Advanced Specialty Gases
An Iwatani Company

Safety Data Sheet

UN1954 -1,1,1,2-Tetrafluoroethane (R-416A)

www.advancedspecialtygases.com

Section 1: Product and Company Identification

Advanced Specialty Gases
135 Catron Dr. Reno, NV 89512
775-356-5500

IN CASE OF EMERGENCY CALL CHEMTREC: 1-800-424-9300

Product Code: UN1954 -1,1,1,2-Tetrafluoroethane (R-416A)
Synonyms:
Recommended Use:
Usage Restrictions:

Section 2: Hazards Identification

Danger

Hazard Classification:
Flammable (Category 1)
Gases Under Pressure

Hazard Statements:
Contains gas under pressure; may explode if heated
Extremely flammable gas

Precautionary Statements
Prevention:
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Response:
Eliminate all ignition sources if safe to do so.
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

Storage:
Protect from sunlight.
Store in well-ventilated place.

Section 3: Composition/Information on Ingredients

	CAS #	Concentration
1,1,1,2-Tetrafluoroethane	811-97-2	59%
R-124	2837-89-0	39.5%
Butane	106-97-8	1.5%

	Chemical Substance	Chemical Family	Trade Names
1,1,1,2-Tetrafluoroethane	1,1,1,2-Tetrafluoroethane	Halogenated, Aliphatic	Dymel, 134a, refrigerant gas R134a : Ethane,1,1,1,2-Tetrafluoro-; 1,2,2,2-Tetrafluoroethane
R-124	Chlorotetrafluoroethane	Refrigerants	HCFC-124, Ethane, 2-chloro-1,1,1,2-tetrafluoro-; CF3CHFCl; R 124 ,Forane (R124),1-chloro- 1,2,2,2-tetrafluoroethane
Butane	BUTANE	Hydrocarbons, Aliphatic, Saturated	N-BUTANE; LIQUIFIED PETROLEUM GAS; NORMAL BUTANE; BUTYL HYDRIDE; LPG; UN 1011; C4H10

Section 4: First Aid Measures

	Skin Contact	Eye Contact	Ingestion	Inhalation	Note to Physicians
1,1,1,2-Tetrafluoroethane	If it is safe to do so, remove victim to an uncontaminated area, and place them in a comfortable position to wait for medical attention. Immediately remove contaminated clothes and shoes. Cleanse the affected skin areas thoroughly with soap under running water for 15 minutes. Seek medical treatment. For exposure to liquid, immediately warm frostbite area with warm water less than 105F (41C).	Rinse the affected eye thoroughly for 10 minutes under running water. Seek immediate medical treatment.	Swallowing is not a likely route of exposure.	If it is safe to do so, remove victim to fresh air, and place them in a comfortable position to wait for medical attention. Administer oxygen or artificial respiration if breathing is difficult. Seek immediate medical treatment.	Do not administer adrenaline due to the sensitizing effect of fluorocarbons on the myocardium. Treatment of overexposure should be directed at the control of symptoms and the clinical condition. Exposure to fluorocarbon pyrolysis products should be considered in the diagnostic evaluation of occupationally related fever of short duration and unknown origin. Signs of exposure include tachycardia, hyperpnoea, and pharyngeal congestion; investigation may reveal pulmonary edema and leukocytosis.
R-124	Flush skin with water.	Flush eyes with large amounts of water for at least 15 minutes	Unlikely route of exposure	Move to fresh air	Not available
Butane	If frostbite or freezing occur, immediately flush with plenty of lukewarm water (105-115 F; 41-46 C). DO NOT USE HOT WATER. If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention.	Contact with liquid: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.	Not likely route of exposure.	If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.	For inhalation, consider oxygen.

Section 5: Fire Fighting Measures

	Suitable Extinguishing Media	Products of Combustion	Protection of Firefighters

	Suitable Extinguishing Media	Products of Combustion	Protection of Firefighters
1,1,1,2-Tetrafluoroethane	Non-flammable. Use extinguishing media suitable for surrounding fire.	Non-flammable	▪ Self-contained breathing apparatus and protective clothing may be required by rescue workers. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear. ▪ Non-flammable
R-124	Nonflammable. Use appropriate media for type of surrounding fire. This material will become combustible when mixed with air under pressure and exposed to strong ignition sources.		▪ Wear self-contained, NIOSH-approved breathing apparatus
Butane	Carbon dioxide, regular dry chemical Large fires: Flood with fine water spray.	Carbon monoxide, carbon dioxide, water and toxic and irritating fumes.	▪ Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. ▪ Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Section 6: Accidental Release Measures

	Personal Precautions	Environmental Precautions	Methods for Containment
1,1,1,2-Tetrafluoroethane	Asphyxiant. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus and protective clothing where needed. Shut off leak if without risk. Ventilate area of leak or move cylinder to a well-ventilated area. Before reentering area, especially confined spaces, check for sufficient oxygen with an appropriate device. Remove all sources of ignition. Soak up small spills with absorbent material. Contain large spills with a dike; pump product into recovery drums	Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.	None available
R-124	Always wear recommended personal protective equipment. Evacuate area.	Not available.	Stop leak if without risk and provide ventilation.
Butane	Keep unnecessary people away, isolate hazard area and deny entry. Ventilate closed spaces before entering. Do not touch spilled material.	Avoid heat, flames, sparks and other sources of ignition.	Stop leak if possible without personal risk. Reduce vapors with water spray. Remove sources of ignition.

	Methods for Cleanup	Other Information
1,1,1,2-Tetrafluoroethane	None available	None
R-124	Stop leak if possible without personal risk.	
Butane	Stop leak, evacuate area. Use protective equipment. Contact emergency personnel.	None

Section 7: Handling and Storage

	Handling	Storage
1,1,1,2-Tetrafluoroethane	Keep container tightly closed in a locked area. Protect from sunlight. Protect from ignition sources. Secure cylinders upright to keep them from falling or being knocked over. Store only where temperature will not exceed 125F (52C).	Always handle in a well ventilated area. Use only in closed systems. Open valve slowly. Close cylinder valve after each use; keep closed even when empty. Avoid contact with skin and eyes. Keep away from heat and ignition sources. Do not get liquid in eyes, on skin, or clothing.

	Handling	Storage
R-124	Store and use with adequate ventilation. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store only where temperature will not exceed 125F (52C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.	Do not get liquid in eyes, on skin, or clothing. Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Open valve slowly. Close cylinder valve after each use; keep closed even when empty. If valve is hard to open, discontinue use and contact your supplier.
Butane	Grounding and bonding required. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. Keep separated from incompatible substances.	Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.110.

Section 8: Exposure Controls/Personal Protection

	Exposure Guidelines
1,1,1,2-Tetrafluoroethane	Not established.
R-124	AIHA WEEL (United States, 1/2009). TWA: 1000 ppm 8 hour(s).
Butane	N-BUTANE: 800 ppm (1900 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993) 800 ppm (1900 mg/m3) NIOSH recommended TWA 10 hour(s) LIQUIFIED PETROLEUM GAS (LPG): 1000 ppm (1800 mg/m3) OSHA TWA 1000 ppm (1800 mg/m3) NIOSH recommended TWA 10 hour(s) ALIPHATIC HYDROCARBON GASES ALKANE (C1-C4): 1000 ppm ACGIH TWA

Engineering Controls

Handle only in fully enclosed systems.

	Eye Protection	Skin Protection	Respiratory Protection
1,1,1,2-Tetrafluoroethane	Wear splash resistant safety goggles with a face shield. Provide an emergency eye wash fountain and shower in work area.	Wear appropriate chemical resistant clothing.	Self-contained breathing apparatus and protective clothing may be required by rescue workers. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.
R-124	Wear safety glasses for normal conditions	General work clothing and leather gloves would be sufficient	Wear self-contained, NIOSH-approved breathing apparatus
Butane	For the gas: Eye protection not required, but recommended. For the liquid: Wear splash resistant safety goggles. Contact lenses should not be worn. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.	For the gas: Protective clothing is not required. For the liquid: Wear appropriate protective, cold insulating clothing.	Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

General Hygiene considerations

- Avoid breathing vapor or mist
- Avoid contact with eyes and skin
- Wash thoroughly after handling and before eating or drinking

Section 9: Physical and Chemical Properties

	Physical State	Appearance	Color	Change in Appearance	Physical Form	Odor	Taste
1,1,1,2-Tetrafluoroethane	Gas	Colorless	Colorless	N/A	Gas	Slightly ethereal	N/A
R-124	Gas	Colorless	Clear	N/A	Gas	Faint ethereal odor	N/A
Butane	Gas	Colorless	Colorless	N/A	Gas	Faint petroleum-like odor	N/A

	Flash Point	Flammability	Partition Coefficient	Autoignition Temperature	Upper Explosive Limits	Lower Explosive Limits
1,1,1,2-Tetrafluoroethane	Not flammable	Not available	Not available	Nonflammable	Nonflammable	Nonflammable
R-124	Not applicable	Not available	Not available	Not applicable	Not applicable	Not applicable

	Flash Point	Flammability	Partition Coefficient	Autoignition Temperature	Upper Explosive Limits	Lower Explosive Limits
Butane	-76 F (-60 C) (CC)	Not available	630.96 (log = 2.80) (estimated from water solubility)	549 F (287 C)	0.085	0.019

	Boiling Point	Freezing Point	Vapor Pressure	Vapor Density	Specific Gravity	Water Solubility	pH	Odor Threshold	Evaporation Rate	Viscosity
1,1,1,2-Tetrafluoroethane	-15.7F (-26.5C)	-153.9F (-103C)	85.9 psia (592 kPa abs) at 70F (21.1C)	3.6 (Air=1.0) @ 25 C (77 F)	1.208 @ 77 F(25C)	0.15% @ 25 C	Not available	Not available	Not available	Not available
R-124	-11C (12.2F)	-199C (-326.2F)	49.1 psia @ 21.1 C (70 F)	4.74	1.34 @ 30C (86F)	Not available	Neutral	Not Available	>1 COMPARED TO: CCl4 = 1	Not available
Butane	30 F (-1 C)	-216 F (-138 C)	1557 mmHg @ 20 C	2.1 (Air=1)	0.5788 @ 0 C	0.15	Not applicable	6.16 ppm	Not applicable for gas. Liquefied n-butane will evaporate rapidly at room temperature	Not available

	Molecular Weight	Molecular Formula	Density	Weight per Gallon	Volatility by Volume	Volatility	Solvent Solubility
1,1,1,2-Tetrafluoroethane	102.03	C2F4H2	Not available	Not available	Not available	Not available	Not available
R-124	136.48 g/mole	C2-H-Cl-F4	Not available	Not available	Not available	Not available	
Butane	58.12	C-H3-(C-H2)2-C-H3	Not available	Not available	100%	Not applicable	Soluble: Alcohol, ether, chloroform

Section 10: Stability and Reactivity

	Stability	Conditions to Avoid	Incompatible Materials
1,1,1,2-Tetrafluoroethane	Stable.	Stable.	Aluminum, CO2 above 1832F (1000C), alloys of more than 2% Mg in the presence of water
R-124	Stable under normal conditions	Stable under normal conditions	Freshly abraded aluminum surfaces. Chemically active metals: potassium, calcium, powdered aluminum, magnesium and zinc
Butane	Stable at normal temperatures and pressure.	Stable at normal temperatures and pressure.	Oxidizing materials, halogen compounds

	Hazardous Decomposition Products	Possibility of Hazardous Reactions
1,1,1,2-Tetrafluoroethane	Thermal decomposition or burning may produce fluorine and carbonyl fluoride.	Polymerization may occur.
R-124	Halogens halogen acids, and possibly carbonyl halides	Will not occur
Butane	Oxides of carbon.	Will not polymerize.

Section 11: Toxicology Information

Acute Effects

	Oral LD50	Dermal LD50	Inhalation

	Oral LD50	Dermal LD50	Inhalation
1,1,1,2-Tetrafluoroethane	: LC50 1 hr = 100,000 ppmv; LC50 4 hr = 50,000 ppmv	Not available	Asphyxiant. High concentrations can cause headaches, dizziness, drowsiness, and loss of consciousness. Very high concentrations may cause suffocation. Lack of oxygen can kill.
R-124	LC50 : 4 hr. (rat) - ?360,000 ppm	Not Available	Displaces oxygen in air and causes symptoms of asphyxiation. Including: loss of coordination, increases heart rate, deeper respiration. Severe exposure may cause cardiac arrhythmia.
Butane	LC(50): 658 mg/l (270,000 ppm) butane (4 hour-rat)	Not established	Irritation, nausea, vomiting, headache, drowsiness, symptoms of drunkenness, tingling sensation, suffocation, convulsions, coma, can displace oxygen at high concentrations

	Eye Irritation	Skin Irritation	Sensitization
1,1,1,2-Tetrafluoroethane	Vapors may irritate the eyes. The liquid may cause severe corneal injury due to frostbite	Vapors may irritate the skin. Liquid may cause frostbite; harmful amounts may be absorbed if skin contact is prolonged or widespread.	No GHS hazards established. Heavier than air. Possible asphyxiant in high concentrations.
R-124	Frostbite, irritation	Irritation, frostbite	No health hazards classified.
Butane	Frostbite, blurred vision	Blisters, frostbite	Central nervous system depression, difficulty breathing

Chronic Effects

	Carcinogenicity	Mutagenicity	Reproductive Effects	Developmental Effects
1,1,1,2-Tetrafluoroethane	Not available	Not available	No data	No data
R-124	Not Available	Not Available	Not Available	No data
Butane	None	Not established	Not established	No data

Section 12: Ecological Information

Fate and Transport

	Eco toxicity	Persistence / Degradability	Bioaccumulation / Accumulation	Mobility in Environment
1,1,1,2-Tetrafluoroethane	Fish toxicity: Not available Invertibrate toxicity: Not available Algal toxicity: Not available Phyto toxicity: Not available Other toxicity: Not available	Not available	Not available	Not available
R-124	Fish toxicity: Not Available Invertibrate toxicity: Not Available Algal toxicity: Not Available Phyto toxicity: Not Available Other toxicity: Not Available	Not Available	Low risk	Gas, so unlikely to remain in water.
Butane	Fish toxicity: Not available Invertibrate toxicity: Not available Algal toxicity: Not available Phyto toxicity: Not available Other toxicity: Expected to exist entirely in the vapor phase in ambient air.	Not available	Not available	Not available

Section 13: Disposal Considerations

1,1,1,2-Tetrafluoroethane	Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.
R-124	Disposal must comply with federal, state, and local disposal or discharge laws.
Butane	Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001.

Section 14: Transportation Information

U.S. DOT 49 CFR 172.101

DOT Information For This Mixture

Shipping Name	Compressed gas, flammable, n.o.s. (1,1,1,2-Tetrafluoroethane, R-124)
UN Number	UN1954
Hazard Class	2.1
Hazard Information	FLAMMABLE GAS

Individual Component Information

	Proper Shipping Name	ID Number	Hazard Class or Division	Packing Group	Labeling Requirements	Passenger Aircraft or Railcar Quantity Limitations	Cargo Aircraft Only Quantity Limitations	Additional Shipping Description
1,1,1,2-Tetrafluoroethane	1,1,1,2-Tetrafluoroethane	UN3159	2.2	Not applicable	Nonflammable gas	N/A	N/A	N/A
R-124	1-Chloro-1,2,2,2-tetrafluoroethane	UN1021	2.2	Not required	N/a	N/A	N/A	N/A
Butane	Butane	UN1011	2.1	Not applicable	2.1	Forbidden	150 kg	N/A

Canadian Transportation of Dangerous Goods

	Shipping Name	UN Number	Class	Packing Group / Risk Group
1,1,1,2-Tetrafluoroethane	REFRIGERANT GAS R 134a; or 1,1,1,2-TETRAFLUOROETHANE	UN3159	2.2	Not applicable
R-124	1-Chloro-1,2,2,2-tetrafluoroethane	UN1021	2.2	Not required
Butane	Butane	UN1011	2.1	Not applicable

Section 15: Regulatory Information

U.S. Regulations

	CERCLA Sections	SARA 355.30	SARA 355.40
1,1,1,2-Tetrafluoroethane	Not available	Not available	Not available
R-124	Not regulated	Not available	Not available
Butane	Not regulated.	Not regulated.	Not regulated.

SARA 370.21

	Acute	Chronic	Fire	Reactive	Sudden Release
1,1,1,2-Tetrafluoroethane	Yes	No	No	No	Yes
R-124	Yes	No	No	No	Yes
Butane	Yes	No	Yes	No	Yes

SARA 372.65

1,1,1,2-Tetrafluoroethane	Not available
R-124	Not regulated
Butane	Not regulated.

OSHA Process Safety

1,1,1,2-Tetrafluoroethane	Not available
R-124	Not regulated
Butane	Not regulated.

State Regulations

	CA Proposition 65
1,1,1,2-Tetrafluoroethane	Not available
R-124	Not regulated
Butane	Not regulated.

Canadian Regulations

	WHMIS Classification
1,1,1,2-Tetrafluoroethane	N/A
R-124	Not available
Butane	A,B1

National Inventory Status

	US Inventory (TSCA)	TSCA 12b Export Notification	Canada Inventory (DSL/NDSL)
1,1,1,2-Tetrafluoroethane	Listed on inventory.	N/A	N/A
R-124	Not available	Not available	Not available
Butane	Listed on inventory.	Not listed.	Listed on inventory.

Section 16: Other Information

	NFPA Rating
1,1,1,2-Tetrafluoroethane	HEALTH=2 FIRE=1 REACTIVITY=0
R-124	Health - 2, Flammability - 0, Reactivity - 0
Butane	HEALTH=1 FIRE=4 REACTIVITY=0

0 = minimal hazard, 1 = slight hazard, 2 = moderate hazard, 3 = severe hazard, 4 = extreme hazard