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

Safety Data Sheet

1. IDENTIFICATION

Product identifier

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

Other means of identification

Safety data sheet number	LIND-CM00206
UN / ID no.	UN1956
Trade name	TUIMIX-CTMN-ARFV2.0, TUIMIX-CTMD-ARFV2.0, TUIMIX CTXX-ARFV3.0, TUIMIX-CTFTS-ARFV2.2, TUIMIX-CTMN-KRFV2.0, TUIMIX-CTFTS-KRFV2.1, TUIMIX-CTFTS-F2V2.1, PHOTOSCRIBE TUIMIXARFV3.0, TUIMIX F2 LASER MIXTURE

Recommended use of the chemical and restrictions on use

Recommended 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) +1 905-501-0802 (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
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	<0.46	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 conditions. Get medical attention if symptoms occur.

Eye contact — None under normal use conditions. 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. May cause irritation to respiratory tract, eyes and skin.

Indication of any immediate medical attention and special treatment needed

Note to physicians — Treat symptomatically.

5. FIRE-FIGHTING MEASURES

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

Unsuitable extinguishing media — None.

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. Never attempt to lift a cylinder by its valve protection cap. When moving cylinders, even for short distance, use a cart designed to transport cylinders. 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 segregrated. 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
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: 2.5 mg / m^3 F	TWA: 0.1 ppm TWA: 0.2 mg / m^3 TWA: 2.5 mg / m^3 F (vacated) TWA: 0.1 ppm (vacated) TWA: 0.2 mg / m^3 (vacated) TWA: 2.5 mg / m^3	IDLH: 25 ppm IDLH: 250 mg / m^3 F 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 — Provide general ventilation, local exhaust ventilation, process enclosure or other engineering controls to maintain airborne levels below recommended exposure limits and maintain oxygen levels 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

Product Information	
Physical state	Gas
Appearance	Colorless.
Odor	Odorless to pungent.
Odor threshold	0.02 - 0.126 ppm (Fluorine)
pH	Not applicable
Melting / freezing point	Not applicable
Evaporation rate	Not applicable
Flammability (solid, gas)	Non-flammable gas
Lower flammability limit:	Not applicable

Upper flammability limit:	Not applicable
Flash point	Not applicable.
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	No data available
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point / range	Vapor Pressure	Vapor density (air =1)	Gas Density kg / m³@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	0.835	-228.8 °C
ARGON	39.94	-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
FLUORINE	37.99	-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	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.

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	-

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

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, XXX), 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, XXX), 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, XXX), 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
Description	UN 1956, Compressed gas, n.o.s.(Fluorine, XXX), 2.2

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 / NDSL - 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

Should this product meet EPCRA 311 / 312 reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

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	RQ 10 lb final RQ RQ 4.54 kg final RQ

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
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

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	06-Sep-2018
Revision Date	06-Sep-2018
Revision Note	Initial Release

LIND-CM00206
F2 <0.46% / Inert

General Disclaimer

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End of Safety Data Sheet