

Safety Data Sheet

**Section 1: Identification of the Substance/Mixture and of the Company/Undertaking****1.1 Product identifier**

Product Name	• Octafluorotetrahydrofuran
Synonyms	• Furan, Octafluorotetrahydro-; Perfluorotetrahydrofuran
CAS Number	• 773-14-8
Product Code	• 20143

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified use(s)	• Semiconductor Uses
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1.3 Details of the supplier of the safety data sheet

Manufacturer	• Air Liquide 2700 Post Oak Blvd. Houston, TX 77056 United States www.us.airliquide.com sds@airliquide.com
Telephone (Technical)	• 713-896-2896
Telephone (Technical)	• 800-819-1704

1.4 Emergency telephone number

Manufacturer	• 800-424-9300 - CHEMTREC
Manufacturer	• +1 703-527-3887 - Outside United States

Section 2: Hazards Identification**EU/EEC**

According to Regulation (EC) No 1272/2008 (CLP)/REACH 1907/2006 [amended by 453/2010]

According to EU Directive 67/548/EEC (DSD) or 1999/45/EC (DPD)

2.1 Classification of the substance or mixture

CLP	• Liquefied Gas - H280
DSD/DPD	• Not classified - Classification criteria not met

2.2 Label Elements

CLP

WARNING**Hazard statements** • H280 - Contains gas under pressure; may explode if heated

Precautionary statements

Storage/Disposal • P403 - Store in a well-ventilated place.

DSD/DPD

Risk phrases • No label element(s) required

2.3 Other Hazards

CLP

- Contact with gas or liquefied gas will cause burns, severe injury and/or frostbite. This material is a simple asphyxiant. May displace or reduce oxygen available for breathing especially in confined spaces. According to Regulation (EC) No. 1272/2008 (CLP) this material is considered hazardous.

DSD/DPD

- Contact with gas or liquefied gas will cause burns, severe injury and/or frostbite. This material is a simple asphyxiant. May displace or reduce oxygen available for breathing especially in confined spaces. This product is considered dangerous according to the European Directive 67/548/EEC.

United States (US)

According to OSHA 29 CFR 1910.1200 HCS

2.1 Classification of the substance or mixture

OSHA HCS 2012

- Liquefied Gas - H280
Simple Asphyxiant
Hazards Not Otherwise Classified - Health Hazard - Frostbite

2.2 Label elements

OSHA HCS 2012

WARNING



Hazard statements • Contains gas under pressure; may explode if heated - H280
May displace oxygen and cause rapid suffocation.

Precautionary statements

Storage/Disposal • Store in a well-ventilated place. - P403

2.3 Other hazards

OSHA HCS 2012

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

Canada

According to WHMIS

2.1 Classification of the substance or mixture

WHMIS

- Compressed Gas - A

2.2 Label elements

WHMIS

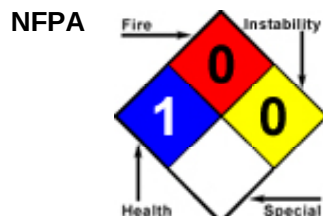


- Compressed Gas - A

2.3 Other hazards

WHMIS

- Contact with gas or liquefied gas will cause burns, severe injury and/or frostbite. This material is a simple asphyxiant. May displace or reduce oxygen available for breathing especially in confined spaces.
In Canada, the product mentioned above is considered hazardous under the Workplace Hazardous Materials Information System (WHMIS).

2.4 Other information**Section 3 - Composition/Information on Ingredients****3.1 Substances**

Composition				
Chemical Name	Identifiers	%	LD50/LC50	Classifications According to Regulation/Directive
Octafluorotetrahydrofuran	CAS:773-14-8	100%	NDA	EU DSD/DPD: Not Classified EU CLP: Self Classified - Press. Gas - Liq., H280 OSHA HCS 2012: Press. Gas - Liq.; Simp. Asphyx.; HNOC - Health Hazards - Frostbite

3.2 Mixtures

- Material does not meet the criteria of a mixture in accordance with Regulation (EC) No 1272/2008.

Section 4 - First Aid Measures**4.1 Description of first aid measures****Inhalation**

- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Administer oxygen if breathing is difficult. Give artificial respiration if victim is not breathing. If signs/symptoms continue, get medical attention.

Skin

- If frostbite has occurred, seek medical attention immediately; do NOT rub the affected area(s) or flush them with water. In order to prevent further tissue damage, do NOT attempt to remove frozen clothing from frostbitten areas. If frostbite has not occurred, immediately and thoroughly wash contaminated skin with soap and water.

Eye

- If eye tissue is frozen, seek medical attention immediately; if tissue is not frozen, immediately and thoroughly flush the eyes with large amounts of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. If irritation, pain, swelling, lacrimation or photophobia persist, get medical attention as soon as possible.

Ingestion

- If frostbite has occurred, seek medical attention immediately; do NOT rub the affected area(s) or flush them with water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting.

4.2 Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to Physician

- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

4.4 Other information

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO GASES WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn. Victim(s) who experience any adverse effect after over-exposure to this gas mixture must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

Section 5 - Firefighting Measures

5.1 Extinguishing media

- Suitable Extinguishing Media**
- Use extinguishing agent suitable for type of surrounding fire.
SMALL FIRES: Dry chemical or CO₂.
LARGE FIRES: Water spray or fog.

- Unsuitable Extinguishing Media**
- No data available

5.2 Special hazards arising from the substance or mixture

- Unusual Fire and Explosion Hazards**
- Containers may explode when heated. Ruptured cylinders may rocket.

- Hazardous Combustion Products**
- No data available

5.3 Advice for firefighters

- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.
Always wear thermal protective clothing when handling refrigerated/cryogenic liquids. Wear positive pressure self-contained breathing apparatus (SCBA).
Move containers from fire area if you can do it without risk.
FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.
FIRE INVOLVING TANKS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
FIRE INVOLVING TANKS: Cool containers with flooding quantities of water until well after fire is out.
FIRE INVOLVING TANKS: Do not direct water at source of leak or safety devices; icing may occur.
FIRE INVOLVING TANKS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
FIRE INVOLVING TANKS: ALWAYS stay away from tanks engulfed in fire.

Section 6 - Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

- Personal Precautions**
- Ventilate the area before entry. Wear appropriate personal protective equipment, avoid direct contact. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Do not walk through spilled material.
- Emergency Procedures**
- Stop leak if you can do it without risk. Keep unauthorized personnel away. Keep out of low areas. Stay upwind. Do not direct water at spill or source of leak. LARGE SPILL: Consider initial downwind evacuation for at least 500 meters (1/3 mile)

6.2 Environmental precautions

- No special environmental precautions necessary.

6.3 Methods and material for containment and cleaning up

Containment/Clean-up Measures

- Stop leak if you can do it without risk.
Do not direct water at spill or source of leak.
Use water spray to reduce vapors; do not put water directly on leak, spill area or inside container.
If possible, turn leaking containers so that gas escapes rather than liquid.
Isolate area until gas has dispersed.
Ventilate the area.
Allow substance to evaporate.
CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

6.4 Reference to other sections

- Refer to Section 8 - Exposure Controls/Personal Protection and Section 13 - Disposal Considerations.

Section 7 - Handling and Storage

7.1 Precautions for safe handling

Handling

- Use only with adequate ventilation. Ventilate closed spaces before entering. Be aware of any signs of dizziness or fatigue, especially if work is done in a poorly ventilated area; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to olfactory fatigue or oxygen deficiency. Cylinders should be firmly secured to prevent falling or being knocked-over. Do not attempt to repair, adjust, or in any other way modify cylinders. If there is a malfunction or another type of operational problem, contact nearest distributor immediately. Empty containers retain product residue and can be hazardous. Do not cut, weld, puncture or incinerate container.

7.2 Conditions for safe storage, including any incompatibilities

Storage

- Store in a cool, dry, well-ventilated place. Protect cylinders against physical damage. Cylinders should be firmly secured to prevent falling or being knocked-over.

7.3 Specific end use(s)

- Refer to Section 1.2 - Relevant identified uses.

Section 8 - Exposure Controls/Personal Protection

8.1 Control parameters

Exposure Limits/Guidelines

- Currently there are no applicable exposure limits established for this material.

8.2 Exposure controls

Engineering Measures/Controls

- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Use explosion-proof - electrical, ventilating and/or lighting equipment.

Personal Protective Equipment

Respiratory

- In case of insufficient ventilation, wear suitable respiratory equipment.

Eye/Face

- Wear safety glasses.

Skin/Body

- Wear leather gloves when handling cylinders.

Environmental Exposure Controls

- Follow best practice for site management and disposal of waste. Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Section 9 - Physical and Chemical Properties

9.1 Information on Physical and Chemical Properties

Material Description			
Physical Form	Gas	Appearance/Description	Colorless, liquefied gas. Colorless, liquefied gas.
Color	Colorless	Odor	Data lacking
Odor Threshold	Data lacking		
General Properties			
Boiling Point	1 to 2 C(33.8 to 35.6 F)	Melting Point	Data lacking
Decomposition Temperature	Data lacking	pH	Data lacking
Specific Gravity/Relative Density	Data lacking	Water Solubility	Data lacking
Viscosity	Data lacking	Explosive Properties	Data lacking
Oxidizing Properties:	Data lacking		
Volatility			
Vapor Pressure	29 psia @ 20 C(68 F)	Vapor Density	Data lacking
Evaporation Rate	Data lacking		
Flammability			
Flash Point	Not relevant	UEL	Not relevant
LEL	Not relevant	Autoignition	Not relevant
Flammability (solid, gas)	Data lacking		
Environmental			
Octanol/Water Partition coefficient	Data lacking		

9.2 Other Information

- No additional physical and chemical parameters noted.

Section 10: Stability and Reactivity

10.1 Reactivity

- No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

- Stable under normal temperatures and pressures.

10.3 Possibility of hazardous reactions

- Hazardous polymerization will not occur.

10.4 Conditions to avoid

- Excess heat.

10.5 Incompatible materials

- Octafluorotetrahydrofuran is incompatible with oxidizers.

10.6 Hazardous decomposition products

- If heated to decomposition, this gas can decompose to form oxides of carbon and oxides of fluorine.

Section 11 - Toxicological Information

11.1 Information on toxicological effects

GHS Properties	Classification
Acute toxicity	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Aspiration Hazard	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Carcinogenicity	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Germ Cell Mutagenicity	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Skin corrosion/Irritation	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Skin sensitization	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
STOT-RE	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
STOT-SE	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Toxicity for Reproduction	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Respiratory sensitization	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Serious eye damage/Irritation	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met

Potential Health Effects

Inhalation

Acute (Immediate)

- This material is a simple asphyxiant. May displace or reduce oxygen available for breathing especially in confined spaces. If this material is released in a small, poorly ventilated area (i.e. an enclosed or confined space), an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The following effects associated with decreased levels of oxygen: increase in breathing and pulse rate, emotional upset, abnormal fatigue, nausea, vomiting, collapse, loss of consciousness, convulsive movements, respiratory collapse and death.

Chronic (Delayed)

- No data available

Skin

Acute (Immediate)

- Contact with gas or liquefied gas will cause burns, severe injury and/or frostbite.

Chronic (Delayed)

- No data available

Eye

Acute (Immediate)

- Contact with gas or liquefied gas will cause burns, severe injury and/or frostbite.

Chronic (Delayed)

- No data available

Ingestion

Acute (Immediate)

- Ingestion can cause burns similar to frostbite.

Chronic (Delayed)

- No data available

Section 12 - Ecological Information

12.1 Toxicity

- Material data lacking.

12.2 Persistence and degradability

- Material data lacking.

12.3 Bioaccumulative potential

- Material data lacking.

12.4 Mobility in Soil

- Material data lacking.

12.5 Results of PBT and vPvB assessment

- PBT and vPvB assessment has not been conducted for this material.

12.6 Other adverse effects

- No studies have been found.

Section 13 - Disposal Considerations

13.1 Waste treatment methods

Product waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

	14.1 UN number	14.2 UN proper shipping name	14.3 Transport hazard class(es)	14.4 Packing group	14.5 Environmental hazards
DOT	UN3163	Liqueified Gas, N.O.S. (Octafluorotetrahydrofuran)	2.2	NDA	NDA
TDG	UN3163	LIQUEIFIED GAS, N.O.S. (Octafluorotetrahydrofuran)	2.2	NDA	NDA
IMO/IMDG	UN3163	LIQUEIFIED GAS N.O.S. (Octafluorotetrahydrofuran)	2.2	NDA	NDA
IATA/ICAO	UN3163	Liqueified Gas, N.O.S. (Octafluorotetrahydrofuran)	2.2	NDA	NDA

14.6 Special precautions for user

- Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

- Not relevant.

Section 15 - Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications • Acute, Pressure(Sudden Release of)

State Right To Know				
Component	CAS	MA	NJ	PA
Octafluorotetrahydrofuran	773-14-8	No	No	No

Inventory						
Component	CAS	Canada DSL	Canada NDSL	China	EU EINECS	EU ELNICS
Octafluorotetrahydrofuran	773-14-8	No	Yes	Yes	No	No

Inventory (Con't.)		
Component	CAS	TSCA
Octafluorotetrahydrofuran	773-14-8	Yes

Canada

Labor

Canada - WHMIS - Classifications of Substances

• Octafluorotetrahydrofuran 773-14-8 Not Listed

Canada - WHMIS - Ingredient Disclosure List

• Octafluorotetrahydrofuran 773-14-8 Not Listed

Environment

Canada - CEPA - Priority Substances List

• Octafluorotetrahydrofuran 773-14-8 Not Listed

China

Environment

China - Ozone Depleting Substances - First Schedule

• Octafluorotetrahydrofuran 773-14-8 Not Listed

China - Ozone Depleting Substances - Second Schedule

• Octafluorotetrahydrofuran 773-14-8 Not Listed

China - Ozone Depleting Substances - Third Schedule

• Octafluorotetrahydrofuran 773-14-8 Not Listed

Other

China - Annex I & II - Controlled Chemicals Lists

• Octafluorotetrahydrofuran 773-14-8 Not Listed

China - Dangerous Goods List

• Octafluorotetrahydrofuran 773-14-8 Not Listed

China - Export Control List - Part I Chemicals

• Octafluorotetrahydrofuran 773-14-8 Not Listed

Europe

Other

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Classification

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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EU - CLP (1272/2008) - Annex VI - Table 3.2 - Concentration Limits

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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EU - CLP (1272/2008) - Annex VI - Table 3.2 - Labelling

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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EU - CLP (1272/2008) - Annex VI - Table 3.2 - Notes - Substances and Preparations

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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EU - CLP (1272/2008) - Annex VI - Table 3.2 - Safety Phrases

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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Germany

Environment

Germany - TA Luft - Types and Classes

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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Germany - Water Classification (VwVwS) - Annex 1

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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Germany - Water Classification (VwVwS) - Annex 2 - Water Hazard Classes

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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Germany - Water Classification (VwVwS) - Annex 3

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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Other

Germany - Specifically Regulated Chemicals in TRGS

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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Portugal

Other

Portugal - Prohibited Substances

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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United Kingdom

Environment

United Kingdom - Pollution Inventory - Schedule 1 - Thresholds for Releases to Air

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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Other

United Kingdom - Workplace Exposure Limits (WELs) - Substances in Review

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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United Kingdom - List of Dangerous Substances in Water

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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United States

Labor

U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - OSHA - Specifically Regulated Chemicals

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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Environment

U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - California - Proposition 65 - Developmental Toxicity

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - California - Proposition 65 - Reproductive Toxicity - Female

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - California - Proposition 65 - Reproductive Toxicity - Male

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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United States - Pennsylvania

Labor

U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List

• Octafluorotetrahydrofuran	773-14-8	Not Listed
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U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances

- Octafluorotetrahydrofuran

773-14-8

Not Listed

15.2 Chemical Safety Assessment

- No Chemical Safety Assessment has been carried out.

Section 16 - Other Information

Last Revision Date

- 08/September/2014

Preparation Date

- 08/September/2014

Disclaimer/Statement of Liability

- To the best of Air Liquide's knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this gas mixture is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.

Key to abbreviationsNDA = No Data Available
