mg/m ³
Germany (AGS)	1 mg/m ³ inhalable aerosol	1 mg/m ³ inhalable aerosol
Germany (DFG)	1 mg/m ³ inhalable aerosol	1 mg/m ³ inhalable aerosol
Hungary	5 mg/m ³	20 mg/m ³
Poland	5 mg/m ³	10 mg/m ³
Spain	5 mg/m ³	10 mg/m ³
Switzerland	5 mg/m ³ inhalable aerosol	n/a
USA - NIOSH	5 mg/m ³	10 mg/m ³
USA - OSHA	5 mg/m ³	n/a
United Kingdom	5 mg/m ³	10 mg/m ³

CAS # 7440-62-2 County of Origin	Occupational Exposure Limit Values	
	Long Term/Eight Hours	Short Term
Austria	5 mg/m ³ inhalable aerosol	1 mg/m ³ inhalable aerosol

CAS # 7439-89-6 There are no currently occupational exposure limit values established for this substance.

Engineering Controls

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Personal Protective Equipment

Eye/face protection: For operations in which particulates are generated, sufficient eye protection should be worn. Wear glasses with side protection.

Skin protection: Depending on the risk, wear a tight, long apron and boots or suitable chemical protection clothing. Wear dust tight protective clothing. Wear flameproof protective clothing.

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Hand protection:	Use protective gloves. The glove material must be sufficiently impermeable and resistant to the substance. Gloves should be well cleaned before being removed, then stored in a well ventilated location. Pay attention to skin care.
Respiratory protection:	In an emergency (e.g.: unintentional release of the substance, exceeding the occupational exposure limit value) respiratory protection must be worn. Consider the maximum period for wear. Respiratory protection: Particle filter P2 or P3, color code white. Use for concentrations above the usage limits for filter devices, for oxygen concentrations below 17% volume, or in circumstances which are unclear.

Environmental Exposure Controls

Prevent from entering sewers, basements and workpans, or any place where its accumulation can be dangerous.

General Hygiene Considerations

Handle in accordance with good industrial hygiene and safety practices. Wash hands before breaks and at the end of workday.

9. Physical and Chemical Properties

Information on Basic Physical and Chemical Properties

Appearance:	Alloy powder or granules
Color:	Solid grey/silver
Odor:	Odorless
pH:	Not applicable
Melting point:	1500 - 1900 °C
Boiling point:	No data available
Density:	5 g/cm ³
Vapor pressure:	No data available
Partition coefficient (n -octanol/water):	Not applicable
Solubility(ies):	Insoluble in water
Flash point:	No data available
Auto-ignition temperature:	No data available
Flammability:	No data available
Explosive properties:	No data available
Oxidising properties:	No data available

Additional Information

Not available.

10. Stability and Reactivity

Chemical Stability

Stable under recommended storage conditions.

Powder is flammable when used or stored near heat, sparks, open flame or any other sources of ignition.

Possibility of Hazardous Reactions

Dust explosion possible if in powder or granular form, mixed with air.

Conditions to Avoid

Incompatible materials, heated, mixed with air.

Incompatible Materials

Avoid contact with oxidizing agents which may generate hydrogen gas, the evolution of hydrogen may be an explosion hazard.

Hazardous Decomposition Products

Hazardous decomposition products formed under fire conditions. - Zirconium oxides, vanadium oxides, iron oxides.

Additional Information

No data available.

11. Toxicological Information

Acute dose effects: Quantitative data on the acute oral/inhalation/dermal toxicity of this product are not available.

Repeated dose effects: No data available.

Irritation/Corrosivity: No quantitative data are available on the eye irritation threshold for zirconium; however, this substance is not known to be eye irritants.

Sensitization (skin or respiratory): No data available.

Additional Information: CAS # 7440-67-7 RTECS #: ZH7070000
CAS # 7440-62-2 RTECS #: YW1355000
CAS # 7439-89-6 RTECS #: NO4565500

CMR effects (Carcinogenicity, Mutagenicity and Toxicity for Reproduction)

Carcinogenicity: Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.

Quantitative data on the mutagenicity and toxicity for reproduction are not available.

Other Information

The toxicological properties have not been fully investigated.

12. Ecological Information

Ecotoxicity Acute and Long-Term Information

Quantitative data on the acute fish/daphnia/bacteria toxicity of this product are not available.

Persistence /Degradability

Not biodegradable.

Bioaccumulation/Bioconcentration

No data available.

Mobility (air, soil, water)

Based on best current information, there is no data components known associated with this product.

Other Adverse Effects

Avoid entering into waters or underground water.

13. Disposal Considerations

Waste Treatment Methods

Check federal, state and local disposal laws and regulations to determine the proper disposal procedure.

All waste materials should be reviewed to determine the applicable hazards.

If approved, the best disposal method consists of incinerating the waste by a licensed hazardous waste incinerator.

Additional Information

Disposal must be made according to official regulations.

14. Transport Information

Land Transport (ADR/RID)

UN-No.:	3089
Official transport designation:	FLAMMABLE SOLID, INORGANIC, N.O.S. (ZIRCONIUM-VANADIUM-IRON GRANULES)
Class:	4.1
Classification Code:	F3
Packing group:	II
Hazard label:	4.1

Sea transport (IMDG-Code)

Proper Shipping Name:	FLAMMABLE SOLID, INORGANIC, N.O.S. (ZIRCONIUM-VANADIUM- IRON GRANULES)
Class:	4.1

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UN-No.: 3089
Packing group: II

Air transport (ICAO-TI/IATA-DGR)

Proper Shipping Name: FLAMMABLE SOLID, INORGANIC, N.O.S.
(ZIRCONIUM-VANADIUM-IRON GRANULES)
Class: 4.1
UN-No.: 3089
Packing group: II

Additional information: Not available.

15. Regulatory Information

US Federal Regulations

TSCA: All the ingredients of the product are listed in the Inventory.

US State Regulations

California Prop 65: This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.
SARA: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302. SARA 313 Components: CAS # 7440-62-2
Revision Date 2007-03-01

European Union Regulations

EINECS: All the ingredients of the product are listed in the Inventory.
DSD(67/548/EEC): CAS # 7440-67-7 is listed in the Annex I.

International Regulations

Canada - DSL: All the ingredients of the product are listed in the Inventory.
China - IECSC: All the ingredients of the product are listed in the Inventory.
Australia - AICS: All the ingredients of the product are listed in the Inventory.
Japan - ENCS (MITI): All the ingredients of the product are listed in the Inventory.
Korea - ECL: All the ingredients of the product are listed in the Inventory.

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16. Other Information

Label Elements

Pictogram:



Signal word:

Danger

Hazard statement(s):

H228 Flammable solid

Precautionary statement(s):

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P240 Ground/bond container and receiving equipment.

P241 Use explosion-proof electrical/ventilating/lighting/equipment.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P370 + P378 In case of fire: Evacuate area.

Hazard Rating

The hazard rating information is not available.

Revision Information

Date of previous revision: Nov 24, 2010

Date of this revision: Jan 18, 2013

Revision summary: Revised MSDS

Key Literature References and Sources for Data

HSDB: Hazardous Substances Data Bank

ICSC: International Chemical Safety Cards

Occupational Safety and Health Guidelines for Zirconium & Compounds

Abbreviations and Acronyms

IARC	International Agency for Research on Cancer
ACGIH	American Conference of Industrial Hygienists
NTP	American National Training Professional
OSHA	The Occupational Safety and Health Administration
CAS	Chemical Abstracts Service (division of the American Chemical Society)
EINECS	European Inventory of Existing Commercial Chemical Substances
RID	European Rail Transport
IMDG	International Maritime Code for Dangerous Goods.
IATA	International Air Transport Association
TSCA	Toxic Substances Control Act, the American chemical inventory
SARA	Superfund Amendments and Reauthorization Act
DSD	Dangerous Substance Directive (67/548/EEC)
IECSC	Inventory of Existing Chemical Substances in China
DSL	Domestic Substances List, the Canadian chemical inventory
AICS	The Australian Inventory of Chemical Substances

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ECL	Existing Chemicals List, the Korean chemical inventory
ENCS	Existing and New Chemical Substances, the Japanese chemical inventory

Note to Reader

The information in this Material Safety Data Sheet (MSDS) section is obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use or disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

APPENDIX B: SAFETY DATA SHEET - NP

According to American National Standard for Hazardous Industrial Chemicals (ANSI Z400.1-2004).

1. Product and Company Identification

Product Identifier

Product name: Zirconium-Iron Getter Granule, > 0.5 mm
Synonyms: No information available

Recommended Use and Restrictions

Relevant Use: As a getter, for the removal of residual gases to maintain a high vacuum level in a device, or for the purification of gases by removing the impurities.
Uses advised against: No information available

Supplier Details

VICI Valco Instruments
P.O. Box 55603
Houston, TX 77255 • USA
Phone: +1 713-688-9345
valco@vici.com

VICI AG International
Parkstrasse 2
CH-6214 Schenkon • Switzerland
Phone: +41 41 925 6200 |
info@vici.ch

Emergency telephone number

The National Poisons Emergency number of UNITED STATES OF AMERICA is 1-800-222-1222.

2. Hazards Identification

GHS Classification

Flammable solids Category 1 (H228)

Label Elements

Symbols/Pictograms:



Signal word:

Danger

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Hazard statement(s): H228 Flammable solid
Prevention:
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ventilating/lighting/equipment.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
Response: P370 + P378 In case of fire: Evacuate area.
Storage: Not applicable
Disposal: Not applicable

Hazards Not Otherwise Classified (HNOC)

Dust explosion possible if in powder or granular form, mixed with air.

Unknown Acute Toxicity: No information available

3. Composition of Ingredients

Chemical Nature: Alloy

CHEMICAL NAME	CAS NO	WEIGHT %
Zirconium	7440-67-7	76.6
Iron	7439-89-6	23.4

4. First Aid Measures

Inhalation: In all cases of doubt, or when symptoms persist, seek medical attention. For overexposure to airborne fumes & particulates generated during various milling operations: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical advice/attention if you feel unwell.

Skin Contact: Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Wash contaminated clothing before reuse. If skin irritation persists, call a physician.

Eye Contact: Not an expected route of exposure. If eye contact: Hold open eyelid and rinse with copious amounts of water to flush out powder or dust. If eye irritation persists: Get medical advice/attention.

Ingestion: Not an expected route of exposure. If swallow by mistake, rinse mouth. Get medical attention. Never give anything by mouth to an unconscious person.

Most Important Symptoms and Effects (acute and delayed)

Labored breath, headache, coughing, nausea, and chest-pain. Inhalation of dust or particulates may cause irritation to the skin, eyes and mucous membranes.

Acute exposure: The signs and symptoms of skin contact with zirconium compounds may include small, reddish-brown papules in linear streaks on the abraded skin.

Chronic exposure: The signs and symptoms of chronic exposure to zirconium or its compounds may include the development of pulmonary granulomas.

Indication of Immediate Medical Attention and Special Treatment Needed

Treat symptomatically and supportively. Treatment may vary with condition of victim and specifics of incident. Persons with pre-existing skin, eye, or respiratory disease may be at increased risk from the irritant or allergic properties of this material. Attending physician should treat exposed patients symptomatically.

5. Fire Fighting Measures

Extinguishing Media

Suitable: Use dry sand, graphite powder, dry sodium chloride based extinguishers, G-1 or Met-L-X powder.

Un-suitable: Water, foam, carbon dioxide

Specific Hazards Arising from the Chemical

Combustible. Finely dispersed particles may form explosive mixture in air. Open flames, electric sparks or electric discharges may cause ignition.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

All personnel must stay at a reasonable distance from burning material to avoid inhalation of combustion fumes.

6. Accidental Release Measures

Personal Precautions, Protective Equipment and Emergency Procedures

- Evacuate personnel to safe areas
- Ensure adequate ventilation, especially in confined areas
- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area)

- Avoid contact with eyes
- Avoid generation of dust
- Do not breathe dust
- Use personal protection recommended in Section 8

Methods and Material for Containment and Cleaning Up

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Sweep up and shovel. Contain spillage, and then collect with wet brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

7. Handling and Storage

Precautions for Safe Handling

- Handle in accordance with good industrial hygiene and safety practice.
- Ensure adequate ventilation, especially in confined areas.
- Stable in air under normal conditions if unheated.
- Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- Activation (heating) must be earned out under inert gas environment or vacuum condition. Do not allow contact with air when activated.
- Take precautionary measures against static discharges.
- Do not rub getter pieces against each other or subject getter to mechanical friction.
- Do not use vacuum cleaner to gather loose getter particles or dust.
- Avoid generation of dust.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Avoid contact with eyes.
- Do not eat, drink or smoke when using this product.
- Do not handle getter directly with bare skin: use plastic gloves or finger cots.
- Use personal protection recommended in Section 8.

Conditions for Safe Storage, Including any Incompatibilities

Store or pack getter material only under vacuum or in an inert atmosphere. Storage containers should be made of conducting materials. Keep getter material away from flame or heat in an open atmosphere, away from strong oxidants. Avoid contact with mineral acids which may generate hydrogen gas.

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8. Exposure Controls/Personal Protection

Control Parameters

CHEMICAL NAME	ACGIH TLV	OSHA PEL	NIOSH IDLH
Zirconium (CAS #: 7440-67-7)	STEL: 10 mg/m ³ STEL: 10 mg/m ³ Zr TWA: 5 mg/m ³ TWA: 5 mg/m ³ Zr	TWA: 5 mg/m ³ Zr (vacated) TWA: 5 mg/m ³ (vacated) TWA: 5 mg/m ³ Zr (vacated) STEL: 10 mg/m ³ (vacated) STEL: 10 mg/m ³ Zr	IDLH: 50 mg/m ³ IDLH: 25 mg/m ³ Zr TWA: 5 mg/m ³ TWA: 5 mg/m ³ except Zirconium tetrachloride Zr STEL: 10 mg/m ³ STEL: 10 mg/m ³ Zr

CHEMICAL NAME	DENMARK	EUROPEAN UNION	LATVIA	FRANCE	FINLAND
Zirconium (CAS #: 7440-67-7)	TWA: 5 mg/m ³	-	-	-	TWA: 1 mg/m ³

CHEMICAL NAME	GERMANY	ITALY	POLAND	PORTUGAL
Zirconium (CAS #: 7440-67-7)	TWA: 1 mg/m ³ Ceiling/ Peak: 1 mg/m ³	-	STEL: 10 mg/m ³ TWA: 5 mg/m ³	STEL: 10 mg/m ³ TWA: 5 mg/m ³

CHEMICAL NAME	SPAIN	SWITZERLAND	NETHERLANDS	NORWAY
Zirconium (CAS #: 7440-67-7)	STEL: 10 mg/m ³ TWA: 5 mg/m ³	TWA: 5 mg/m ³	-	TWA: 5 mg/m ³ STEL: 10 mg/m ³

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CHEMICAL NAME	UNITED KINGDOM	AUSTRALIA	AUSTRIA	BELGIUM
Zirconium (CAS #: 7440-67-7)	TWA: 5 mg/m ³	5 mg/m ³ 10 mg/m ³ STEL	TWA: 5 mg/m ³	-

Appropriate Engineering Controls

Ensure adequate ventilation, especially in confined areas. Showers. Eyewash stations. Remove all sources of ignition.

Individual protection measures, such as personal protective equipment

Respiratory Protection	If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive -pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.
Hand Protection	Use protective gloves. The glove material must be sufficiently impermeable and resistant to the substance. Gloves should be well cleaned before being removed, then stored in a well ventilated location. Pay attention to skin care.
Eye/Face Protection	For operations in which particulates are generated, sufficient eye protection should be worn, wear glasses with side protection.
Skin and Body Protection	Depending on the risk, wear a tight, long apron and boots or suitable chemical protection clothing. Wear dust tight protective clothing. Wear flameproof protective clothing.

9. Physical and Chemical Properties

Appearance	Alloy granules
Color	Solid grey/silver
Odor	Odorless
Odor Threshold	Not determined
pH	Not determined

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Melting point/freezing point	1500-1900°C
Boiling point / boiling range	Not determined
Flash point	Not determined
Evaporation rate	Not determined
Flammability (solid, gas)	Not flammable
Flammability Limit in Air	Not determined
Vapor Pressure	Not determined
Vapor density	Not determined
Density	3.5 g/cm ³
Relative density	3.5
Bulk density	Not determined
Specific gravity	Not determined
Water solubility	Insoluble in water
Partition coefficient (LogPow)	Not determined
Autoignition temperature	Not determined
Decomposition temperature	Not determined
Kinematic viscosity	Not determined
Dynamic viscosity	Not determined
Explosive properties	Not an explosive
Oxidizing properties	Not determined

10. Stability and Reactivity

Reactivity

Stable under recommended storage and handling conditions (see Section 7).

Chemical Stability

Powdered Zirconium-Iron is flammable when use or store near heat, sparks, open flame or any other sources of ignition.

Possibility of Hazardous Reactions

Dust explosion possible if in powder or granular form, mixed with air.

Conditions to Avoid

Heat, flames and sparks. Air. Water. Mist. Incompatible materials.

Incompatible Materials

Strong oxidizing agents. Acids. Water.

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Hazardous Decomposition Products

Hazardous decomposition products formed during combustion - Zirconium oxides.

11. Toxicological Information

Information on Likely Routes of Exposure

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye Contact	May cause eye irritation in susceptible persons
Skin Contact	May cause skin irritation in susceptible persons.
Ingestion	Harmful if swallowed.

Information on Toxicological Effects

Acute Toxicity

CHEMICAL NAME	ORAL LD50	DERMAL LD50	INHALATION LC50
Zirconium (CAS #: 7440-67-7)	>5000 mg/kg bw (rat)	-	>4.3 mg/L (rat)
Iron (CAS #: 7439-89-6)	98.6 g/kg bw (rat)	-	-

Skin Corrosion/Irritation	May cause skin irritation in susceptible person.
Serious Eye Damage/Eye Irritation	May cause eye irritation in susceptible person.
Sensitization	Not sensitizing to skin.
Germ Cell Mutagenicity	Negative.
Carcinogenicity	Not classified.
Reproductive toxicity	Not classified.
STOT - Single Exposure	Not classified.
STOT - Repeated Exposure	Not classified.
Aspiration Hazard	Not classified.

12. Ecological Information

Exotoxicity

CHEMICAL NAME	ALGAE/AQUATIC PLANTS EC50	FISH LC50	CRUSTACEA EC50
Iron (CAS #: 7439-89-6)	-	-	>100 mg/L/48h (Daphnia magna)

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Persistence and Degradability	No information available
Mobility in Soil	No information available
Other Adverse Effects	No information available

13. Disposal Considerations

Waste Treatment Methods

Disposal of Wastes	Disposal should be in accordance with applicable regional, national and local laws and regulations. If approved, the best disposal method consists of incinerating the waste by a licensed hazardous waste incinerator.
Contaminated Packaging	Dispose of in accordance with federal, state and local regulations

14. Transport Information

DOT

UN/ID No.	3178
Proper Shipping Name	Flammable solid, Inorganic, N.O.S. (Zirconium-Iron Getter Granules)
Hazard Class	4.1
Packing Group	II
Environmental Hazards	Non-marine pollutant
Special Precautions	No information available
Transport in bulk	Not applicable

According to Annex II of MARPOL 73/38 and the IBC Code.

IATA (62nd)

UN/ID No.	3178
Proper Shipping Name	Flammable solid, Inorganic, N.O.S. (Zirconium-Iron Getter Granules)
Hazard Class	4.1
Packing Group	II
Environmental Hazards	Non-marine pollutant
Special Precautions	No information available
Transport in bulk	Not applicable

MARPOL 73/38 and the IBC Code.

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15. Regulatory Information

International Inventories

COMPONENT	AICS	DSL/ NDSL	EINECS/ ELINCS	ENCS	IECSC	KECL	PICCS	TSCA
Zirconium 7440-67- 7 (76.6%)	X	X	X	Expect	X	X	X	X
Iron 7439-89- 6 (23.4%)	X	X	X	Expect	X	X	X	X

16. Other Information

Key/Legend to Abbreviations/Acronyms

TWA	Time-Weighted Average)
STEL	Short Term Exposure Limit
Ceiling	Maximum limit value
TSCA	United States Toxic Substances Control Act Section B(b) Inventory
DSL/NDSL	Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS	European Inventory of Existing Chemical Substances/ European List of Notified Chemical Substances
ENCS	Japan Existing and New Chemical Substances
IECSC	China Inventory of Existing Chemical Substances
KECL	Korean Existing and Evaluated Chemical Substances
PICCS	Philippines Inventory of Chemicals and Chemical Substances
AICS	Australian Inventory of Chemical Substances

Disclaimer

The information provided in this Material Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.