PENTANE
Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name        PENTANE
Product Code(s)      G-65
UN-Number            UN1265
Recommended Use      Compressed gas.
Synonyms             Amyl hydride
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

DANGER!

Emergency Overview

Extremely flammable
Irritating to eyes, respiratory system and skin
May cause central nervous system depression
Contents under pressure
Keep at temperatures below 54°C / 130°F

Appearance        Colorless
Physical State     Liquid
Odor              Mild paraffinic

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. Skin contact. Eye contact.

Acute Toxicity

Inhalation
Irritating to respiratory system. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. High concentrations paralyze the central nervous system, causing loss of consciousness and respiratory paralysis.

Eyes
Irritating to eyes.

Skin
Irritating to skin. Prolonged skin contact may defat the skin and produce dermatitis.

Skin Absorption Hazard
No known hazard in contact with skin.

Ingestion
Not an expected route of exposure.

Chronic Effects
None known

Aggravated Medical Conditions
Central nervous system. Pre-existing eye disorders. Skin disorders. Respiratory disorders.

Interactions with Other Chemicals
Use of alcoholic beverages may enhance toxic effects.

Environmental Hazard
Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. See Section 12 for additional Ecological Information.

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>Pentane</td>
<td>109-66-0</td>
<td>&gt;99</td>
<td>C₅H₁₂</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Eye Contact
Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Call a physician immediately.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes. Consult a physician.

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. Containers may explode when heated.
Suitable Extinguishing Media
Dry chemical or CO\(_2\). Water spray or fog. DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Hazardous Combustion Products
Carbon monoxide. Carbon dioxide (CO\(_2\)).

Explosion Data

Sensitivity to Mechanical Impact
None

Sensitivity to Static Discharge
Yes.

Specific Hazards Arising from the Chemical
Rapid flame propagation and flashback possible. 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
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.

Isolate spill or leak area for at least 100 meters (330 feet) in all directions. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may accumulate in confined areas (basement, tanks, hopper/ tank cars, etc.). Vapors may travel to source of ignition and flash back.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers.

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
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. Monitor oxygen level.

Environmental Precautions
Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas. 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. Ensure adequate ventilation.

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's (CGA) Safety Bulletin SB-2, Oxygen-Deficient Atmospheres.

**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 54°C / 130°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>Pentane 109-66-0</td>
<td>TWA: 600 ppm</td>
<td>TWA: 1000 ppm</td>
<td>IDLH: 1500 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA: 2950 mg/ m³</td>
<td>(vacated) TWA: 600 ppm</td>
<td>Ceiling: 610 ppm 15 min</td>
</tr>
<tr>
<td></td>
<td>(vacated) TWA: 1800 mg/ m³</td>
<td>(vacated) STEL: 750 ppm</td>
<td>Ceiling: 1800 mg/ m³ 15 min</td>
</tr>
<tr>
<td></td>
<td>(vacated) STEL: 2250 mg/ m³</td>
<td></td>
<td>TWA: 120 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TWA: 350 mg/ m³</td>
</tr>
</tbody>
</table>

Immediately Dangerous to Life or Health.

**Other Exposure Guidelines**
Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

**Engineering Measures**
Explosion proof ventilation systems. Showers. Eyewash stations.

**Ventilation**
Use ventilation adequate to keep exposures below recommended exposure limits.

**Personal Protective Equipment**

**Eye/ Face Protection**
Wear protective eyewear (safety glasses). If splashes are likely to occur, wear: Goggles. Face-shield.

**Skin and Body Protection**
Work gloves and safety shoes are recommended when handling cylinders. Cotton or Nomex® clothing is recommended to prevent static build-up.

**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

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>Flash Point</td>
<td>-57 °F / -49.4 °C</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>No information available.</td>
</tr>
<tr>
<td>Freezing Point</td>
<td>No information available.</td>
</tr>
<tr>
<td>Water Solubility</td>
<td>Negligible</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>15 PSIA @ 100°F</td>
</tr>
<tr>
<td>VOC Content (%)</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Odor</td>
<td>Mild paraffinic.</td>
</tr>
<tr>
<td>Physical State</td>
<td>Liquid</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>No information available.</td>
</tr>
<tr>
<td>Boiling Point/ Boiling Range</td>
<td>36 °C / 97 °F</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>72.15</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>No information available.</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>2.48 @ 70°F (1 atm)</td>
</tr>
<tr>
<td>Flammability Limits in Air</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>7.8%</td>
</tr>
<tr>
<td>Lower</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

- **Stability**: Stable under recommended storage conditions.
- **Incompatible Products**: Oxidizing agents.
- **Conditions to Avoid**: Heat, flames and sparks.
- **Hazardous Decomposition Products**: None known.
- **Hazardous Polymerization**: Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

**Acute Toxicity**

- **LD50 Oral**: No information available.
- **LD50 Dermal**: No information available.
- **LC50 Inhalation**: 123,368 ppm/4 hr. (Rat)
- **Repeated Dose Toxicity**: No information available.

**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**: No information available.
Synergistic Materials
None known.

Target Organ Effects
Central nervous system (CNS). Eyes. Respiratory system. Skin.

12. ECOLOGICAL INFORMATION

Ecotoxicity
Toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

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

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

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentane</td>
<td>3.39</td>
</tr>
</tbody>
</table>

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.

14. TRANSPORT INFORMATION

**DOT**

<table>
<thead>
<tr>
<th>Proper shipping name</th>
<th>Pentanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>Subsidiary Class</td>
<td></td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN1265</td>
</tr>
<tr>
<td>Packing Group</td>
<td>I</td>
</tr>
<tr>
<td>Description</td>
<td>UN1265,Pentanes,3,PG I</td>
</tr>
<tr>
<td>Emergency Response Guide Number</td>
<td>128</td>
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</table>

**TDG**

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Pentanes, liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN1265</td>
</tr>
<tr>
<td>Packing Group</td>
<td>I</td>
</tr>
<tr>
<td>Description</td>
<td>UN1265,PENTANES, LIQUID,3,PG I</td>
</tr>
</tbody>
</table>

**ME**

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Pentanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN1265</td>
</tr>
</tbody>
</table>
Description
UN1265 Pentanes,3,I

Packing Group
I

IATA

UN-Number
UN1265

Proper Shipping Name
Pentanes

Hazard Class
3

Packing Group
I

ERG Code
3H

Description
UN1265,Pentanes,3,PG I

Maximum Quantity for Passenger
1 L

Maximum Quantity for Cargo Only
30 L

Limited Quantity
No information available.

IMDG/IMO

Proper Shipping Name
Pentanes, liquid

Hazard Class
3

UN-Number
UN1265

Packing Group
I

EmS No.
F-E, S-D

Description
UN1265, Pentanes, liquid,3,PG I, FP -40C

ADR

Proper Shipping Name
Pentanes, liquid

Hazard Class
3

UN-Number
UN1265

Packing Group
I

Classification Code
F1

Description
UN1265 Pentanes, liquid,3,I

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:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances</th>
<th>U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances</th>
<th>U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentane</td>
<td></td>
<td>10000 lbs</td>
<td></td>
</tr>
</tbody>
</table>

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

<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>Pentane</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

International Regulations

Mexico - Grade
Severe risk, Grade 4

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Carcinogen Status</th>
<th>Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentane</td>
<td></td>
<td>Mexico: TWA 600 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: TWA 1800 mg/ m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: STEL 760 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: STEL 2250 mg/ m³</td>
</tr>
</tbody>
</table>

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
B2  Flammable liquid
A  Compressed gases
Prepared By: Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issuing Date: 05-Mar-2010
Revision Date: 27-Sep-2013
Revision Number: 2
Revision Note: Not applicable.

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Stability</th>
<th>Physical and Chemical Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0</td>
<td>Personal Protection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Physical Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

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
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End of Safety Data Sheet