1. PRODUCT AND COMPANY IDENTIFICATION

<table>
<thead>
<tr>
<th></th>
<th>ETHYL CHLORIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Name</td>
<td>ETHYL CHLORIDE</td>
</tr>
<tr>
<td>Product Code(s)</td>
<td>G-32</td>
</tr>
<tr>
<td>UN-No</td>
<td>UN1037</td>
</tr>
<tr>
<td>Recommended Use</td>
<td>Compressed gas.</td>
</tr>
<tr>
<td>Synonyms</td>
<td>Chloroethane; Monochloroethane; Chlorene; Chloroethyl</td>
</tr>
<tr>
<td>* May include subsidiaries or affiliate companies/divisions.</td>
<td></td>
</tr>
<tr>
<td>For additional product information contact your local customer service.</td>
<td></td>
</tr>
<tr>
<td>Chemical Emergency Phone Number</td>
<td>Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US</td>
</tr>
</tbody>
</table>
2. HAZARDS IDENTIFICATION

DANGER!

Emergency Overview

Extremely flammable
May form explosive mixtures with air
May cause skin and eye irritation
Direct contact with skin causes numbness.
Causes central nervous system depression
Contact with product may cause frostbite
May cause sensitization by skin contact
May adversely affect liver and kidney.
Contents under pressure
Keep at temperatures below 52°C / 125°F

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Physical State</th>
<th>Odor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorless</td>
<td>Compressed gas.</td>
<td>Ether</td>
</tr>
</tbody>
</table>

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. Eye contact. Skin contact.

Acute Toxicity

Inhalation
May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination.

Eyes
This product is a gas at room temperature. Contact with liquid may cause frostbite. May cause irritation.

Skin
This product is a gas at room temperature. Contact with liquid may cause frostbite. May cause irritation. Direct contact with skin causes numbness. May cause sensitization by skin contact.

Skin Absorption Hazard
No known hazard in contact with skin.

Ingestion
Not an expected route of exposure.

Chronic Effects
May cause adverse liver and kidney effects.

Aggravated Medical Conditions

Environmental Hazard
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>Ethyl chloride</td>
<td>75-00-3</td>
<td>&gt;99</td>
<td>C₂H₅Cl</td>
</tr>
</tbody>
</table>
4. FIRST AID MEASURES

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

Notes to Physician
Treat symptomatically. 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.

5. FIRE-FIGHTING MEASURES

Flammable Properties
Extremely flammable.

Suitable Extinguishing Media
Dry chemical or CO2. Water spray or fog. DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Hazardous Combustion Products
Hydrogen chloride. Phosgene.

Explosion Data
None

Sensitivity to Mechanical Impact
Yes

Specific Hazards Arising from the Chemical
Vapors 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.

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. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn.

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. 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. "NO SMOKING" signs should be posted in storage and use areas. Remove all sources of ignition. 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.

Gasketing materials should be Teflon®, Buna®, or Buna N®. Do not use PVC, polypropylene, Hypalon®, natural or butyl rubber.

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

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
Appropriate protective and chemical resistant gloves, clothing and splash protection, or fully encapsulating vapor protective clothing to prevent exposure. For materials of construction, consult protective clothing manufacturer's specifications. (Teflon®, or Kel-F® are generally effective. Do not use PVC, natural rubber, butyl rubber or polypropylene). Wear cold insulating gloves when handling liquid. Safety shoes.

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
When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Name</td>
<td>Ethyl chloride</td>
</tr>
<tr>
<td>Acronym</td>
<td>75-00-3</td>
</tr>
<tr>
<td>ACGIH TLV TWA ppm</td>
<td>100</td>
</tr>
<tr>
<td>OSHA PEL TWA ppm</td>
<td>1000</td>
</tr>
<tr>
<td>NIOSH IDLH ppm</td>
<td>3800</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>64.51</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>Colorless</td>
</tr>
<tr>
<td>Flash Point</td>
<td>-58°F / -50°C</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>19°C / -218°F</td>
</tr>
<tr>
<td>Water Solubility</td>
<td>Slightly soluble</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>20.3 PSIA @ 70°F</td>
</tr>
<tr>
<td>VOC Content (%)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Odor</td>
<td>Ether.</td>
</tr>
<tr>
<td>Physical State</td>
<td>Compressed gas</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>519°C / 966°F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>12.2°C / 54°F</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>64.51</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>No information available</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>2.22 (air = 1)</td>
</tr>
<tr>
<td>Flammability Limits in Air</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>15.4%</td>
</tr>
<tr>
<td>Lower</td>
<td>3.8%</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability
Stable.

Incompatible Products
Oxidizing agents.

Conditions to Avoid
Heat, flames and sparks. Protect from water.
Hazardous Decomposition Products
Hydrogen chloride. Phosgene.

Hazardous Polymerization
Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
LD50 Oral: No information available.
LD50 Dermal: No information available.
LC50 Inhalation: 57,600 ppm/2 hr. (Rat)
Inhalation Effects begin in humans at approximately 13,000 ppm. Higher concentrations may produce anesthesia. No overt signs of toxicity were seen in rats or mice exposed for a single 4-hr. period to 19,000 ppm. A single 6 hour exposure has caused liver effects in rats at 4000 ppm but not at 1600 ppm.
Repeated Dose Toxicity No information available.

Chronic Toxicity
Chronic Toxicity May cause adverse liver and kidney effects.
Carcinogenicity Ethyl chloride produced clear evidence of uterine cancer in mice and malignant skin neoplasms in rats both chronically exposed at 15,000 ppm. Toxicokinetics studies indicate that the female mouse may be unique in its response to ethyl chloride.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl chloride</td>
<td>A3</td>
<td>Group 3</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Irritation Non-irritating to the skin. Non-irritating to the eye.
Sensitization May cause sensitization by skin contact.
Mutagenic Effects Mutations seen on S. Typhmurium screening test with and without metabolic activation; however was negative in the cell transformation assay and mouse micronuclei assay.
Reproductive Toxicity No information available.
Developmental Toxicity Concentrations of 500-5000 ppm administered during organogenesis caused no evidence of teratogenicity in mice. The only evidence of fetotoxicity was the presence of a few small unossified areas at 5000 ppm.
Synergistic Materials None known.
Target Organ Effects None known.

12. ECOLOGICAL INFORMATION

Ecotoxicity
Harmful 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>Ethyl chloride</td>
<td>EC50: 39 mg/L Desmodesmus subspicatus 72 h</td>
<td></td>
<td></td>
<td>EC50: 58 mg/L Daphnia magna 48 h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl chloride</td>
<td>1.52</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. This material, as supplied, is a hazardous waste according to federal regulations (40 CFR 261).

14. TRANSPORT INFORMATION

DOT

Proper Shipping Name: Ethyl chloride
Hazard Class: 2.1
Subsidiary Class: None
UN-No: UN1037
Description: UN1037, Ethyl chloride, 2.1
Emergency Response Guide Number: 115

TDG

Proper Shipping Name: Ethyl chloride
Hazard Class: 2.1
UN-No: UN1037
Description: UN1037, ETHYL CHLORIDE, 2.1

MEX

Proper Shipping Name: Ethyl chloride
Hazard Class: 2.1
UN-No: UN1037
Description: UN1037, Ethyl chloride, 2.1

IATA

UN-No: UN1037
Proper Shipping Name: Ethyl chloride
Hazard Class: 2.1
ERG Code: 10A
Description: UN1037, Ethyl chloride, 2.1
Maximum Quantity for Passenger: Forbidden
Maximum Quantity for Cargo Only: 150 kg
Limited Quantity: No information available.
Proper Shipping Name: Ethyl chloride
Hazard Class: 2.1
UN-No: UN1037
EmS No.: F-D, S-U
Description: UN1037, Ethyl chloride, 2.1, FP -50C

ADR
Proper Shipping Name: Ethyl chloride
Hazard Class: 2.1
UN-No: UN1037
Classification Code: 2F
Description: UN1037, Ethyl chloride, 2.1

15. REGULATORY INFORMATION

International Inventories

| Legend |
| 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 contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl chloride</td>
<td>75-00-3</td>
<td>1.0</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazard Categories

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

Clean Water Act
This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42):

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
<th>CWA - Hazardous Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl chloride</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

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:
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>Ethyl chloride</td>
<td>75-00-3</td>
<td>Present</td>
<td>Group IV</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>Ethyl chloride</td>
<td>100 lb</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>Ethyl chloride</td>
<td>75-00-3</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>Ethyl chloride</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</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>Ethyl chloride</td>
<td>A3</td>
<td>Mexico: TWA= 2600 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: TWA= 1000 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: STEL= 1250 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mexico: STEL= 3250 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
A Compressed gases
B1 Flammable gas
Legend
NPRI - National Pollutant Release Inventory

16. OTHER INFORMATION

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

Issuing Date
05-Mar-2010

Revision Date
01-Sep-2010

Revision Number
1

Revision Note
(M)SDS sections updated. 1.

<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>2</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Physical Hazard</th>
<th>Personal Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2*</td>
<td>4</td>
<td>1</td>
<td></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
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