

March 28, 2014

To: Praxair Distribution, Inc.
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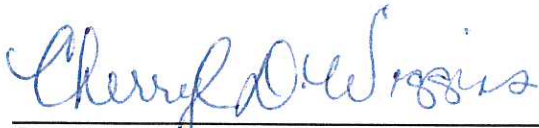
Praxair Order Number: 13483507
Purchase Order Number: 26888250-00
Specification Number: PCS-009

CERTIFICATE OF ANALYSIS

Krypton, Research, 5.0

Minimum Purity: 99.999+%

Required Components			Oxygen	Nitrogen	THC	Moisture	CO2	CF4	Xe, Ar, H2
Customer Specification (Maximum PPM)			2.0	5.0	0.2	3.0	0.5	3.0	4.0
Cylinder Number	Batch Number	Liters	Analytical Results						
ELB 8093	922-3043-50	26	0.15	0.5	0.1	0.5	0.1	0.3	0.6


Prepared By


Authorized Reviewer

IMPORTANT

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Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Krypton, compressed (MSDS No. P-4616-E) Trade Names: Krypton
 Chemical Name: Krypton Synonyms: None known.
 Chemical Family: Rare Gas Product Grades: 3.0, 5.0 research
 Telephone: Emergencies: 1-800-645-4633* Company Name: Praxair, Inc.
 CHEMTREC: 1-800-424-0300* 59 Old Ridgebury Road
 Routine: 1-800-PRAXAIR Danbury, CT 06810-5113
 *Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

2. Hazards Identification

EMERGENCY OVERVIEW
CAUTION! High-pressure gas. Can cause rapid suffocation. May cause dizziness and drowsiness.
 Self-contained breathing apparatus may be required by rescue workers. This is a colorless, odorless gas at normal temperature and pressure.

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).

POTENTIAL HEALTH EFFECTS:
Effects of a Single (Acute) Overexposure
 Inhalation. Asphyxiant. Effects are due to lack of oxygen. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill.
 Skin Contact. No harm expected.
 Swallowing. An unlikely route of exposure. This product is a gas at normal temperature and pressure.
 Eye Contact. No harm expected.
Effects of Repeated (Chronic) Overexposure. No harm expected.
Other Effects of Overexposure. None known.
Medical Conditions Aggravated by Overexposure. The toxicology and the physical and chemical properties of krypton suggest that overexposure is unlikely to aggravate existing medical conditions.

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 A vertical line in the left margin indicates revised or new material.

CARCINOGENICITY: Krypton is not listed by NTP, OSHA, or IARC.
 POTENTIAL ENVIRONMENTAL EFFECTS: None known. For further information, see section 12, Ecological Information.

3. Composition/Information on Ingredients

See section 16 for important information about mixtures.

COMPONENT	CAS NUMBER	CONCENTRATION
Krypton	7439-90-9	>99%*

*The symbol > means "greater than."

4. First Aid Measures

INHALATION: Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.
SKIN CONTACT: No harm expected.
SWALLOWING: An unlikely route of exposure. This product is a gas at normal temperature and pressure.
EYE CONTACT: No harm expected.
NOTES TO PHYSICIAN: There is no specific antidote. This product is nearly inert. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Nonflammable
SUITABLE EXTINGUISHING MEDIA: Krypton cannot catch fire. Use media appropriate for surrounding fire.
PRODUCTS OF COMBUSTION: Not applicable.
PROTECTION OF FIREFIGHTERS: CAUTION! High-pressure gas. Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool; then move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers. (See section 16.) On-site fire brigades must comply with OSHA 29 CFR 1910.156.
Specific Physical and Chemical Hazards. Krypton cannot catch fire. Heat of fire can build pressure in cylinder and cause it to rupture. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). Krypton cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.)
Protective Equipment and Precautions for Firefighters. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
CAUTION! High-pressure gas.

Personal Precautions. Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off leak if without risk. Ventilate area of leak or move cylinder to a well-ventilated area. Test for sufficient oxygen, especially in confined spaces, before allowing reentry.
Environmental Precautions. Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING: Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. **Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve.** Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. **Open valve slowly.** If valve is hard to open, discontinue use and contact your supplier. For other precautions in using krypton, see section 16.
PRECAUTIONS TO BE TAKEN IN STORAGE: Gas can cause rapid suffocation due to oxygen deficiency. Store and use with adequate ventilation at all times. Close valve after each use; keep closed even when empty. **Firmly secure cylinders upright to keep them from falling or being knocked over.** Screw valve protection cap firmly in place by hand. **Store only where temperature will not exceed 125°F (52°C).** Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.
RECOMMENDED PUBLICATIONS: For further information on storage, handling, and use, see Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

COMPONENT	OSHA PEL	ACGIH TLV-TWA (2007)
Krypton	Not established.	Not established.

IDLH = Not available.

ENGINEERING CONTROLS:
Local Exhaust. Use a local exhaust system, if necessary, to prevent oxygen deficiency.
Mechanical (General). General exhaust ventilation may be acceptable if it can maintain an adequate supply of air.
Special. None
Other. None

PERSONAL PROTECTIVE EQUIPMENT:
Skin Protection. Wear work gloves and metatarsal shoes when handling cylinders. Select shoes in accordance with OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

Eye/Face Protection. Safety glasses are recommended. Select in accordance with OSHA 29 CFR 1910.133.
Respiratory Protection. None required under normal use. However, air-supplied respirators are required when working in confined spaces with this product. Respiratory protection must conform to OSHA 29 CFR 1910.134. Select per OSHA 29 CFR 1910.134 and ANSI Z88.2.

9. Physical and Chemical Properties

APPEARANCE:	Colorless gas
ODOR:	None
ODOR THRESHOLD:	Not applicable.
PHYSICAL STATE:	Gas at normal temperature and pressure
pH:	Not applicable.
MELTING POINT at 1 atm:	-251.27°F (-157.37°C)
BOILING POINT at 1 atm:	-244.03°F (-153.35°C)
FLASH POINT (test method):	Not applicable.
EVAPORATION RATE (Butyl Acetate = 1):	Gas, not applicable.
FLAMMABILITY:	Nonflammable
FLAMMABLE LIMITS IN AIR, % by volume:	LOWER: Not applicable. UPPER: Not applicable.
VAPOR PRESSURE:	Not applicable.
GAS DENSITY at 70°F (21.1°C) and 1 atm:	0.2167 lb/ft ³ (3.471 kg/m ³)
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	2.894
SOLUBILITY IN WATER:	Negligible
PARTITION COEFFICIENT: n-octanol/water:	Not available.
AUTOIGNITION TEMPERATURE:	Not applicable.
DECOMPOSITION TEMPERATURE:	None
PERCENT VOLATILES BY VOLUME:	100
MOLECULAR WEIGHT:	83.80
MOLECULAR FORMULA:	Kr

10. Stability and Reactivity

CHEMICAL STABILITY: Unstable Stable
CONDITIONS TO AVOID: None known.
INCOMPATIBLE MATERIALS: None known. Krypton is chemically unreactive but not completely inert.
HAZARDOUS DECOMPOSITION PRODUCTS: None known.
POSSIBILITY OF HAZARDOUS REACTIONS: May Occur Will Not Occur

11. Toxicological Information

ACUTE DOSE EFFECTS: Krypton is a simple asphyxiant.
STUDY RESULTS: None known.

12. Ecological Information

ECOTOXICITY: No known effects.
OTHER ADVERSE EFFECTS: Krypton does not contain any Class I or Class II ozone-depleting chemicals.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.
Emergency Disposal.
CAUTION: Any disposal must be conducted in accordance with federal, state, and local regulations.
Secure cylinder in a well-ventilated area or outdoors; then slowly discharge gas to the atmosphere.

14. Transport Information

Table with 4 columns: DOT/IMO SHIPPING NAME, HAZARD CLASS, SHIPPING LABEL(s), and PLACARD. Includes identification number UN1058 and product name Krypton, compressed.

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle.
MARINE POLLUTANTS: Krypton is not listed as a marine pollutant by DOT.

15. Regulatory Information

The following selected regulatory requirements may apply to this product.
U.S. FEDERAL REGULATIONS:
EPA (ENVIRONMENTAL PROTECTION AGENCY)
CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:
SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

TPQ: None
EHS RQ (40 CFR 355): None
IMMEDIATE: Yes
DELAYED: No
PRESSURE: Yes
REACTIVITY: No
FIRE: No

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Krypton is not subject to reporting under Section 313.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Krypton is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Krypton is listed on the TSCA inventory.
OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Krypton is not listed in Appendix A as a highly hazardous chemical.

STATE REGULATIONS:

CALIFORNIA: Krypton is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).
PENNSYLVANIA: Krypton is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: High-pressure gas. Use piping and equipment adequately designed to withstand pressures to be encountered. Prevent reverse flow. Reverse flow into cylinder may cause rupture.

Mixtures. When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture.

HAZARD RATING SYSTEMS:

Table comparing NFPA RATINGS and HMIS RATINGS for Health, Flammability, and Instability. NFPA: HEALTH=0, FLAMMABILITY=0, INSTABILITY=0. HMIS: HEALTH=0, FLAMMABILITY=0, PHYSICAL HAZARD=3.

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

Table of valve connections: THREADED (0-3000 psig CGA-560, 3001-5500 psig CGA-680, 5001-7500 psig CGA-677) and PIN-INDEXED YOKE (Not applicable CGA-718).

ULTRA-HIGH-INTEGRITY CONNECTION: Not applicable CGA-718

Use the proper CGA connections. DO NOT USE ADAPTERS. Additional limited-standard connections may apply. See CGA pamphlet V-1 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information can be found in the following materials published by the Compressed Gas Association, Inc. (CGA), 4221 Watney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, http://www.cganet.com/Publication.asp.

- AV-1 Safe Handling and Storage of Compressed Gases
P-1 Safe Handling of Compressed Gases in Containers
SB-2 Oxygen-Deficient Atmospheres
V-1 Compressed Gas Cylinder Valve Inlet and Outlet Connections
Handbook of Compressed Gases, Fourth Edition

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

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