



OCTAFLUOROCYCLOBUTANE (RC318)

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name OCTAFLUOROCYCLOBUTANE (RC318)

Other means of identification

Safety data sheet number LIND-P092
 UN/ID no. UN1976
 Synonyms Cyclooctafluorobutane; Perfluorocyclobutane; Cyclobutane; Octafluorocyclobutane; Propellant C 318; Freon C-318; FC-C 318; PFC-C318; Refrigerant Gas RC 318; RC318

Recommended use of the chemical and restrictions on use

Recommended Use Industrial and professional use.
 Uses advised against Consumer use

Details of the supplier of the safety data sheet

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.
 Road 869, Km 1.8
 Barrio Palmas, Catano, PR 00962
 Phone: 787-641-7445
 www.pr.lindegas.com

Linde Canada Limited
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 905-501-1700
 www.lindecana.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number

Company Phone Number 800-232-4726 (Linde National Operations Center, US)
 905-501-0802 (Canada)
 CHEMTREC: 1-800-424-9300 (North America) +1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

| | |
|----------------------|---------------|
| Gases under pressure | Liquefied gas |
| Simple asphyxiants | Yes |

Label elements

Hazard Statements

Contains gas under pressure; may explode if heated
 May displace oxygen and cause rapid suffocation
 May cause frostbite

Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood
 Do not get in eyes, on skin, or on clothing
 Use and store only outdoors or in a well ventilated place
 Use backflow preventive device in piping
 Close valve after each use and when empty

Precautionary Statements - Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical attention/advice.
 IF ON SKIN: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

Other Information

3. COMPOSITION/INFORMATION ON INGREDIENTS

| Chemical Name | CAS No. | Volume % | Chemical Formula |
|-----------------------|----------|----------|-------------------------------|
| Octafluorocyclobutane | 115-25-3 | 100 | C ₄ F ₈ |

4. FIRST AID MEASURES

Description of first aid measures

General advice

Show this safety data sheet to the doctor in attendance.

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| Inhalation | If breathing is difficult, give oxygen. If breathing has stopped, give artificial respiration. Get medical attention immediately. Remove to fresh air and keep comfortable for breathing. |
| Skin contact | 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. |
| Eye contact | If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention. |
| Ingestion | Not an expected route of exposure. |
| Self-protection of the first aider | RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. |

Most important symptoms and effects, both acute and delayed

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| Symptoms | High concentrations may cause asphyxia from lack of oxygen or act as a narcotic causing central nervous system depression. May cause nausea, dizziness, headaches, shortness of breath, lethargy, narcosis, unconsciousness and possibly cardiac arrhythmias. Contact with liquid may cause cold burns/frostbite. |
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Indication of any immediate medical attention and special treatment needed

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| Note to physicians | A patient adversely affected by exposure to this product should not be given adrenaline (epinephrine) or similar heart stimulant since these would increase the risk of cardiac arrhythmias. |
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5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Specific extinguishing methods

Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical

Non-flammable gas. Cylinders may rupture under extreme heat.

Hazardous combustion products Hydrogen fluoride. Carbonyl fluoride.

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, protective equipment and emergency procedures

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| Personal precautions | Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Monitor oxygen level. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. |
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Environmental precautions

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| Environmental precautions | Prevent spreading of vapors through sewers, ventilation systems and confined areas. |
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Methods and material for containment and cleaning up

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| 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. |

7. HANDLING AND STORAGE

Precautions for safe handling

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|-------------------------|---|
| Advice on safe handling | <p>Product is non-corrosive and may be used with any common structural material. Silver and carbon bearing alloys can act as catalysts for decomposing the product at high temperatures. Alloys containing more than 2% magnesium should not be used if water is present.</p> <p>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. Never attempt to lift a cylinder by its valve protection cap. 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. Use only with adequate ventilation. Use backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Ensure the complete gas system has been checked for leaks before use.</p> <p>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.</p> <p>Only experienced and properly instructed persons should handle gases under pressure. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.</p> <p>For additional recommendations consult Compressed Gas Association's (CGA) Safety Bulletin SB-2, Oxygen-Deficient Atmospheres.</p> |
|-------------------------|---|

Conditions for safe storage, including any incompatibilities

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| Storage Conditions | 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. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. 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. Stored containers should be periodically checked for general condition and leakage. |
| Incompatible materials | May react violently with chemically active metals such as sodium, potassium and barium, powdered magnesium, powdered aluminum and organometallics. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

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| Exposure Guidelines | This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies. |
|---------------------|---|

Appropriate engineering controls

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| Engineering Controls | Ventilation systems. Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Oxygen detectors should be used when asphyxiating gases may be released. Systems under pressure should be regularly checked for leakages. Showers. Eyewash stations. |
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Individual protection measures, such as personal protective equipment

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| Eye/face protection | Wear safety glasses with side shields (or goggles). If splashes are likely to occur, wear: Goggles. Face-shield. |
| Skin and body protection | Work gloves and safety shoes are recommended when handling cylinders. Wear cold insulating gloves when handling liquid. |
| Respiratory protection | Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%). |
| General Hygiene Considerations | Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin, or on clothing. |

9. PHYSICAL AND CHEMICAL PROPERTIESInformation on basic physical and chemical properties

| | |
|---------------------------|--------------------------|
| Physical state | Compressed liquefied gas |
| Appearance | Colorless. |
| Odor | Slight ethereal. |
| Odor threshold | No information available |
| pH | No data available |
| Melting point | -40.2 °C / -40.4 °F |
| Evaporation rate | Not applicable |
| Lower flammability limit: | Not applicable |
| Upper flammability limit: | Not applicable |
| Flash point | No information available |
| Autoignition temperature | No data available |
| Decomposition temperature | No data available |
| Water solubility | 140 mg/l |
| Partition coefficient | No data available |
| Kinematic viscosity | Not applicable |

Component Level Information:

| Chemical Name | Molecular weight | Boiling point | Vapor Pressure | Vapor density (air =1) | Gas Density Kg/m ³ @20°C | Critical Temperature |
|-----------------------|------------------|---------------|-----------------|------------------------|-------------------------------------|----------------------|
| Octafluorocyclobutane | 200.03 | -6 °C | 2.7 bar @ 20 °C | 6.6 | 8.6 | 115.2 °C |

10. STABILITY AND REACTIVITYReactivity

Not reactive under normal conditions.

Chemical stability

Stable under normal conditions.

Explosion data

| | |
|----------------------------------|-------|
| Sensitivity to Mechanical Impact | None. |
| Sensitivity to Static Discharge | None. |

Possibility of Hazardous Reactions

None under normal processing.

Conditions to avoid

Heat, flames and sparks.

Incompatible materials

May react violently with chemically active metals such as sodium, potassium and barium, powdered magnesium, powdered aluminum and organometallics.

Hazardous Decomposition Products

Hydrogen fluoride. Carbonyl fluoride.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

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|--------------|---|
| Inhalation | High concentrations may cause ventricular fibrillation and CNS effects. |
| Skin contact | Prolonged skin contact may defat the skin and produce dermatitis. Contact with liquid may cause cold burns/frostbite. |
| Eye contact | May cause slight irritation. Contact with liquid may cause cold burns/frostbite. |
| Ingestion | Not an expected route of exposure. |

Information on toxicological effects

| | |
|----------|---|
| Symptoms | High concentrations may cause asphyxia from lack of oxygen or act as a narcotic causing central nervous system depression. May cause nausea, dizziness, headaches, shortness of breath, lethargy, narcosis, unconsciousness and possibly cardiac arrhythmias. |
|----------|---|

Delayed and immediate effects as well as chronic effects from short and long-term exposure

| | |
|--------------------------|---|
| Irritation | Not classified. |
| Sensitization | Not classified. |
| Germ cell mutagenicity | Not classified. |
| Carcinogenicity | This product does not contain any carcinogens or potential carcinogens listed by OSHA, IARC or NTP. |
| Reproductive toxicity | Not classified. |
| STOT - single exposure | Not classified. |
| STOT - repeated exposure | Not classified. |
| Chronic toxicity | Possible risks of irreversible effects. |
| Target Organ Effects | Heart, Central nervous system (CNS). |
| Aspiration hazard | Not applicable. |

Numerical measures of toxicity

Component Level Information:

| Chemical Name | Oral LD50 | Dermal LD50 | Inhalation LC50 | Inhalation LC50 (CGA P-20) |
|-----------------------------------|-----------|-------------|----------------------|-------------------------------|
| Octafluorocyclobutane 115-25-3 | - | - | 75780 ppm /2hr (Rat) | - |

Product Information

| | |
|-----------------|--------------------------|
| Oral LD50 | No information available |
| Dermal LD50 | No information available |
| Inhalation LC50 | No information available |
| Inhalation LC50 | 75780 ppm/ 2hr (Rat) |

12. ECOLOGICAL INFORMATION

Ecotoxicity

No known acute aquatic toxicity.

Persistence and degradability

No information available.

Bioaccumulation

Will not bioconcentrate.

Other adverse effects

Contains fluorinated greenhouse gas.

Global warming potential (GWP) 10300

13. DISPOSAL CONSIDERATIONSWaste treatment methods

Disposal of wastes 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.

14. TRANSPORT INFORMATIONDOT

| | |
|---------------------------------|------------------------------------|
| UN/ID no. | UN1976 |
| Proper shipping name | Octafluorocyclobutane |
| Hazard Class | 2.2 |
| Special Provisions | T50 |
| Description | UN1976, Octafluorocyclobutane, 2.2 |
| Emergency Response Guide Number | 126 |

TDG

| | |
|----------------------|------------------------------------|
| UN/ID no. | UN1976 |
| Proper shipping name | Octafluorocyclobutane |
| Hazard Class | 2.2 |
| Description | UN1976, Octafluorocyclobutane, 2.2 |

MEX

| | |
|----------------------|------------------------------------|
| UN/ID no. | UN1976 |
| Proper shipping name | Octafluorocyclobutane |
| Hazard Class | 2.2 |
| Description | UN1976, Octafluorocyclobutane, 2.2 |

IATA

| | |
|----------------------|-------------------------------------|
| UN/ID no. | UN1976 |
| Proper shipping name | Refrigerant gas R C318 |
| Hazard Class | 2.2 |
| ERG Code | 2L |
| Description | UN1976, Refrigerant gas R C318, 2.2 |

IMDG

| | |
|----------------------|------------------------------------|
| UN/ID no. | UN1976 |
| Proper shipping name | Octafluorocyclobutane |
| Hazard Class | 2.2 |
| EmS-No. | F-C, S-V |
| Description | UN1976, Octafluorocyclobutane, 2.2 |

ADR

| | |
|-------------------------|---|
| UN/ID no. | UN1976 |
| Proper shipping name | Octafluorocyclobutane |
| Hazard Class | 2.2 |
| Classification code | 2A |
| Tunnel restriction code | (C/E) |
| Description | UN1976, Octafluorocyclobutane, 2.2, (C/E) |

15. REGULATORY INFORMATION

International Inventories

| | |
|---------------|----------|
| TSCA | Complies |
| DSL | Complies |
| EINECS/ELINCS | Complies |

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 Chemical Substances/European List of Notified Chemical Substances

US 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

| | |
|-----------------------------------|-----|
| Acute Health Hazard | Yes |
| Chronic Health Hazard | No |
| Fire Hazard | No |
| Sudden release of pressure hazard | Yes |
| Reactive Hazard | No |

CERCLA

This material, as supplied, does not contain any 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). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPS) (see 40 CFR 61)

This product does not contain any substances regulated as hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act Amendments of 1990.

CWA (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.

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

| Chemical Name | New Jersey | Massachusetts | Pennsylvania |
|-----------------------------------|------------|---------------|--------------|
| Octafluorocyclobutane 115-25-3 | X | - | - |

Canada

16. OTHER INFORMATION

NFPA Health hazards 2 Flammability 0 Instability 0 Physical and Chemical Properties *

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.

Issue Date 17-Feb-2015
 Revision Date 17-Feb-2015
 Revision Note Initial Release.

General Disclaimer

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End of Safety Data Sheet