



FLUORINE (<0.46%) In ARGON, HELIUM, KRYPTON, NEON, NITROGEN or XENON

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name FLUORINE (<0.46%) In ARGON, HELIUM, KRYPTON, NEON, NITROGEN or XENON

Other means of identification

Safety data sheet number LIND-M0080
UN/ID no. UN1956

Recommended use of the chemical and restrictions on use

Recommended Use Industrial and professional use. Excimer laser gas.
Uses advised against Consumer use

Details of the supplier of the safety data sheet

Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC
200 Somerset Corporate Blvd, Suite 7000
Bridgewater, NJ 08807
Phone: 908-464-8100
www.lindeus.com

Linde Gas Puerto Rico, Inc.
Road 869, Km 1.8
Barrio Palmas, Catano, PR 00962
Phone: 787-641-7445
www.pr.lindegas.com

Linde Canada Limited
5860 Chedworth Way
Mississauga, Ontario L5R 0A2
Phone: 905-501-2500/905-501-1700
www.lindecanada.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number

Company Phone Number +1 800-232-4726 (Linde National Operations Center, US) 905-501-0802 (Canada)
CHEMTREC: 1-800-424-9300 (North America) +1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

Gases under pressure	Compressed gas
Simple asphyxiants	Yes

Label elements



Signal word

Warning

Hazard Statements

Contains gas under pressure; may explode if heated

May displace oxygen and cause rapid suffocation

Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood

Use and store only outdoors or in a well ventilated place

Use a backflow preventive device in piping

Use only with equipment rated for cylinder pressure

Close valve after each use and when empty

Precautionary Statements - Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical attention/advice.

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Xenon	7440-63-3	0-99	Xe
Nitrogen	7727-37-9	0-99	N ₂

Neon	7440-01-9	0-99	Ne
Krypton	7439-90-9	0-99	Kr
Helium	7440-59-7	0-99	He
Argon	7440-37-1	0-99	Ar
Fluorine	7782-41-4	<1	F ₂

Composition covers range of mixtures that fall within the same hazard classifications.

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance.
Inhalation	Remove to fresh air and keep comfortable for breathing. If breathing is difficult, give oxygen. If breathing has stopped, give artificial respiration. Get medical attention immediately.
Skin contact	None under normal use. Get medical attention if symptoms occur.
Eye contact	None under normal use. Get medical attention if symptoms occur.
Ingestion	Not an expected route of exposure.
Self-protection of the first aider	RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Most important symptoms and effects, both acute and delayed

Symptoms	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.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Specific extinguishing methods

Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical

Non-flammable gas. Cylinders may rupture under extreme heat.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Monitor oxygen level. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

Environmental precautions

Environmental precautions Prevent spreading of vapors through sewers, ventilation systems and confined areas.

Methods and material for containment and cleaning up

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

Precautions for safe handling

Advice on safe handling Handle only in areas with extensive venting capabilities, preferably a gas handling cabinet. Consider installation of fluorine gas detection equipment in handling areas. Any detection of fluorine odor should trigger immediate response and corrective action. Gas handling equipment must be cleaned for oxygen service. Equipment must be dry, purged with dry nitrogen or other inert gas and meticulously leak checked before connecting cylinder to system. Open valve slowly. Prior to disconnecting cylinder from system, manifold and pigtails must be purged with inert gas.

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. Never attempt to lift a cylinder by its valve protection cap. 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. Use only with adequate ventilation. Use a backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Ensure the complete gas system has been checked for leaks before use.

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.

Only experienced and properly instructed persons should handle gases under pressure. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

For additional recommendations consult Compressed Gas Association's (CGA) Safety Bulletin SB-2, Oxygen-Deficient Atmospheres.

Conditions for safe storage, including any incompatibilities

Storage Conditions 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. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. 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. Stored containers should be periodically checked for general condition and leakage.

Incompatible materials Water. Moisture.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitrogen 7727-37-9	: See Appendix F: Minimal Oxygen Content	None	None
Neon 7440-01-9	: See Appendix F: Minimal Oxygen Content	None	None
Helium 7440-59-7	: See Appendix F: Minimal Oxygen Content	None	None
Argon 7440-37-1	: See Appendix F: Minimal Oxygen Content	None	None
Fluorine 7782-41-4	STEL: 2 ppm TWA: 1 ppm	TWA: 0.1 ppm TWA: 0.2 mg/m ³ TWA: 2.5 mg/m ³ F TWA: 2.5 mg/m ³ dust (vacated) TWA: 0.1 ppm (vacated) TWA: 0.2 mg/m ³ (vacated) TWA: 2.5 mg/m ³	IDLH: 25 ppm TWA: 0.1 ppm TWA: 0.2 mg/m ³

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health

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

Appropriate engineering controls

Engineering Controls Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Oxygen detectors should be used when asphyxiating gases may be released. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles).

Skin and body protection Work gloves and safety shoes are recommended when handling cylinders.

Respiratory protection Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%). If exposure limits are exceeded or irritation is experienced, NIOSH 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.

General Hygiene Considerations Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Compressed gas
Appearance	Colorless.
Odor	Odorless to pungent.
Odor threshold	0.02 - 0.126 ppm (Fluorine)
pH	No data available
Melting point	No data available
Evaporation rate	Not applicable
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable

Flash point	Not applicable.
Autoignition temperature	No data available
Decomposition temperature	No data available
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m ³ @20°C	Critical Temperature
Krypton	83.79	-153.4 °C	Above critical temperature	2.89	3.479	-228.8 °C
Neon	20.17	-246.1 °C	Above critical temperature	0.694	0.922	-228.8 °C
Argon	39.95	-185.9 °C	Above critical temperature	1.38	1.65	-122.3 °C
Helium	4.00	-268.9 °C	Above critical temperature	0.138	0.165	-267.9 °C
Xenon	131.29	-108.1 °C	Above critical temperature	4.55	5.472	16.6 °C
Nitrogen	28.01	-196 °C	Above critical temperature	0.97	1.153	-146.9 °C
Fluorine	38	-188.2 °C	Above critical temperature	1.3	1.57	-128.8 °C

10. STABILITY AND REACTIVITY

Reactivity

Not reactive under normal conditions

Chemical stability

Stable under normal conditions.

Explosion data

Sensitivity to Mechanical Impact None.

Sensitivity to Static Discharge None.

Possibility of Hazardous Reactions

None under normal processing.

Conditions to avoid

None under recommended storage and handling conditions (see Section 7).

Incompatible materials

Water. Moisture.

Hazardous Decomposition Products

None known.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation Pungent odor of fluorine provides warning of release. Mice exposed to sublethal concentrations

(LC50: 150 ppm/1 hr.) of fluorine experienced pulmonary irritation and delayed focal necrosis of the liver and kidney. May cause irritation of respiratory tract. Product is a simple asphyxiant.

Skin contact No data available.
 Eye contact May cause irritation.
 Ingestion Not an expected route of exposure.

Information on toxicological effects

Symptoms No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Not classified.
 Sensitization Not classified.
 Germ cell mutagenicity Not classified.
 Carcinogenicity This product does not contain any carcinogens or potential carcinogens listed by OSHA, IARC or NTP.
 Reproductive toxicity Not classified.
 STOT - single exposure Not classified.
 STOT - repeated exposure Not classified.
 Chronic toxicity Extended low level systemic absorption of fluorides may cause fluorosis, an abnormal calcification pattern of the skeletal system.
 Target Organ Effects Respiratory system, Skeletal system, Eyes, Skin.
 Aspiration hazard Not applicable.

Numerical measures of toxicity

Component Level Information:

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Fluorine 7782-41-4	-	-	= 185 ppm (Rat) 1 h	185 ppm (Rat) 1hr

Product Information

Oral LD50 No information available.
 Dermal LD50 No information available.
 Inhalation LC50 No information available

The following values are calculated based on chapter 3.1 of the GHS document .

ATEmix (inhalation-gas) >20,000 ppm

12. ECOLOGICAL INFORMATION

Ecotoxicity

No known acute aquatic toxicity.

Persistence and degradability

Not applicable.

Bioaccumulation

No information available

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Disposal of wastes 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

Note: The technical names of components listed as part of shipping description will depend on specific mixture composition and/or balance gas.

DOT

UN/ID no.	UN1956
Proper shipping name	Compressed gas, n.o.s.
Hazard Class	2.2
Description	UN1956, Compressed gas, n.o.s.(Fluorine, XXXXX), 2.2
Emergency Response Guide Number	126

TDG

UN/ID no.	UN1956
Proper shipping name	Compressed gas, n.o.s.
Hazard Class	2.2
Description	UN1956, Compressed gas, n.o.s.(Fluorine, XXXXX), 2.2

MEX

UN/ID no.	UN1956
Proper shipping name	Compressed gas, n.o.s.
Hazard Class	2.2
Description	UN1956, Compressed gas, n.o.s.(Fluorine, XXXXX), 2.2

IATA

UN/ID no.	UN1956
Proper shipping name	Compressed gas, n.o.s.
Hazard Class	2.2
ERG Code	2L
Description	UN1956, Compressed gas, n.o.s.(Fluorine, XXXXX), 2.2

IMDG

UN/ID no.	UN1956
Proper shipping name	Compressed gas, n.o.s.
Hazard Class	2.2
EmS-No.	F-C, S-V
Special Provisions	274

ADR

UN/ID no.	UN1956
Proper shipping name	Compressed gas, n.o.s.
Hazard Class	2.2
Classification code	1A
Tunnel restriction code	(E)
Special Provisions	274, 655
Description	UN1956, Compressed gas, n.o.s.(Fluorine, XXXXX), 2.2, (E)

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL/NDSL	Complies
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 Chemical Substances/European List of Notified Chemical Substances

US 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	No
Chronic Health Hazard	No
Fire Hazard	No
Sudden release of pressure hazard	Yes
Reactive Hazard	No

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302).

Chemical Name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Fluorine 7782-41-4	10 lb	10 lb	10 lb 4.54 kg

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.

CWA (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
Fluorine	1000 lb		1000 lb

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Neon 7440-01-9	X	X	X
Argon 7440-37-1	X	X	X
Helium 7440-59-7	X	X	X

Xenon 7440-63-3	X	-	-
Nitrogen 7727-37-9	X	X	X
Fluorine 7782-41-4	X	X	X

Chemical Name	Carcinogenicity	Exposure Limits
Fluorine		Mexico: TWA 1 ppm Mexico: TWA 2 mg/m ³ Mexico: TWA 2.5 mg/m ³ Mexico: STEL 2 ppm Mexico: STEL 4 mg/m ³

Chemical Name	NPRI
Fluorine	X

Legend
Canada NPRI - National Pollutant Release Inventory

16. OTHER INFORMATION

NFPA Health hazards 0 Flammability 0 Instability 0 Physical and Chemical Properties Simple asphyxiant

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.

Issue Date 11-Mar-2015
Revision Date 13-Jul-2016
Revision Note SDS sections updated; 1

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