

1. Identification of the Substance/Preparation and the Company**Product Identifier:**

- **Product Name:** R448A
- **Chemical Name:** Mixture of Difluoromethane (HFC-32), Pentafluoroethane (HFC-125), 1,3,3,3-Tetrafluoropropene (HFO-1234yf), 1,1,1,2-Tetrafluoroethane (HFC-134a), and Carbon Dioxide (CO₂)
- **Synonyms:** Solstice[®] N40, Genetron[®] Performax LT
- **CAS Numbers:**
 - Difluoromethane: 75-10-5
 - Pentafluoroethane: 354-33-6
 - 1,3,3,3-Tetrafluoropropene: 754-12-1
 - 1,1,1,2-Tetrafluoroethane: 811-97-2
 - Carbon Dioxide: 124-38-9
- **EC Numbers:**
 - Difluoromethane: 200-839-4
 - Pentafluoroethane: 206-557-8
 - 1,3,3,3-Tetrafluoropropene: 468-710-7
 - 1,1,1,2-Tetrafluoroethane: 212-377-0
 - Carbon Dioxide: 204-696-9
- **REACH Registration Number:** Not applicable (mixture)

Relevant Identified Uses of the Substance:

- Refrigerant gas used in commercial and industrial refrigeration systems.

Details of the Supplier of the SDS:

- **Company Name:** Gaslogic B.V.
- **Address:** Overschiesweg 105, 3044 EH, Rotterdam.
- **Telephone Number:** +31 103 22 09 94
- **Email Address:** info@gaslogic.nl

Emergency Telephone Number:

- +44 344 892 0111 (Available 24 hours)

2. Hazards Identification**2.1 Classification of the Substance****According to Regulation (EC) No 1272/2008 (CLP):**

- **Physical Hazards:**
 - Gases Under Pressure – Liquefied Gas (H280)
 - Flammable Gas (H221)
- **Health Hazards:**
 - Not classified as hazardous.
- **Environmental Hazards:**
 - Not classified as hazardous.

2.2 Label Elements

- **Pictogram:**



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- **Signal Word:** Warning
- **Hazard Statements:**
 - **H221:** Flammable gas.
 - **H280:** Contains gas under pressure; may explode if heated.
- **Precautionary Statements:**
 - **P210:** Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. No smoking.
 - **P377:** Leaking gas fire: Do not extinguish unless leak can be stopped safely.
 - **P410 + P403:** Protect from sunlight. Store in a well-ventilated place.

2.3 Other Hazards

- **Risk of frostbite:** Direct contact with the liquid form may cause frostbite or cold burns.
- **Asphyxiation risk:** High concentrations can displace oxygen in confined spaces, leading to suffocation.

3. Composition / Information on Ingredients

Substance	CAS Number	EC Number	Concentration (%)
Difluoromethane (HFC-32)	75-10-5	200-839-4	26%
Pentafluoroethane (HFC-125)	354-33-6	206-557-8	25%
1,3,3,3-Tetrafluoropropene (HFO-1234yf)	754-12-1	468-710-7	20%
1,1,1,2-Tetrafluoroethane (HFC-134a)	811-97-2	212-377-0	21%
Carbon Dioxide (CO ₂)	124-38-9	204-696-9	7%

4. First Aid Measures

4.1 Description of First Aid Measures

- **Inhalation:**
 - Move the person to fresh air immediately.
 - If breathing is difficult, administer oxygen and seek medical attention if symptoms persist.
- **Skin Contact:**
 - In case of contact with liquid refrigerant, flush the area with lukewarm water.
 - Do not rub the skin; seek immediate medical attention for frostbite.
- **Eye Contact:**
 - Flush eyes with lukewarm water for at least 15 minutes.
 - Seek medical attention if irritation or injury occurs.
- **Ingestion:**
 - Ingestion is not considered a likely route of exposure due to the gaseous state.
 - If ingestion occurs, seek immediate medical attention.

4.2 Most Important Symptoms and Effects

- **Acute effects:** Dizziness, headache, nausea, and confusion from inhalation.
- **Skin contact:** Frostbite or cold burns from contact with liquid refrigerant.

4.3 Indication of Immediate Medical Attention

- Immediate medical attention is required for frostbite or high inhalation exposure leading to asphyxiation.

5. Fire-Fighting Measures**5.1 Extinguishing Media**

- **Suitable Extinguishing Media:** Use CO₂, dry chemical, or water spray.
- **Unsuitable Extinguishing Media:** Do not use water jets, as they may spread the fire.

5.2 Special Hazards Arising from the Substance

- **Explosion risk:** Containers may explode when exposed to heat or fire.
- **Toxic gases:** Burning may release toxic gases, such as hydrogen fluoride and carbonyl fluoride.

5.3 Advice for Firefighters

- Wear self-contained breathing apparatus (SCBA) and full protective clothing.
- Cool containers exposed to fire with water spray to prevent explosions.

6. Accidental Release Measures**6.1 Personal Precautions, Protective Equipment, and Emergency Procedures**

- Evacuate the area and ensure proper ventilation.
- Use appropriate personal protective equipment (PPE), including cold-resistant gloves and eye protection.
- Eliminate ignition sources.

6.2 Environmental Precautions

- Avoid release into the environment.
- Ensure adequate ventilation to allow gas to dissipate.

6.3 Methods and Material for Containment and Cleaning Up

- Stop the leak if it can be done safely.
- Allow the gas to disperse in a well-ventilated area.

7. Handling and Storage**7.1 Precautions for Safe Handling**

- Avoid inhalation of gas and vapors.
- Ensure good ventilation in enclosed areas.
- Keep away from heat, sparks, and open flames.

7.2 Conditions for Safe Storage

- Store in a cool, dry, well-ventilated area away from direct sunlight.
- Ensure containers are properly labeled and secured.
- Store cylinders upright and away from ignition sources.

8. Exposure Controls / Personal Protection**8.1 Control Parameters**

Substance	Occupational Exposure Limits (OELs)
Difluoromethane (HFC-32)	1,000 ppm (TWA)
Pentafluoroethane (HFC-125)	Not established
1,3,3,3-Tetrafluoropropene (HFO-1234yf)	Not established
1,1,1,2-Tetrafluoroethane (HFC-134a)	1,000 ppm (TWA)
Carbon Dioxide (CO ₂)	5,000 ppm (TWA)

8.2 Exposure Controls

Engineering Controls:

- Ensure proper ventilation, especially in confined spaces.
- Use gas detection systems to monitor air quality in enclosed areas.

Personal Protective Equipment:

- **Respiratory Protection:** Use an approved respirator if exposure limits are exceeded.
- **Hand Protection:** Wear insulated gloves to protect from liquid refrigerant.
- **Eye Protection:** Wear safety goggles or a face shield when handling liquid refrigerant.
- **Skin Protection:** Wear protective clothing to avoid skin contact with liquid refrigerant.

9. Physical and Chemical Properties

Property	Value
Physical State	Gas at ambient temperature
Appearance	Colorless gas
Odor	Slight ethereal odor
Melting Point	Not available
Boiling Point	-46°C
Flash Point	Not applicable
Vapor Pressure	1,700 kPa at 25°C
Vapor Density	3.5 (air = 1)
Solubility in Water	Slight
Partition Coefficient (Kow)	Not available
Auto-ignition Temperature	750°C
Decomposition Temperature	>400°C

10. Stability and Reactivity

10.1 Reactivity

- Not reactive under normal conditions.

10.2 Chemical Stability

- Stable under normal storage and handling conditions.

10.3 Possibility of Hazardous Reactions

- No hazardous reactions are expected under normal use.

10.4 Conditions to Avoid

- Avoid exposure to heat, sparks, open flames, and direct sunlight.

10.5 Incompatible Materials

- Strong oxidizing agents and alkali metals.

10.6 Hazardous Decomposition Products

- Thermal decomposition may produce toxic gases, such as hydrogen fluoride and carbonyl fluoride.

11. Toxicological Information

11.1 Information on Toxicological Effects

Acute Toxicity:

- **Inhalation:** Inhalation of high concentrations may cause dizziness, drowsiness, or unconsciousness.
- **Skin and Eye Contact:** Exposure to liquid refrigerant may cause frostbite or cold burns.

Skin Corrosion/Irritation:

- Direct contact with liquid refrigerant may cause frostbite or cold burns.

Serious Eye Damage/Irritation:

- Liquid refrigerant may cause serious eye damage if in contact with the eyes.

Respiratory or Skin Sensitization:

- Not classified as a sensitizer.

Carcinogenicity:

- Not classified as carcinogenic by IARC, NTP, or OSHA.

Germ Cell Mutagenicity:

- Not classified as mutagenic.

Reproductive Toxicity:

- Not classified as toxic to reproduction.

STOT – Single Exposure:

- May cause dizziness, drowsiness, and respiratory irritation due to inhalation of high concentrations.

Aspiration Hazard:

- Not applicable (gaseous state).

12. Ecological Information**12.1 Toxicity**

- Low toxicity to aquatic organisms.
 - **LC50 (Fish, 96h):** Not available
 - **EC50 (Daphnia, 48h):** Not available

12.2 Persistence and Degradability

- The components of this product are expected to persist in the atmosphere.

12.3 Bioaccumulative Potential

- Low potential for bioaccumulation due to high volatility.

12.4 Mobility in Soil

- Highly volatile and expected to partition into the atmosphere.

12.5 Results of PBT and vPvB Assessment

- Not classified as Persistent, Bioaccumulative, and Toxic (PBT) or very Persistent and very Bioaccumulative (vPvB).

13. Disposal Considerations**13.1 Waste Treatment Methods**

- **Product Disposal:** Recover or recycle if possible. Dispose of according to local, regional, and national regulations.
- **Packaging Disposal:** Empty containers should be returned to the supplier or disposed of in accordance with local regulations.

14. Transport Information (Extended Chapter)**14.1 UN Number**

- **UN 1078**

14.2 UN Proper Shipping Name

- **Refrigerant Gas R448A**

14.3 Transport Hazard Class(es)

- **Class 2.2 (Non-flammable Gas)**

14.4 Packing Group

- Not applicable (gases do not have a packing group).

14.5 Environmental Hazards

- Not classified as a marine pollutant under IMDG.

14.6 Special Precautions for User

- Ensure proper ventilation during transport, especially in confined spaces.
- Cylinders must be transported upright and properly secured.
- Ensure that containers are properly labeled with the UN number, hazard class, and correct shipping name.

14.7 Transport in Bulk According to Annex II of MARPOL and the IBC Code

- Not applicable, as this product is transported in cylinders and not in bulk.

14.8 Additional Transport Information**Transport by Road/Rail (ADR/RID):**

- **Classification Code:** 2A (Non-flammable Gas)
- **Tunnel Restriction Code:** (C/E) – Prohibited in tunnels of category C when transported in bulk.

Transport by Sea (IMDG):

- **EMS Code:** F-C, S-V
- **Stowage:** Store away from heat sources and ensure proper ventilation.

Transport by Air (IATA):

- **Packing Instruction:** 200
- **Passenger Aircraft:** Limited to smaller quantities.
- **Cargo Aircraft Only:** Larger quantities are allowed, but adequate ventilation and stowage are required.

Special Handling Instructions:

- Ensure personnel involved in handling and transporting R448A are trained in handling pressurized gases.
- Inspect cylinders for leaks or damage before transport. Ensure they are equipped with pressure-relief devices where applicable.
- Ensure compliance with local and international regulations regarding the transportation of compressed gases.

15. Regulatory Information**15.1 Safety, Health, and Environmental Regulations/Legislation Specific for the Substance**

- **EU Regulations:**
 - **REACH Registration:** Components are registered under REACH.
 - **CLP Regulation (EC) No 1272/2008:** Classified and labeled according to CLP regulation.
 - **F-gas Regulation:** Subject to restrictions under the F-gas regulation.

15.2 Chemical Safety Assessment

- A chemical safety assessment has not been conducted for this mixture.
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16. Other Information**Key Abbreviations:**

- **PBT:** Persistent, Bioaccumulative, Toxic
- **vPvB:** Very Persistent, Very Bioaccumulative
- **LC50:** Lethal Concentration for 50% of organisms
- **EC50:** Effective Concentration for 50% of organisms

Training Advice:

- Personnel handling R448A should be trained in proper handling, storage, and emergency procedures, particularly for handling pressurized gases.

Disclaimer:

- The information provided in this SDS is correct to the best of our knowledge, based on available information at the time of publication. This SDS is intended to provide guidance for the safe handling, use, processing, storage, transportation, and disposal of the product. It should not be considered a guarantee of any specific properties.