

Safety Data Sheet (SDS)

Refrigerant R449A (HFC/HFO Blend, R32/R125/R1234yf/R134a = 25.3/24.4/24.7/25.6, A2L Mildly Flammable)

UN No.: 3161 Date: August 29, 2026 Version: V1.0

1 Identification

1.1 Product Identifier

Chemical Name (EN)	Refrigerant R449A (Mixture of Difluoromethane/Pentafluoroethane/2,3,3,3-Tetrafluoropropene/1,1,1,2-Tetrafluoroethane)
Trade Name / Synonyms	R449A, Opteon XP40, Forane 449A, HFO-449A
CAS No.	No single CAS number (mixture; component CAS numbers in Section 3)
UN No.	3161 (Liquefied Gas, Flammable)
Hazardous Goods Class	Class 2.1 Flammable Gas
Mixture Type	Zeotropic Mixture (Temperature Glide ~1°C)
Molecular Weight	85.26 g/mol
Primary Use	Environmentally friendly replacement for R404A/R507A in medium- and low-temperature commercial refrigeration (GWP reduced ~67%)

1.2 Manufacturer / Supplier Information

Supplier Name	Hangzhou Wula Chemical Co., Ltd.
Address	No. 7 Longtan Road, Yuhang District, Hangzhou, Zhejiang Province, China
Postal Code	311100
Telephone	+86-571-87024025
Fax	+86-571-87024025
Email	safety@wulachem.cn

1.3 Emergency Telephone

National Chemical Accident Emergency Hotline: +86-532-83889090 (24-hour)

2 Hazards Identification

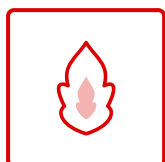
2.1 GHS Hazard Classification

Hazard Classification:

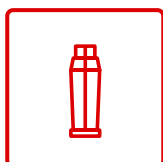
- Flammable Gas (Physical Hazard) — Category 2
- Gases Under Pressure (Physical Hazard) — Liquefied Gas
- Specific Target Organ Toxicity - Single Exposure (Health Hazard, Narcotic Effects) — Category 3

Note: R449A is an A2L-classified refrigerant (mildly flammable, low toxicity). The flammability range is very narrow (~12.3%–14.3%), with a low burning velocity (≤ 10 cm/s), resulting in a low practical fire risk. Frostbite from liquid contact with skin/eyes is a physical cold-temperature injury.

2.2 GHS Label Elements



GHS02 Flammable



GHS04 Gas Under Pressure



GHS07 Warning

Signal Word: **Warning**

Hazard Statements:

- H221** Flammable gas.
- H280** Contains gas under pressure; may explode if heated.
- H336** May cause drowsiness or dizziness.

Note: The H221 classification is based on the A2L mildly flammable characteristic. R449A has a very narrow flammability range (~12.3%–14.3%) and low burning velocity, resulting in a practical fire risk far lower than A2/A3-class gases.

Precautionary Statements:

- P102** Keep out of reach of children. Read and understand all safety precautions before use.
- P210** Keep away from heat, sparks, open flames, and hot surfaces. No smoking.
- P271** Use only outdoors or in a well-ventilated area.
- P280** Wear protective gloves/protective clothing/eye protection/face protection.
- P304+P340** IF INHALED: Remove person to fresh air and keep comfortable for breathing.
- P312** Call a poison center/doctor if you feel unwell.
- P377** Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381 In case of leakage, eliminate all ignition sources if safe to do so.

P403 Store in a well-ventilated place.

P410+P403 Protect from sunlight. Store in a well-ventilated place.

P405 Store locked up.

2.3 Other Hazards

- Vapor is heavier than air and can spread along the ground to distant locations, creating an oxygen-deficient environment.
- A2L mildly flammable gas: The flammability range is very narrow (~12.3%–14.3%), with a low burning velocity (≤ 10 cm/s), resulting in a low practical fire risk.
- Zeotropic mixture with a temperature glide of approximately 1°C; liquid-phase charging is recommended.
- At high temperatures ($>500^{\circ}\text{C}$), thermal decomposition produces toxic and corrosive gases (hydrogen fluoride, carbon monoxide, carbonyl fluoride, etc.).
- Cylinders exposed to heat will increase in pressure, with a risk of rupture and explosion.
- High-concentration inhalation may cause cardiac sensitization to catecholamines, potentially inducing arrhythmia.

3 Composition / Information on Ingredients

3.1 Substance / Mixture

This product is a zeotropic mixture composed of four refrigerants, with a temperature glide of approximately 1°C.

3.2 Component Information

Component Name	CAS No.	Chemical Name	Molecular Formula	Concentration (mass fraction)
R32	75-10-5	Difluoromethane	CH_2F_2	25.3%
R125	354-33-6	Pentafluoroethane	C_2HF_5 (CF_3CHF_2)	24.4%
R1234yf	754-12-1	2,3,3,3-Tetrafluoroprop-1-ene	$\text{C}_3\text{H}_2\text{F}_4$ ($\text{CF}_3\text{CF}=\text{CH}_2$)	24.7%
R134a	811-97-2	1,1,1,2-Tetrafluoroethane	$\text{C}_2\text{H}_2\text{F}_4$ (CH_2FCF_3)	25.6%

3.3 Impurities

Impurity	Limit
Acidity (as HCl)	≤ 1 ppm
Moisture	≤ 10 ppm
Non-volatile residue	≤ 100 ppm
Non-condensable gases (25°C, volume fraction)	$\leq 1.5\%$
Chlorides	Pass

4 First Aid Measures

4.1 Description of Necessary First Aid Measures

General Advice: Immediately remove the victim from the contaminated area. Keep warm and quiet. Show this Safety Data Sheet to the attending physician.

Inhalation:

- Quickly move the patient to fresh air; keep the airway open.
- If breathing is difficult, administer oxygen.
- If breathing has stopped, perform artificial respiration (use a bag-valve-mask or pocket mask; avoid mouth-to-mouth).
- If cardiac arrest has occurred, perform CPR immediately.
- Keep the patient warm and at rest. Closely monitor their condition. Seek medical attention immediately.

Skin Contact (Frostbite):

- Immediately flush the frostbitten area with large amounts of lukewarm water (37–40°C) to promote rewarming.
- Do not use hot water (>40°C) or apply direct heat. Do not rub the frostbitten area.
- Carefully remove frozen clothing; if clothing is stuck to the skin, do not forcibly remove it. Cover the wound with sterile dressing. Seek medical attention immediately.

Eye Contact:

- Immediately open the eyelids and flush with large amounts of running water or saline solution for at least 15 minutes.
- Remove contact lenses if present and easy to do (if feasible). Seek medical attention immediately, preferably from an ophthalmologist.

Ingestion: Not applicable. This product is a gas at normal temperature and is not an ingestion hazard.

4.2 Most Important Symptoms and Health Effects

- Acute inhalation: Dizziness, drowsiness, headache, nausea, loss of coordination, unconsciousness, arrhythmia.
- Skin contact with liquid: Frostbite (skin whitening, hardening, pain, blistering).
- Eye contact with liquid: Severe frostbite, corneal damage, visual impairment.

4.3 Indication of Immediate Medical Attention and Special Treatment

Notes to Physician:

- Provide symptomatic and supportive treatment; maintain airway patency; administer oxygen if necessary.
- Monitor cardiac function; high-concentration exposure may cause arrhythmia.
- Avoid catecholamine drugs such as epinephrine (may increase myocardial sensitivity to fluorocarbons and induce ventricular fibrillation).
- Treat frostbite according to standard protocols; rewarm with lukewarm water (37–40°C); do not use dry heat or rubbing.
- If exposure to thermal decomposition products (HF) is suspected, monitor blood and urine fluoride levels; administer calcium gluconate therapy.

5

Firefighting Measures

5.1 Extinguishing Media

Suitable Extinguishing Media: Water spray, dry chemical powder, carbon dioxide, foam. For A2L mildly flammable gas, shut off the gas source before extinguishing the fire.

Unsuitable Extinguishing Media: No specific restrictions.

5.2 Special Hazards Arising from the Substance

- A2L mildly flammable gas: Can ignite within a specific concentration range in air (flammability range ~12.3%–14.3%, very narrow); low burning velocity (≤ 10 cm/s).
- Practical fire risk is low, but avoid contact with strong ignition sources in enclosed spaces.
- At high temperatures ($>500^{\circ}\text{C}$), thermal decomposition produces toxic hydrogen fluoride, carbon monoxide, carbonyl fluoride, and other corrosive, harmful gases.
- Cylinders exposed to heat may increase in internal pressure and may rupture.
- May react with alkali metals, alkaline earth metals, and aluminum powder under specific conditions.

5.3 Hazardous Combustion Products

Hydrogen fluoride (HF), carbon monoxide (CO), carbonyl fluoride (COF_2), other fluorinated compounds

5.4 Firefighting Instructions and Protective Equipment

- Firefighters must wear positive pressure self-contained breathing apparatus (SCBA) and full protective fire-fighting gear.
- Move containers away from the fire area if it can be done safely. Spray water to cool containers in the fire area until the fire is extinguished.
- Immediately evacuate if containers in the fire show discoloration or if safety relief devices activate.
- **Do not extinguish a leaking gas fire until the gas source can be stopped** (P377); otherwise, flammable gas may re-accumulate, causing re-ignition or explosion.
- Eliminate all ignition sources if safe to do so (P381).

6 Accidental Release Measures

6.1 Personal Precautions, Protective Equipment, and Emergency Procedures

- Quickly evacuate personnel from the leak area to an upwind location; isolate the area and strictly restrict access.
- Emergency responders should wear positive pressure SCBA, general work clothing, cryogenic protective gloves, and safety goggles.
- Approach the site from upwind. Shut off the leak source if possible. Do not touch or walk through the leaked material.
- **Eliminate all ignition sources** (open flames, electric sparks, static electricity, etc.); do not use tools that may produce sparks.

6.2 Environmental Precautions

- Prevent gas from entering sewers, basements, or enclosed spaces. Ensure adequate ventilation to promote dispersion.
- For large leaks, control greenhouse gas emissions; recover and process as much as possible. Avoid discharge into the atmosphere, water bodies, and soil.

6.3 Containment, Clean-up Methods, and Materials

- **Small leaks:** Enhance ventilation to accelerate gas dispersion. Monitor oxygen levels and flammable gas concentrations to prevent asphyxiation and combustion.
- **Large leaks:** Close the leak source valve (if safe to operate). Use a dedicated gas recovery system for recovery. If recovery is not possible, dilute with water spray. When the cylinder valve cannot be closed, immerse the cylinder in an alkaline aqueous solution for absorption treatment.
- **Cylinder leak disposal:** Move the cylinder to a ventilated, safe area and release slowly; if the valve cannot be closed, contact the supplier for professional handling.

6.4 Reference

See Section 8 (Exposure Controls/Personal Protection) and Section 13 (Disposal).

Special Warning: R449A vapor density is approximately 2.9 times that of air and will accumulate in low-lying areas and enclosed spaces, creating an oxygen-deficient environment and potentially reaching flammable concentrations. Before entering enclosed spaces or low-lying areas, oxygen levels ($\geq 19.5\%$) and flammable gas concentrations (below 20% of the LFL) must be tested, with a safety attendant present. Eliminate all ignition sources.

7 Handling and Storage

7.1 Handling Precautions

- Operate in enclosed systems with adequate natural or local exhaust ventilation.
- Operators must be specially trained, follow operating procedures strictly, and hold appropriate certifications.
- **Keep away from heat, sparks, open flames, and hot surfaces. No smoking.**
- Avoid contact with reactive metals and strong oxidizers. Handle cylinders gently to prevent damage to cylinders and accessories.
- Equip the workplace with emergency leak response equipment. Eating, drinking, and smoking are strictly prohibited in the workplace.
- When handling liquid, wear insulated gloves and safety goggles to prevent frostbite.
- Use explosion-proof ventilation systems and equipment. Use spark-free tools and equipment.
- Regularly inspect the sealing of cylinders, valves, and piping. Maintain good workplace ventilation to prevent gas accumulation to flammable concentrations.
- As a zeotropic mixture, charge in the liquid phase to ensure composition consistency.

7.2 Safe Storage Conditions, Including Incompatibilities

- Store in a cool, dry, well-ventilated dedicated flammable gas warehouse. Storage temperature should not exceed 45°C. Keep away from fire and heat sources; avoid direct sunlight.
- Store separately from oxidizers and reactive metals. Cylinders should be stored upright with valve caps and shock-absorbing rings in place and securely fastened.
- Use explosion-proof lighting and ventilation facilities. **Do not use mechanical equipment and tools that may produce sparks.**
- Filling coefficient not greater than 1.0 kg/L. Storage areas should display prominent safety warning signs and flammable gas detection and alarm devices. Implement dual-person receipt and dual-person custody systems.

7.3 Specific End Uses

For industrial and commercial refrigeration use only; users must be professionally trained. R449A is an environmentally friendly replacement for R404A/R507A with GWP reduced by approximately 67%, suitable

for medium- and low-temperature commercial refrigeration systems. Not approved for direct food contact, medical inhalation, or other unapproved uses.

8 Exposure Controls / Personal Protection

8.1 Occupational Exposure Limits

China OEL	No statutory limit established. WEEL reference: 500 ppm (TWA, 8-hour)
USA WEEL (R1234yf component)	500 ppm (TWA)
USA ACGIH TLV-TWA (R134a component)	1000 ppm (TWA)
Mixture Recommended OEL	500 ppm (TWA, most restrictive value)
Biological Exposure Limit	Not established

Note: According to GBZ 2.1-2019, this substance is not currently listed in the Chinese occupational exposure limit table; international standards are recommended for operational guidance.

8.2 Exposure Monitoring Methods

Gas chromatography with flame ionization detection (GC-FID) or mass spectrometry (GC-MS); portable halogen/combustible gas detectors

8.3 Engineering Controls

- Enclose production processes; provide general or local exhaust ventilation. Provide safety showers and eyewash stations.
- Install flammable gas detection and alarm devices (alarm at 20% of LFL) in areas where large leaks may occur. Use explosion-proof electrical equipment.

8.4 Personal Protective Equipment (PPE)

Respiratory Protection:

- Normal conditions: No special protection required. At higher concentrations: A half-mask respirator is recommended. In high-concentration environments or emergencies: Positive pressure self-contained breathing apparatus (SCBA) should be worn.

Eye Protection: Safety glasses for general operations; chemical safety goggles or face shield required when handling liquid to prevent frostbite.

Skin Protection: Anti-static protective gloves for general handling; cryogenic insulated gloves when handling liquid. Anti-static work clothing for body protection; cold-protective clothing when handling liquid.

8.5 Hygiene Measures

- Remove contaminated clothing promptly after work; wash skin thoroughly. Maintain good personal hygiene habits. Equip the workplace with eyewash stations and emergency shower facilities.

9 Physical and Chemical Properties

9.1 Basic Physical and Chemical Properties

Appearance	Colorless gas with a slight ethereal odor; gaseous at normal temperature and pressure; colorless transparent liquid under pressure
Odor Threshold	No data available (slight ethereal odor)
pH	Not applicable (gas)
Melting / Freezing Point	No defined melting point (mixture)
Boiling Point / Range (101.3 kPa)	-43.6°C (-46.5°F) (bubble point, temperature glide ~1°C)
Flash Point	None (not applicable for gas, but classified as mildly flammable)
Evaporation Rate	No data available
Flammability (Gas)	Mildly flammable (A2L)
Upper/Lower Explosive Limits	~12.3%–14.3% (in air, very narrow range)
Vapor Pressure (25°C)	1200 kPa
Vapor Density (air = 1)	~2.9 (heavier than air)
Relative Density (liquid, 25°C)	1.152 g/cm ³
Solubility	Slightly soluble in water; soluble in ethanol, diethyl ether, and other organic solvents
Partition Coefficient (log P)	No data available (mixture)
Auto-ignition Temperature	~600°C (estimated)
Decomposition Temperature	>500°C (thermal decomposition begins)
Viscosity (gas, 25°C)	~12.5 μPa·s
Surface Tension (25°C, liquid)	~6.5 mN/m

Burning Velocity	≤10 cm/s (A2L class requirement)
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9.2 Thermodynamic Properties

Critical Temperature	83.5°C (182.3°F)
Critical Pressure	~4500 kPa (4.50 MPa / 653 psia)
Critical Density	~0.470 g/cm ³
Heat of Vaporization (at boiling point)	~170 kJ/kg
Liquid Specific Heat (25°C)	~1.55 kJ/(kg·°C)
Gas Specific Heat (25°C, constant pressure)	~0.95 kJ/(kg·°C)

9.3 Other Safety Data

ASHRAE Safety Class	A2L (mildly flammable, low toxicity)
Ozone Depletion Potential (ODP)	0 (does not deplete the ozone layer)
Global Warming Potential (GWP, 100-yr)	1273 (reduced ~67% vs. R404A/R507A)
Atmospheric Lifetime	~11.8 years
Temperature Glide	~1°C (zeotropic mixture)

10 Stability and Reactivity

10.1 Reactivity

Chemically stable under normal temperature and pressure; not prone to chemical reactions.

10.2 Chemical Stability

Stable under normal temperature and pressure. The R1234yf component contains a carbon-carbon double bond and degrades relatively quickly in the atmosphere, but remains stable under normal storage and use conditions.

10.3 Possibility of Hazardous Reactions

- Thermal decomposition at high temperatures (>500°C) produces toxic hydrogen fluoride, carbon monoxide, and carbonyl fluoride.

- May react with alkali metals, alkaline earth metals, and aluminum powder at high temperatures or under specific conditions.
- R32 and R1234yf components may form flammable mixtures with air under specific conditions (A2L mildly flammable characteristic).

10.4 Conditions to Avoid

High temperature, open flames, direct heat sources, cylinder over-pressurization, strong ignition sources

10.5 Incompatible Materials

Reactive metals (sodium, potassium, calcium, aluminum powder, magnesium powder, etc.), strong oxidizers

10.6 Hazardous Decomposition Products

Hydrogen fluoride (HF), carbon monoxide (CO), carbonyl fluoride (COF₂), other fluorinated compounds

10.7 Polymerization Hazard

Will not undergo polymerization.

11 Toxicological Information

11.1 Acute Toxicity

Rat Inhalation LC ₅₀ (4 hr)	> 500,000 ppm
R32 Component Rat LC ₅₀ (4 hr)	> 1,000,000 ppm
R125 Component Rat LC ₅₀ (4 hr)	> 800,000 ppm
R1234yf Component Rat LC ₅₀ (4 hr)	> 520,000 ppm
R134a Component Rat LC ₅₀ (4 hr)	> 500,000 ppm
Rabbit Dermal LD ₅₀	No data (gaseous substance)

11.2 Skin Irritation / Corrosion

Liquid contact may cause frostbite (physical injury), but the substance is not classified as chemically corrosive.

11.3 Eye Irritation / Corrosion

Liquid contact may cause severe frostbite and corneal damage.

11.4 Respiratory or Skin Sensitization

No sensitization reported.

11.5 Germ Cell Mutagenicity

All components showed no mutagenic effects in in vitro and in vivo tests.

11.6 Carcinogenicity

None of the components are listed as carcinogens by IARC, ACGIH, or other agencies. IARC: Not listed; ACGIH: Group A4; EPA: Group D.

11.7 Reproductive Toxicity

Animal studies showed no significant reproductive or developmental toxicity at high concentrations.

11.8 Specific Target Organ Toxicity - Single Exposure

- Narcotic effects (Category 3): High-concentration inhalation may cause central nervous system depression.
- Cardiac effects: High-concentration exposure may cause arrhythmia (catecholamine sensitization).

11.9 Specific Target Organ Toxicity - Repeated Exposure

Repeated low-concentration exposure showed no significant target organ toxicity.

11.10 Aspiration Hazard

In the gaseous state, aspiration pneumonia is unlikely. High-concentration inhalation may cause central nervous system depression and cardiac sensitization.

12 Ecological Information

12.1 Ecotoxicity

Fish Acute Toxicity (LC ₅₀ , 96h)	> 100 mg/L (low toxicity to fish)
Daphnia Acute Toxicity (EC ₅₀ , 48h)	> 100 mg/L
Algae Growth Inhibition (EC ₅₀ , 72h)	> 100 mg/L

12.2 Persistence and Degradability

- Atmospheric degradation: The R1234yf component degrades rapidly (~11 days); the R32 and R125 components degrade more slowly. The overall atmospheric lifetime of the mixture is approximately 11.8 years.
- Biodegradability: Not readily biodegradable.

12.3 Bioaccumulation Potential

All components have low log P values, indicating low bioaccumulation potential.

12.4 Mobility in Soil

As a gas, it is highly volatile and mobile.

12.5 PBT and vPvB Assessment

Does not meet PBT/vPvB criteria.

12.6 Other Adverse Environmental Effects

- **ODP:** 0 (does not deplete the ozone layer)
- **GWP (100-yr):** 1273 (reduced ~67% vs. R404A/R507A)
- Large releases contribute to global warming; emissions should be controlled, with priority on recovery and reuse.
- R32 and R125 components are HFCs subject to the Kigali Amendment controls; R1234yf is an HFO with very low GWP and is not subject to controls.

13 Disposal Considerations

13.1 Waste Treatment Methods

Product / Residues:

- Direct discharge into the atmosphere is strictly prohibited (greenhouse gas). Recycling and regeneration are the preferred treatment methods.
- If recycling is not possible, send to a qualified hazardous waste disposal facility. High-temperature incineration may be used.
- Do not discharge into sewers, water bodies, or soil.

Contaminated Packaging: Empty cylinders should be returned to the supplier or a qualified organization for handling; do not discard or cut without authorization.

13.2 Disposal Precautions

- Consult national and local regulations before disposal. Operators should wear appropriate personal protective equipment.
- Ensure adequate ventilation to prevent personnel asphyxiation and flammable gas accumulation. Eliminate all ignition sources.

14 Transport Information

14.1 UN Number

3161 (Liquefied Gas, Flammable)

14.2 UN Proper Shipping Name

LIQUEFIED GAS, FLAMMABLE, N.O.S. (Refrigerant Gas R449A)

14.3 Transport Hazard Class

Class 2.1 Flammable Gas

14.4 Packing Group

Not applicable (Class 2 gases have no packing group classification)

14.5 Hazard Labels

- Primary hazard label: Flammable Gas label (red, Class 2.1)
- Subsidiary hazard label: None

14.6 Packing Method

- Steel cylinders (seamless), compliant with GB 5099 or equivalent standards. Common specifications: 11.4 kg, 13.6 kg, 50 kg, 100 kg cylinders.
- Filling coefficient not greater than 1.0 kg/L. Cylinder valve outlet thread direction: left-hand for flammable gases.

14.7 Special Requirements for Different Transport Modes

Road Transport (GB/T 12268 / ADR):

- Transport vehicles must have hazardous goods transport qualifications. Cylinders must be fitted with valve caps and shock-absorbing rings.
- Follow designated routes; stopping in residential and densely populated areas is prohibited. Vehicle exhaust pipes must be equipped with flame arresters.

Rail Transport (RID):

- No hump shunting. Transport in boxcars; cylinders stored upright or horizontally and secured.

Sea Transport (IMDG Code):

- UN 3161, Class 2.1. Marine Pollutant: No. Stowage Category: D (deck cargo only).

Air Transport (ICAO/IATA DGR):

- UN 3161, Class 2.1. Passenger aircraft: Prohibited. Cargo aircraft: Permitted (subject to packing quantity limitations).

14.8 Transport Precautions

- Do not transport together with oxidizers, reactive metals, or food-grade chemicals.
 - Transport vehicles should be equipped with fire-fighting equipment and emergency leak response equipment. Transport personnel must be certified.
 - Protect from sun exposure, rain, and high temperature during transport. Vehicle exhaust pipes must be equipped with flame arresters. Handle with care during loading and unloading.
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15.1 China Regulations

- Regulations on the Safe Management of Hazardous Chemicals (State Council Decree No. 591)
- Catalog of Hazardous Chemicals (2015 Edition): Listed
- Chemical Classification and Labeling Standards (GB 30000 Series)
- Safety Data Sheet for Chemical Products - Content and Order (GB/T 16483-2008)
- Occupational Exposure Limits for Hazardous Factors in the Workplace - Part 1: Chemical Hazardous Factors (GBZ 2.1-2019)
- Technical Regulation for Safety of Gas Cylinders (TSG 23-2021)
- Production Safety Law of the PRC; Air Pollution Prevention and Control Law of the PRC
- Montreal Protocol Kigali Amendment Implementation Plan (China): HFC components subject to control

15.2 International Regulations

- **UN GHS:** 8th Revised Edition
- **Montreal Protocol:** Not an ozone-depleting substance (ODP = 0)
- **Montreal Protocol Kigali Amendment:** R32 and R125 components are high-GWP HFCs subject to control; R1234yf is an HFO not subject to control
- **EU F-Gas Regulation (EU 517/2014):** R449A meets quota requirements as a low-GWP replacement for R404A/R507A
- **EU REACH / CLP Regulation**
- **US EPA SNAP Program:** Approved for medium- and low-temperature commercial refrigeration
- **US AIM Act:** HFC phase-down program
- **ADR/RID, IMDG Code, IATA DGR**

16.1 References

- ASHRAE Standard 34-2024: Designation and Safety Classification of Refrigerants
- ASHRAE Handbook - Refrigeration Systems and Applications
- UNEP RTOC Assessment Report 2022
- GB/T 16483-2008 Safety Data Sheet for Chemical Products - Content and Order
- GB 30000 Series Chemical Classification and Labeling Standards
- UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS), 8th Revised Edition

16.2 Abbreviations

Abbreviation	Full Name
SDS/MSDS	Safety Data Sheet
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
CAS	Chemical Abstracts Service (Number)
UN	United Nations (Hazardous Goods Number)
ODP	Ozone Depletion Potential
GWP	Global Warming Potential
LC ₅₀	Lethal Concentration, 50%
SCBA	Self-Contained Breathing Apparatus
HFC	Hydrofluorocarbon
HFO	Hydrofluoroolefin
STOT	Specific Target Organ Toxicity

16.3 Disclaimer

This Safety Data Sheet (SDS) is prepared in accordance with GB/T 16483-2008 and the UN GHS standards and is intended to provide guidance on the safe use, handling, and disposal of the product. The information serves only as a safety operation guide and does not constitute a guarantee of product specifications or performance. Users should assess the applicability of this information based on their specific use scenarios and local regulatory requirements, and take necessary safety precautions. The preparer assumes no legal liability for any direct or indirect losses resulting from the use of the information in this document. Data in this document may be updated as new research findings and regulations evolve; it is recommended to check for the latest version periodically.

This document is prepared in accordance with GB/T 16483-2008 and UN GHS 8th Revised Edition | Refrigerant R449A Safety Data Sheet | Version V1.0