1. PRODUCT AND COMPANY IDENTIFICATION

Product Name                        KRYPTON 85 ISOTOPE
Product Code(s)                     1162
UN-Number                           UN2915
Recommended Use                     Lighting gas applications.
Synonyms                            Enriched Krypton
Supplier Address*                   Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC
                                      575 Mountain Ave.
                                      Murray Hill, NJ 07974
                                      Phone: 908-464-8100
                                      www.lindeus.com
                                      Linde Gas Puerto Rico, Inc.
                                      Las Palmas Village
                                      Road No. 869, Street No. 7
                                      Catano, Puerto Rico 00962
                                      Phone: 787-641-7445
                                      www.pr.lindegas.com
                                      Linde Canada Limited
                                      5860 Chedworth Way
                                      Mississauga, Ontario L5R 0A2
                                      Phone: 905-501-1700
                                      www.lindecanada.com
                                      * May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Chemical Emergency Phone Number     Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US

2. HAZARDS IDENTIFICATION

WARNING!

Emergency Overview

Radioactive material
Simple asphyxiant
Cancer hazard
Contents under pressure
Keep at temperatures below 52°C / 125°F

Appearance Colorless
Physical State Compressed gas.
Odor Odorless

OSHA Regulatory Status
This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Potential Health Effects

Principle Routes of Exposure

External radiation hazard. Inhalation.

Acute Toxicity

Inhalation

Krypton-85 is a radioactive isotope. Though Krypton-85 occurs naturally and a small amount of this isotope is normally present in the atmosphere, exposure to significant quantities may be harmful. Krypton-85 generates beta particles and gamma rays and poses an external radiation hazard. Upon inhalation of Krypton-85 gas, this isotope can be incorporated in the body’s cells and emit radiation energy to surrounding tissues. Exposure to this product should be kept to levels as low as reasonably achievable. Refer to applicable standards and regulations for workplace limits on radiation exposure. In the U.S. reference Nuclear Regulatory Commission (NRC) Radiation Safety Regulations 10 CFR SubpartC, Section 20.1201 for occupational dose limits for adults.

Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen-deficient atmosphere (<19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>Volume %</th>
<th>Chemical Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krypton</td>
<td>7439-90-9</td>
<td>0-99</td>
<td>Kr</td>
</tr>
<tr>
<td>Krypton 85</td>
<td>13983-27-2</td>
<td>&lt; 10 TBq</td>
<td>^85Kr</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

General Advice

Immediate medical attention is required. Contact your radiation safety office or your State or Regional NRC office for information. Show this safety data sheet to the doctor in attendance.

Eye Contact

None normally required. If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.

Skin Contact

None normally required. For dermal contact or suspected frostbite, remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if contact with the product has resulted in blistering of the dermal surface or in deep tissue freezing.

Environmental Hazard

See Section 12 for additional Ecological Information.
Inhalation

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.

Ingestion

None under normal use. Get medical attention if symptoms occur.

Notes to Physician

Treat symptomatically.

Protection of First-aiders

Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Flammable Properties

Not flammable.

Suitable Extinguishing Media

Use extinguishing agent suitable for type of surrounding fire.

Explosion Data

Sensitivity to Mechanical Impact

None

Sensitivity to Static Discharge

None

Specific Hazards Arising from the Chemical

External radiation hazard. Cylinders may rupture under extreme heat. Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.

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.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions

Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Use personal protective equipment. Geiger-Mueller detector can be used to determine that the radioactive material has been dissipated. Monitor oxygen level.

Environmental Precautions

Prevent spreading of vapors through sewers, ventilation systems and confined areas.

Methods for Containment

Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Linde location.

Methods for Cleaning Up

Return cylinder to Linde or an authorized distributor.

Other Information

Ventilate the area.

7. HANDLING AND STORAGE
7. HANDLING AND STORAGE

Handling

THIS COMPOUND IS A RADIOISOTOPE. ALL WORK PRACTICES MUST BE DESIGNED TO ELIMINATE OR REDUCE HUMAN EXPOSURE TO THE LOWEST LEVEL POSSIBLE. Employees must be trained in proper use and handling of radioactive materials. Areas in which this product is used must have appropriate radiation warning signs. Personnel monitoring may be required. Appropriate radiation shielding should be used. Obtain appropriate governmental licenses to possess and handle radioactive materials. Refer to the regulations of Nuclear Regulatory Commission (10CFR Part 20) for specific radiation protection standards.

Use only in ventilated areas. Never attempt to lift a cylinder by its valve protection cap. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Use equipment rated for cylinder pressure. Use backflow preventive device in piping. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur.

Use an adjustable strap wrench to remove over-tight or rusted caps. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner’s written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

For additional recommendations, consult Compressed Gas Association Pamphlets P-1, P-14, and Safety Bulletin SB-2.

Storage

Storage should be controlled in a manner compliant with applicable governmental regulations for radioactive materials. Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a “first in-first out” inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krypton 85 13983-27-2</td>
<td>20 mSv Effective Dose annual; 150 mSv (lens of eye) annual equivalent dose; 500 mSv (Skin) annual equivalent dose; 500 mSv (hands and feet) annual equivalent dose; 0.5 mSv (embryo/fetus) equivalent dose term of pregnancy; 2 mSv (abdomen of pregnant woman over course of pregnancy.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other Exposure Guidelines

For OSHA exposure requirements for ionizing radiation refer to 29 CFR 1910.1096.

Engineering Measures

Showers. Eyewash stations. Ventilation systems.

Ventilation

Use ventilation adequate to keep exposures below recommended exposure limits.

Personal Protective Equipment

Eye/Face Protection

Wear protective eyewear (safety glasses).
Skin and Body Protection

Work gloves and safety shoes are recommended when handling cylinders.

Respiratory Protection

General Use

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.

Emergency Use

Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%).

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Product Information

| Appearance | Colorless. |
| Odor Threshold | No information available. |
| Flash Point | No information available. |
| Physical State | Compressed gas |
| Autoignition Temperature | No information available. |

The following information is for the NON-INERT components of this mixture:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Boiling Point</th>
<th>Melting Point</th>
<th>Molecular Weight</th>
<th>Evaporation Rate</th>
<th>Water Solubility</th>
<th>Vapor Pressure</th>
<th>Vapor Density (Air=1)</th>
<th>Gas Density Kg/m³@20°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krypton 85</td>
<td>-153.4°C</td>
<td>-157°C</td>
<td>85</td>
<td>-</td>
<td>0.0594 (vol/vol @ 20°C and 1 atm)</td>
<td>-</td>
<td>-</td>
<td>3.479</td>
</tr>
</tbody>
</table>

The following information is for the INERT components that may be part of this mixture:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Boiling Point</th>
<th>Melting Point</th>
<th>Molecular Weight</th>
<th>Evaporation Rate</th>
<th>Water Solubility</th>
<th>Vapor Pressure</th>
<th>Vapor Density (Air=1)</th>
<th>Gas Density Kg/m³@20°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krypton</td>
<td>-153.4 °C</td>
<td>-157 °C</td>
<td>83.79</td>
<td>-</td>
<td>0.0594 (vol/vol @ 20°C and 1 atm)</td>
<td>Above critical temperature</td>
<td>2.89</td>
<td>3.479</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability

Stable.

Incompatible Products

None known.

Conditions to Avoid

None known.

Hazardous Decomposition Products

None known based on information supplied.

Hazardous Polymerization

Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
Product Information

LD50 Oral: No information available.
LD50 Dermal: No information available.
LC50 Inhalation: No information available.
Repeated Dose Toxicity: No information available.

Component Information

Chronic Toxicity

Carcinogenicity

This product contains one or more substances which are classified by IARC as carcinogenic to humans (Group I), probably carcinogenic to humans (Group 2A) or possibly carcinogenic to humans (Group 2B).

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krypton 85</td>
<td></td>
<td>Group 1</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans

OSHA: (Occupational Safety & Health Administration)
X - Present

Irritation: No information available.
Sensitization: No information available.
Reproductive Toxicity: No information available.
Developmental Toxicity: No information available.
Synergistic Materials: None known.
Target Organ Effects: None known.

12. ECOLOGICAL INFORMATION

Ecotoxicity

The environmental impact of this product has not been fully investigated.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Linde for proper disposal.
Contaminated Packaging  Do not re-use empty containers.

14. TRANSPORT INFORMATION

**DOT**

Proper shipping name  Radioactive material, Type A package
Hazard Class  7
Subsidiary Class  None
UN-Number  UN2915
Special Provisions  Except for LSA material, a Type A package may not contain greater quantity than A2 for “normal form” Class 7 material (49 CFR 173.431). Gas in a cylinder is “normal form”. A2 for Kr 85 = 10Tbq (approx. 270 Ci).

Description  UN2915, Radioactive material, Type A package, 7, PG None
Additional Marking Requirements:
Placard requirements: 7 (Radioactive Yellow III only placarding is required for Yellow III labeled material and “exclusive use” shipments (49 CFR 172.504).
Label requirements: Class 7 label options are dependant on Transport Index (determined by maximum radiation level 1 meter from package surface) (DOT regulation 49 CFR 172.403).

Emergency Response Guide Number  163

**TDG**

No information available.

**MEX**

No information available.

**IATA**

UN-Number  UN2915
Proper Shipping Name  Radioactive material, Type A package
Hazard Class  7
ERG Code  7L
Special Provisions  Label Requirements: 7 (I, II or III as determined by Table 10.5.D), and 10.2.2
Placard (required if in large container*): See IATA “Dangerous Goods Regulations”, Section 10.7.7.5.

Description  UN2915, Radioactive material, Type A package, 7
Maximum Quantity for Passenger  See 10.3
Maximum Quantity for Cargo Only  See 10.3
Limited Quantity  No information available.

**IMDG/IMO**

No information available.

**ADR**

No information available.

15. REGULATORY INFORMATION

International Inventories
15. REGULATORY INFORMATION

Legend

- TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
- DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
- EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

U.S. Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Health Hazard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic Health Hazard</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Sudden Release of Pressure Hazard</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Clean Water Act
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

Risk and Process Safety Management Programs
This material, as supplied, does not contain any regulated substances with specified thresholds under 40 CFR Part 68. This product does not contain any substances regulated as Highly Hazardous Chemicals pursuant to the 29 CFR Part 1910.110.

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)
This product contains the following substances which are listed hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>HAPS data</th>
<th>VOC Chemicals</th>
<th>Class 1 Ozone Depletors</th>
<th>Class 2 Ozone Depletors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krypton 85</td>
<td>13983-27-2</td>
<td>Present (A type of atom which spontaneously undergoes radioactive decay [including radon])</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CERCLA/SARA
This material, as supplied, contains one or more substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355):

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Hazardous Substances RQs</th>
<th>Extremely Hazardous Substances RQs</th>
<th>TPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krypton 85</td>
<td>1000 curies</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

U.S. State Regulations
California Proposition 65
This product contains the following Proposition 65 chemicals:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>California Prop. 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krypton 85</td>
<td>13983-27-2</td>
<td>Carcinogen</td>
</tr>
</tbody>
</table>

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krypton</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Krypton 85</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

International Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
A Compressed gases
D2A Very toxic materials

16. OTHER INFORMATION

Prepared By          Product Stewardship
                      23 British American Blvd.
                      Latham, NY 12110
                      1-800-572-6501

Issuing Date        10-Feb-2011
Revision Date
Revision Number      0
Revision Note        Initial Release.

NFPA
Health Hazard 0
Flammability 0
Stability 0
Physical and Chemical Hazards Simple asphyxiant

HMIS
Health Hazard 1*
Flammability 0
Physical Hazard 3
Personal Protection -

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

General Disclaimer
For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.
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End of Safety Data Sheet