



HEXAFLUORO 1,3-BUTADIENE (Halocarbon 2316)

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	HEXAFLUORO 1,3-BUTADIENE (Halocarbon 2316)
Product Code(s)	G-457
UN-No	UN3160
Recommended Use	Compressed gas.
Synonyms	Perfluorobutadiene
Supplier Address*	<p>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</p> <p>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</p> <p>Linde Canada Limited 5860 Chedworth Way Mississauga, Ontario L5R 0A2 Phone: 905-501-1700 www.lindecanada.com</p> <p>* May include subsidiaries or affiliate companies/divisions.</p> <p>For additional product information contact your local customer service.</p>
Chemical Emergency Phone Number	Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US

2. HAZARDS IDENTIFICATION

DANGER!		
Emergency Overview		
Extremely flammable Fatal if inhaled. May cause skin, eye, and respiratory tract irritation May cause adverse kidney effects Contents under pressure Keep at temperatures below 52°C / 125°F		
Appearance Colorless	Physical State Gas.	Odor Odorless

Potential Health Effects

Principle Routes of Exposure	Eye contact. Skin contact. Inhalation.
Acute Toxicity	
Inhalation	Fatal if inhaled. Inhalation may have a narcotic effect or cause irregular heart beat (arrhythmias) and kidney damage. Signs and symptoms may include respiratory irritation, cough, and dizziness.
Eyes	May cause irritation. Contact with rapidly expanding gas near the point of release may cause frostbite.
Skin	May cause irritation. Contact with rapidly expanding gas near the point of release may cause frostbite.
Skin Absorption Hazard	No known effect based on information supplied.
Ingestion	Not an expected route of exposure.
Chronic Effects	May cause adverse kidney effects.
Aggravated Medical Conditions	Kidney disorders. Respiratory disorders. Central nervous system. Skin disorders.
Environmental Hazard	See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Volume %	Chemical Formula
Perfluorobutadiene	685-63-2	>99	C ₄ F ₆

4. FIRST AID MEASURES

General Advice	Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.
Eye Contact	None required for gas. If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.
Skin Contact	None required for gas. 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.

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	Not an expected route of exposure.
Notes to Physician	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.
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	Extremely flammable.
Suitable Extinguishing Media	Carbon dioxide (CO ₂). Foam. Dry chemical. DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
Hazardous Combustion Products	Fluorine compounds.
<u>Explosion Data</u>	
Sensitivity to Mechanical Impact	None
Sensitivity to Static Discharge	Yes
Specific Hazards Arising from the Chemical	Contact with flames or red heat can produce toxic and corrosive fluorine decomposition products. Continue to cool fire exposed cylinders until flames are extinguished. Cylinders may rupture under extreme heat. Damaged cylinders should be handled only by specialists.
Protective Equipment and Precautions for Firefighters	<p>If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Ventilation fans must be explosion proof. Use non-sparking tools to close container valves.</p> <p>For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn.</p> <p>Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers.</p> <p>As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.</p>

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. All equipment used when handling the product must be grounded. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
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.

7. HANDLING AND STORAGE

Handling	<p>Remove all sources of ignition. Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Use only in ventilated areas. "NO SMOKING" signs should be posted in storage and use areas.</p> <p>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.</p> <p>Use an adjustable strap wrench to remove over-tight or rusted caps. Close valve after each use and when empty. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.</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>
Storage	Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Keep at temperatures below 52°C / 125°F. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. 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	This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.
Engineering Measures	Showers. Eyewash stations. Explosion proof ventilation systems. Exhaust gas should be vented to a gas treatment system.
Ventilation	Use ventilation adequate to keep exposures below recommended exposure limits.
<u>Personal Protective Equipment</u>	
Eye/Face Protection	Tightly fitting safety goggles. Face-shield.
Skin and Body Protection	Wear cold insulating gloves when handling liquid.
Respiratory Protection	
General Use	No respiratory equipment is needed if workplace oxygen levels are kept above 19.5%.
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

Appearance	Colorless.	Odor	Odorless.
Odor Threshold	No information available.	Physical State	Gas
Flash Point	No information available.	Autoignition Temperature	No information available.
Decomposition Temperature	No information available.	Boiling Point/Range	6°C / 42.8°F
Freezing Point	-132°C / -205.6°F	Molecular Weight	161.98
Water Solubility	Insoluble in water.	Evaporation Rate	No information available
Vapor Pressure	54.9 psig	Vapor Density	5.6 (air = 1)
Gas Density	0.4245 lb/ft ³	VOC Content (%)	Not applicable.
Flammability Limits in Air			
Upper	73%		
Lower	7%		

10. STABILITY AND REACTIVITY

Stability	Stable under recommended storage conditions.
Incompatible Products	Oxidizing agents. Alkaline earth metals. Alkalis.
Conditions to Avoid	Ignitions sources - heat, sparks and open flames.
Hazardous Decomposition Products	Fluorine compounds.
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

LD50 Oral:	No information available.
LD50 Dermal:	No information available.
LC50 Inhalation:	LC50: 4.42 mg/L/4 hr. (approximately 667 ppm).
Eye Contact	May cause irritation.
Skin Contact	May cause irritation.
Repeated Dose Toxicity	No information available.

Chronic Toxicity

Chronic Toxicity	May cause adverse kidney effects.
Carcinogenicity	Contains no ingredient listed as a carcinogen.

Irritation	No information available.
Sensitization	No information available.
Mutagenic Effects	Was not mutagenic in Salmonella bacterial assay.
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	Liquefied gas, toxic, flammable, n.o.s.
Hazard Class	2.3
Subsidiary Class	2.1
UN-No	UN3160
Special Provisions	This material is toxic by inhalation in Hazard Zone C.
Description	UN3160, Liquefied gas, toxic, flammable, n.o.s. (Hexafluoro-1,3-butadiene), 2.3, (2.1)
Additional Description:	"Toxic-Inhalation Hazard Zone C".
Additional Marking Requirements:	"Inhalation Hazard".
Emergency Response Guide Number	119

TDG

Proper Shipping Name	Liquefied gas, toxic, flammable, n.o.s.
Hazard Class	2.3
Subsidiary Class	(2.1)
UN-No	UN3160

Description	UN3160, LIQUEFIED GAS, TOXIC, FLAMMABLE, N.O.S. (Hexafluoro-1,3-butadiene), 2.3(2.1)
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MEX

Proper Shipping Name	Liquefied gas, toxic, flammable, n.o.s.
Hazard Class	2.3
Subsidiary Class	2.1
UN-No	UN3160
Description	UN3160 Liquefied gas, toxic, flammable, n.o.s. (Hexafluoro-1,3-butadiene), 2.3

IATA

UN-No	UN3160
Proper Shipping Name	Liquefied gas, toxic, flammable, n.o.s.
Hazard Class	2.3
Subsidiary Class	2.1
ERG Code	10P
Description	UN3160, Liquefied gas, toxic, flammable, n.o.s. (Hexafluoro-1,3-butadiene), 2.3(2.1)
Maximum Quantity for Passenger	Forbidden
Maximum Quantity for Cargo Only	Forbidden
Limited Quantity	No information available.

IMDG/IMO

Proper Shipping Name	Liquefied gas, toxic, flammable, n.o.s.
Hazard Class	2.3
Subsidiary Class	2.1
UN-No	UN3160
EmS No.	F-D, S-U
Description	UN3160, Liquefied gas, toxic, flammable, n.o.s. (Hexafluoro-1,3-butadiene), 2.3(2.1)

ADR

Proper Shipping Name	Liquefied gas, toxic, flammable, n.o.s.
Hazard Class	2.3
UN-No	UN3160
Classification Code	2TF
Description	UN3160 Liquefied gas, toxic, flammable, n.o.s. (Hexafluoro-1,3-butadiene), 2.3,
ADR/RID-Labels	.1

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL	Does not Comply
EINECS/ELINCS	Complies

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDL - 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

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	Yes
Sudden Release of Pressure Hazard	Yes
Reactive Hazard	No

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

CERCLA/SARA

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.

U.S. State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations.

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

B1 Flammable gas

D1A Very toxic materials



16. OTHER INFORMATION

Prepared By	Product Stewardship 23 British American Blvd. Latham, NY 12110 1-800-572-6501
Issuing Date	17-Mar-2010
Revision Date	10-Sep-2010
Revision Number	1
Revision Note	(M)SDS sections updated. 1.

<u>NFPA</u>	Health Hazard 3	Flammability 4	Stability 0	Physical and Chemical Hazards -
<u>HMIS</u>	Health Hazard 2	Flammability 4	Physical Hazard 0	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