

## Praxair Material Safety Data Sheet

### 1. Chemical Product and Company Identification

<b>Product Name:</b> Krypton, refrigerated liquid (MSDS No. P-6305-A)	<b>Trade Names:</b> Liquid Krypton
<b>Chemical Name:</b> Krypton	<b>Synonyms:</b> Krypton, cryogenic liquid
<b>Chemical Family:</b> Cryogenic liquid	<b>Product Grades:</b> None assigned.
<b>Telephone:</b>	<b>Company Name:</b> Praxair, Inc.
<b>Emergencies:</b> 1-800-645-4633*	39 Old Ridgebury Road
<b>CHEMTREC:</b> 1-800-424-9300*	Danbury, CT 06810-5113
<b>Routine:</b> 1-800-PRAXAIR	

*\*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

**WARNING! Extremely cold liquid and gas under pressure.**

**Can cause rapid suffocation.**

**Can cause severe frostbite.**

**May cause dizziness and drowsiness.**

**Self-contained breathing apparatus and protective clothing may be required by rescue workers.**

**As stored and shipped, this material is a colorless, odorless clear liquid.**

**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 from gas at ambient temperature. Cold gas or liquid may cause severe frostbite, a freezing injury resembling a burn.

**Swallowing.** An unlikely route of exposure. This product is a gas at normal temperature and pressure, but frostbite of the lips and mouth may result from contact with the liquid.

**Eye Contact.** No harm expected from warm gas. Cold gas or liquid may cause severe frostbite.

**Effects of Repeated (Chronic) Overexposure.** No harm expected.

**Other Effects of Overexposure.** Contact with the liquid may cause frostbite.

**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.

**CARCINOGENICITY:** Krypton is not listed by NTP, OSHA, or IARC.

**POTENTIAL ENVIRONMENTAL EFFECTS:** None expected. 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:** For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). In case of massive exposure, remove contaminated clothing while showering with warm water. Call a physician.

**SWALLOWING:** An unlikely route of exposure. This product is a gas at normal temperature and pressure.

**EYE CONTACT:** Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Seek the advice of a physician, preferably an ophthalmologist, immediately.

**NOTES TO PHYSICIAN:** *There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

### 5. Fire Fighting Measures

**FLAMMABLE PROPERTIES:** Liquid or vapor cannot catch fire. Heat of fire can build pressure in closed container and cause it to rupture. No part of a container should be subjected to a temperature higher than 125°F (52°C). Liquid krypton containers are equipped with pressure relief devices. (Exceptions may exist where authorized by DOT.) Venting vapors may obscure visibility. Liquid causes severe frostbite.

**SUITABLE EXTINGUISHING MEDIA:** Krypton cannot catch fire. Use media appropriate for surrounding fire.

**PRODUCTS OF COMBUSTION:** Not applicable

**PROTECTION OF FIREFIGHTERS: WARNING! Extremely cold liquid and gas under pressure.** Evacuate all personnel from danger area. Immediately spray containers with water from maximum distance until cool, taking care not to direct spray onto vents on top of container. Do not discharge sprays into liquid krypton. Liquid krypton will freeze water rapidly. When containers have cooled, move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

**Specific Physical and Chemical Hazards.** Asphyxiant. Lack of oxygen can kill. Contact with liquid may cause severe frostbite.

**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:**

**WARNING! Extremely cold liquid and gas under pressure.**

**Personal Precautions.** Asphyxiant. Lack of oxygen can kill. Evacuate all personnel from danger area, using self-contained breathing apparatus where needed. Extremely cold liquid and gas. Liquid causes severe frostbite. Shut off leak if without risk. Avoid contact with spilled liquid and allow it to evaporate. Ventilate area of leak or move container 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:** Avoid contact with cold liquid or gas. ***Krypton gas can cause rapid suffocation due to oxygen deficiency.*** Never allow any unprotected part of your body to touch uninsulated pipes or vessels containing cryogenic fluids. Flesh will stick to the extremely cold metal and will tear when you try to pull free. Use a suitable hand truck to move containers. Cryogenic containers must be handled and stored in an upright position. Do not drop or tip containers, or roll them on their sides. 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:** Store and use with adequate ventilation. Do not store at temperatures above 125°F (52°C). Do not store in a confined space. Cryogenic containers are equipped with a pressure relief device and a pressure-controlling valve. Under normal conditions these containers will periodically vent product. Use adequate pressure relief devices in systems and piping to prevent pressure buildup; entrapped liquid can generate extremely high pressures when vaporized by warming.

**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 (2008)
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.** Metatarsal shoes for container handling; high-top shoes are preferred. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Wear loose-fitting, cryogenic gloves.

**Eye/Face Protection.** Safety glasses and a full face shield are recommended. Select in accordance with OSHA 29 CFR 1910.133.

**Respiratory Protection.** None required. However, air supplied respirators are required while working in oxygen deficient atmospheres such as confined spaces.

### 9. Physical and Chemical Properties

<b>APPEARANCE:</b>	Clear, colorless liquid
<b>ODOR:</b>	None
<b>ODOR THRESHOLD:</b>	Not available
<b>PHYSICAL STATE:</b>	Cryogenic liquid at boiling point
<b>pH:</b>	Not applicable
<b>MELTING POINT</b> at 1 atm:	-251.27°F (-157.37°C)
<b>BOILING POINT</b> at 1 atm:	-244.03°F (-153.35°C)
<b>FLASH POINT</b> (test method):	Not applicable
<b>EVAPORATION RATE</b> (Butyl Acetate = 1):	Not available
<b>FLAMMABILITY:</b>	Nonflammable
<b>FLAMMABLE LIMITS IN AIR</b> , % by volume:	<b>LOWER:</b> Not applicable <b>UPPER:</b> Not applicable
<b>VAPOR PRESSURE</b> at boiling point:	Not available
<b>LIQUID DENSITY</b> at boiling point and 1 atm:	150.6 lb/ft <sup>3</sup> (2412.38 kg/m <sup>3</sup> )
<b>VAPOR DENSITY</b> at 70°F (21.1°C) and 1 atm:	0.2167 lb/ft <sup>3</sup> (3.471 kg/m <sup>3</sup> )
<b>SPECIFIC GRAVITY</b> (H <sub>2</sub> O = 1):	Not available
<b>SPECIFIC GRAVITY</b> (Air = 1) at 70°F (21.1°C) and 1 atm:	2.894
<b>SOLUBILITY IN WATER:</b>	Negligible
<b>PARTITION COEFFICIENT: n-octanol/water:</b>	Not available
<b>AUTOIGNITION TEMPERATURE:</b>	Not applicable
<b>DECOMPOSITION TEMPERATURE:</b>	Not available
<b>PERCENT VOLATILES BY VOLUME:</b>	100
<b>MOLECULAR WEIGHT:</b>	83.80
<b>MOLECULAR FORMULA:</b>	Kr
<b>EXPANSION RATIO</b> for liquid at boiling point to gas at 70°F (21.1°C):	1 to 693

**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:** Not available. Krypton is a simple asphyxiant.

**STUDY RESULTS:** None known.

**12. Ecological Information**

**ECOTOXICITY:** No known effects.

**OTHER ADVERSE EFFECTS:** This product 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.

**14. Transport Information**

**DOT/IMO SHIPPING NAME:** Krypton, refrigerated liquid

HAZARD CLASS:	PACKING GROUP/Zone:	IDENTIFICATION NUMBER:	PRODUCT RQ:
2.2	NA/NA*	UN1970	None

**SHIPPING LABEL(s):** NONFLAMMABLE GAS

**PLACARD (when required):** NONFLAMMABLE GAS

\* NA=Not applicable.

**SPECIAL SHIPPING INFORMATION:** Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

**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. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

### U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

**CERCLA:** COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

**Reportable Quantity (RQ):** None

**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

**SECTIONS 311/312:** Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

**IMMEDIATE:** Yes

**PRESSURE:** Yes

**DELAYED:** No

**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.

### 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:** *Extremely cold liquid and gas under pressure.* Use piping and equipment adequately designed to withstand pressures to be encountered. Avoid materials incompatible with cryogenic use; some metals such as carbon steel may fracture easily at low temperature. To prevent liquid or cold gas from being trapped in piping between valves, equip the piping with pressure relief devices. Use only transfer lines designed for cryogenic liquids. Praxair recommends piping all vents to the exterior of the building. Store and use with adequate ventilation. Use a backflow prevention device in any piping. Close container valve after each use; keep closed even when empty. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state, and local laws; then repair the leak. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

**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. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

### HAZARD RATING SYSTEMS:

#### NFPA RATINGS:

HEALTH = 3  
 FLAMMABILITY = 0  
 INSTABILITY = 0  
 SPECIAL = SA (CGA recommends this to designate Simple Asphyxiant.)

#### HMIS RATINGS:

HEALTH = 3  
 FLAMMABILITY = 0  
 PHYSICAL HAZARD = 2

### STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

**THREADED:** ½-in. male VCR  
**PIN-INDEXED YOKE:** Not applicable  
**ULTRA-HIGH-INTEGRITY CONNECTION:** Not applicable

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 pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, <http://www.cganet.com/Publication.asp>.

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.

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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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