



# Liquefied Natural Gas

## Material Safety Data Sheet

### 1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	Liquefied Natural Gas
UN-Number	UN1972
Recommended Use	Industrial use.
Synonyms	LNG
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.lindecana.com</p>

\* 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

**DANGER!**

#### Emergency Overview

Extremely flammable  
 Extremely cold liquid and gas under pressure.  
 May cause skin, eye, and respiratory tract irritation  
 Asphyxiant at high concentrations  
 May cause central nervous system depression  
 Contents under pressure  
 Keep at temperatures below 52°C / 125°F

Appearance Colorless.

Physical State Cryogenic Liquid.

Odor Petroleum like

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	Inhalation.
Acute Toxicity	
Inhalation	May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. 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.
Eyes	Contact with product may cause frostbite.
Skin	May cause frostbite.
Skin Absorption Hazard	No known hazard in contact with skin.
Ingestion	Not an expected route of exposure.
Chronic Effects	None known.
Aggravated Medical Conditions	Respiratory disorders.
Environmental Hazard	See Section 12 for additional Ecological Information.

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

Chemical Name	CAS-No	Volume %	Chemical Formula
Methane	74-82-8	62-93	CH <sub>4</sub>
Nitrogen	7727-37-9	1-9	N <sub>2</sub>
Propane	74-98-6	1-7	C <sub>3</sub> H <sub>8</sub>
Ethane	74-84-0	3-11	C <sub>2</sub> H <sub>6</sub>
N-Butane	106-97-8	1-3	C <sub>4</sub> H <sub>10</sub>
Isobutane	75-28-5	1-3	C <sub>4</sub> H <sub>10</sub>
Helium	7440-59-7	<2	He
Isopentane	78-78-4	<1	C <sub>5</sub> H <sub>12</sub>
Pentane	109-66-0	<1	C <sub>5</sub> H <sub>12</sub>
Carbon dioxide	124-38-9	<1	CO <sub>2</sub>

**4. FIRST AID MEASURES**

Eye Contact	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.
Skin Contact	Wash off immediately with plenty of water. If skin irritation persists, call a physician. 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	None under normal use. Get medical attention if symptoms occur.
Notes to Physician	Treat symptomatically.

## 5. FIRE-FIGHTING MEASURES

Flammable Properties	Extremely flammable.
Suitable Extinguishing Media	Dry chemical or CO <sub>2</sub> . Water spray or fog. DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
Hazardous Combustion Products	Carbon monoxide. Carbon dioxide (CO <sub>2</sub> ).
<u>Explosion Data</u>	
Sensitivity to Mechanical Impact	None
Sensitivity to Static Discharge	Yes.
Specific Hazards Arising from the Chemical	May form explosive mixtures with air. Continue to cool fire exposed cylinders until flames are extinguished. Cylinders may rupture under extreme heat. Damaged cylinders should be handled only by specialists. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may travel to source of ignition and flash back.
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>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). All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Monitor oxygen level.
Environmental Precautions	Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. 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

Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Remove all sources of ignition. Use only in ventilated areas. "NO SMOKING" signs should be posted in storage and use 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.

Use an adjustable strap wrench to remove over-tight or rusted caps. 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.

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

Outside or detached storage is preferred. 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

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Isopentane 78-78-4	TWA: 600 ppm		
Carbon dioxide 124-38-9	STEL = 30000 ppm TWA: 5000 ppm	TWA: 5000 ppm TWA: 9000 mg/m <sup>3</sup> (vacated) TWA: 10000 ppm (vacated) TWA: 18000 mg/m <sup>3</sup> (vacated) STEL: 30000 ppm (vacated) STEL: 54000 mg/m <sup>3</sup>	IDLH: 40000 ppm TWA: 5000 ppm TWA: 9000 mg/m <sup>3</sup> STEL: 30000 ppm STEL: 54000 mg/m <sup>3</sup>
N-Butane 106-97-8	TWA: 1000 ppm	(vacated) TWA: 800 ppm (vacated) TWA: 1900 mg/m <sup>3</sup>	TWA: 800 ppm TWA: 1900 mg/m <sup>3</sup>
Pentane 109-66-0	TWA: 600 ppm	TWA: 1000 ppm TWA: 2950 mg/m <sup>3</sup> (vacated) TWA: 600 ppm (vacated) TWA: 1800 mg/m <sup>3</sup> (vacated) STEL: 750 ppm (vacated) STEL: 2250 mg/m <sup>3</sup>	IDLH: 1500 ppm Ceiling: 610 ppm 15 min Ceiling: 1800 mg/m <sup>3</sup> 15 min TWA: 120 ppm TWA: 350 mg/m <sup>3</sup>
Methane 74-82-8	TWA: 1000 ppm		
Ethane 74-84-0	TWA: 1000 ppm		
Propane 74-98-6	TWA: 1000 ppm	TWA: 1000 ppm TWA: 1800 mg/m <sup>3</sup>	IDLH: 2100 ppm TWA: 1000 ppm TWA: 1800 mg/m <sup>3</sup>
Isobutane 75-28-5	TWA: 1000 ppm	N/A	N/A

*Immediately Dangerous to Life or Health.*

<b>Other Exposure Guidelines</b>	Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).
<b>Engineering Measures</b>	Showers. Eyewash stations. Explosion proof ventilation systems.
<b>Ventilation</b>	Use ventilation adequate to keep exposures below recommended exposure limits.
<b><u>Personal Protective Equipment</u></b>	
<b>Eye/Face Protection</b>	Wear protective eyewear (safety glasses).
<b>Skin and Body Protection</b>	Work gloves and safety shoes are recommended when handling cylinders. Wear cold insulating gloves when handling liquid. Cotton or Nomex® clothing is recommended to prevent static build-up.
<b>Respiratory Protection</b>	
<b>General Use</b>	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.
<b>Emergency Use</b>	Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%).
<b>Hygiene Measures</b>	Wear suitable gloves and eye/face protection.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

## Product Information

Appearance	Colorless.	Odor	Petroleum like.
Odor Threshold	No information available	Physical State	Cryogenic Liquid
Flash Point	-306°F / -188°C	Flashpoint Method	Closed cup
Autoignition Temperature	580°C / 1076°F	Flammability Limits in Air	
		Upper	15%
		Lower	5%

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

Chemical Name	Boiling Point	Melting Point	Molecular Weight	Evaporation Rate	Water Solubility	Vapor Pressure	Vapor Density (Air=1)	Gas Density Kg/m <sup>3</sup> @20°C
Isopentane	28 °C	-160 °C	72.14	-	No information available		2.5	3.212 @15°
Carbon dioxide	56 °C	-56 °C	44.00	-	0.145 g/ml @ 25°C	838 psig (5778 kPa) @ 21.1°C	1.522	1.839
Pentane	36°C	<-50 °C	72.14		No information available	1100 hPa @ 38 °C	2.5	3.228 @15°
N-Butane	-0.5 °C	-138.3 °C	58.12	-	No information available	2200 hPa @ 20 °C	2.11	2.52 @15°
Methane	-162 °C	-182.5 °C	16.04	-	No information available	46700 hPa @ - 82.5 °C	0.56	0.668 @15°
Ethane	-88.7°C	-183 --20 °C	30.06	-	No information available	600 - 39000 hPa @ 20 °C	1.05	1.282 @15°
Propane	-42.1°C	-183 --20 °C	44.09	-	No information available	600 - 39000 hPa @ 20 °C	1.55	1.99 @15°
Isobutane	-11.7 °C	-255 °C	58.12	-	No information available	2100 hPa @ 20 °C	2.06	2.51 @15°

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

Chemical Name	Boiling Point	Melting Point	Molecular Weight	Evaporation Rate	Water Solubility	Vapor Pressure	Vapor Density (Air=1)	Gas Density Kg/m <sup>3</sup> @20°C
Helium	-268.94 °C	-272.0 °C	4.00	-	0.0089 (vol/vol @ 20°C and 1 atm)	Above critical temperature	0.138	0.166
Nitrogen	-196 °C	-210 °C	28.01	-	0.023 (vol/vol @ 20°C and 1 atm)	Above critical temperature	0.97	1.165

## 10. STABILITY AND REACTIVITY

Stability	Stable.
Incompatible Products	Oxidizing agents.
Conditions to Avoid	Heat, flames and sparks.
Hazardous Decomposition Products	Carbon monoxide (CO). Carbon dioxide (CO <sub>2</sub> ).
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 No information available.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Propane		-	= 658 mg/L ( Rat ) 4 h
Ethane			= 658 mg/L ( Rat ) 4 h
N-Butane			658 mg/L ( Rat ) 4 h
Isobutane			= 658 mg/L ( Rat ) 4 h
Isopentane			= 280000 mg/m <sup>3</sup> ( Rat ) 4 h
Pentane	> 2000 mg/kg ( Rat )	= 3000 mg/kg ( Rabbit )	= 364 g/m <sup>3</sup> ( Rat ) 4 h
Carbon dioxide			470000 ppm (Rat)

### Chronic Toxicity

Chronic Toxicity None known.

Carcinogenicity Contains no ingredient listed as a carcinogen.

Irritation No information available.

Sensitization No information available.

Reproductive Toxicity No information available.

Developmental Toxicity Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

Synergistic Materials None known.

Target Organ Effects None known.

## 12. ECOLOGICAL INFORMATION

### Ecotoxicity

Will not bioconcentrate.

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

Chemical Name	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Isopentane				EC50 48 h: = 2.3 mg/L (Daphnia magna)

Chemical Name	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Daphnia Magna (Water Flea)
Pentane		LC50 96 h: = 11.59 mg/L (Pimephales promelas) LC50 96 h: = 9.87 mg/L (Oncorhynchus mykiss) LC50 96 h: = 9.99 mg/L (Lepomis macrochirus)		EC50 48 h: = 9.74 mg/L (Daphnia magna)

Chemical Name	Log Pow
Isopentane	3.3
N-Butane	2.89
Pentane	3.39
Ethane	2.8
Propane	2.3
Isobutane	2.88

### 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. This material, as supplied, is a hazardous waste according to federal regulations (40 CFR 261).

### 14. TRANSPORT INFORMATION

#### DOT

Proper shipping name	Methane, refrigerated liquid
Hazard Class	2.1
Subsidiary Class	None
UN-Number	UN1972
Description	UN1972, Methane, refrigerated liquid, 2.1
Emergency Response Guide Number	115

#### TDG

Proper Shipping Name	Methane, refrigerated liquid
Hazard Class	2.1
UN-Number	UN1972
Description	UN1972, METHANE, REFRIGERATED LIQUID, 2.1

#### MEX

Proper Shipping Name	Methane, refrigerated liquid
Hazard Class	2.1
UN-Number	UN1972
Description	UN1972 Methane, refrigerated liquid, 2.1

#### IATA

UN-Number	UN1972
Proper Shipping Name	Natural gas, refrigerated liquid
Hazard Class	2.1
ERG Code	10L



Description	UN1972,Natural gas, refrigerated liquid,2.1
Maximum Quantity for Passenger	Forbidden
Maximum Quantity for Cargo Only	Forbidden
Limited Quantity	Forbidden

IMDG/IMO

Proper Shipping Name	Methane, refrigerated liquid
Hazard Class	2.1
UN-Number	UN1972
EmS No.	F-D, S-U
Description	UN1972, Methane, refrigerated liquid,2.1, FP -188C

ADR

Proper Shipping Name	Methane, refrigerated liquid
Hazard Class	2.1
UN-Number	UN1972
Classification Code	3F
Description	UN1972 Methane, refrigerated liquid,2.1,

**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 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, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

Chemical Name	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances	U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals
Isopentane		10000 lbs	
N-Butane		10000 lbs	
Pentane		10000 lbs	
Methane		10000 lbs	
Ethane		10000 lbs	
Propane		10000 lbs	
Isobutane		10000 lbs	

**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**

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Helium	X	X	X	-	X
Isopentane	X	X	X		
Carbon dioxide	X	X	X	-	X
N-Butane	X	X	X		X
Pentane	X	X	X		X
Methane	X	X	X		X
Ethane	X	X	X		X
Propane	X	X	X		X
Isobutane	X	X	X		
Nitrogen	X	X	X	-	X

**International Regulations**

Chemical Name	Carcinogen Status	Exposure Limits
Carbon dioxide	-	Mexico: TWA= 5000 ppm Mexico: TWA= 9000 mg/m <sup>3</sup> Mexico: STEL= 15000 ppm Mexico: STEL= 27000 mg/m <sup>3</sup>
N-Butane		Mexico: TWA 800 ppm Mexico: TWA 1900 mg/m <sup>3</sup>
Pentane		Mexico: TWA 600 ppm Mexico: TWA 1800 mg/m <sup>3</sup> Mexico: STEL 760 ppm Mexico: STEL 2250 mg/m <sup>3</sup>

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



**16. OTHER INFORMATION**

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

Issuing Date                      22-Sep-2011

Revision Date

Revision Number                      0

Revision Note                      Initial Release.

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

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

End of Safety Data Sheet