

SAFETY DATA SHEET (SDS)

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product Identifier

Mixture identification:

Name: R448A

1.2. Relevant identified uses of the substance/mixture and uses advised against

Recommended use:

Industrial and professional

Refrigerant gas

1.3. Details of the supplier of the safety data sheet

Company:

TAZZETTI S.P.A

CORSO EUROPA 600/A

10088 VOLPIANO (TO) - ITALY-

Tel. +39 011 97021

Fax +39 011 9702460

rsg.inquiry@tazzetti.com

1.4. Emergency telephone number

Tel. +39 02 66101029 (24h / 24h) - Poison centre Niguarda Hospital of Milan (Italy)

SECTION 2. HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

EC regulation criteria 1272/2008 (CLP):

Warning, Liquef. Gas, Contains gas under pressure

2.2. Label elements

Symbols:



Signal word: Warning

Hazard statements:

H280 Contains gas under pressure; may explode if heated.

Precautionary statements:

P403 Store in a well ventilated place

P410 Protect from sunlight

P273 Avoid release to the environment.

P314 Get medical advice/attention if you feel unwell

Special Provisions:

Contains fluorinated greenhouse gases covered by the Kyoto protocol.

2.3. Other hazards

vPvB Substances: None - PBT Substances: None



Contact with liquid may cause cold burns/frostbite.
In high concentrations may cause asphyxiation.
Vapour heavier than air, may accumulate below ground level and cause choking.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances
Not applicable

3.2. Mixtures

Substances	No. Reg. REACH	CAS No.	EC No.	% (w/w)	Classific. CLP
1,1,1,2-tetrafluoroethane	01-2119459374-33-0010	811-97-2	212-377-0	21	H280 Press. Gas
2,3,3,3-tetrafluoroprop-1-ene	01-0000019665-61-0000	754-12-1	468-710-7	20	H220 Flam. Gas 1 H280 Press. Gas
Difluoromethane	01-2119471312-47-0000	75-10-5	200-839-4	26	H220 Flam. Gas 1 H280 Press. Gas
Pentafluoroethane	01-2119485636-25-0011	354-33-6	206-557-8	26	H280 Press. Gas
Trans-1,3,3,3-tetrafluoroprop-1-ene	01-0000019758-54-0000	29118-24-9	471-480-0	7	H280 Press. Gas

SECTION 4. FIRST AID MEASURES

4.1. Description of first aid measures

Skin contact:

In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.

Eye contact:

In case of contact with eyes, rinse immediately (for at least 15 minutes) with plenty of water and seek medical advice.

Ingestion:

Do not induce vomiting. Obtain medical assistance.

Inhalation:

Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

4.2. Most important symptoms and effects, both acute and delayed

Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects., Other symptoms potentially related to misuse or inhalation abuse are: Anaesthetic effects, Light-headedness, dizziness, confusion, incoordination, drowsiness, or unconsciousness, irregular heartbeat with a strange sensation in the chest, heart thumping, apprehension, feeling of fainting, dizziness or weakness. In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation.

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

Treatment: None

SECTION 5. FIRE-FIGHTING MEASURES

5.1. Extinguishing media

All known extinguishants can be used.

Extinguishing media which must not be used for safety reasons: None in particular.



5.2. Special hazards arising from the substance or mixture

The product is not flammable in air, in a normal temperature and pressure conditions. Certain mixtures of the product with air, in certain conditions of pressure may be flammable. Avoid mixtures of the product with air, under pressure.

Certain mixtures of the product and chlorine may be flammable or reactive under certain conditions. Thermal decomposition causes the emission of fumes very toxic and corrosive gases (hydrogen fluoride).

Containers may explode if heated

Do not inhale explosion and combustion gases.

5.3. Advice for fire-fighters

Use suitable breathing apparatus

Move undamaged containers from immediate hazard area if it can be done safely.

Cool containers/tank with water.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

Evacuate area.

Ensure adequate air ventilation.

Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

See protective measures under point 7 and 8.

6.2. Environmental precautions

Avoid discharge to atmosphere.

6.3. Methods and material for containment and cleaning up

Ventilate area.

6.4. Reference to other sections

See also section 8 and 13.

SECTION 7. HANDLING AND STORAGE

7.1. Precautions for safe handling

Do not allow backfeed into the container.

Use only equipment suitable for the product and the operating pressure.

Avoid contact with skin and eyes, inhalation of vapours and mists.

Only experienced and properly instructed persons should handle compressed gases.

The substance must be handled in accordance with good industrial hygiene and safety procedures.

Close container valve after each use and when empty, even if still connected to equipment.

Never attempt to repair or modify container valves or safety relief devices.

Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.

Never use direct flame to raise the pressure of a container.

Do not remove or deface labels provided by the supplier for the identification of the cylinder contents.

Do not cut, drill, grind, weld or do similar operations on containers.

7.2. Conditions for safe storage, including any incompatibilities

Observe all regulations and local requirements regarding storage of containers.

Keep container in a well ventilated place.

Protect cylinders from physical damage; do not drag, roll, slide or drop.



Keep away from open flames, sparks and heat sources.
Keep container below 50 °C.
Containers should not be stored in conditions likely to encourage corrosion.
Incompatible materials:
See paragraph 10 below.
Instructions as regards storage permises:
Adequately ventilated.

7.3. Specific end use(s)
If annexed, please make reference to the scenario

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Occupational exposure limits:

Difluoromethane : TWA 1000 ppm
Pentafluoroethane : TWA 1000 ppm
1,1,1,2-tetrafluoroethane : TWA 1000 ppm
2,3,3,3-tetrafluoroprop-1-ene : TWA 500 ppm
Trans-1,3,3,3-tetrafluoroprop-1-ene : TWA 800 ppm

Valori DNEL/PNEC:

Difluoromethane : Lavoratori/effetti sistemici a lungo termine: 7035 mg/m³
Pentafluoroethane : Lavoratori/effetti sistemici a lungo termine: 16444 mg/m³
1,1,1,2-tetrafluoroethane : Lavoratori/effetti sistemici a lungo termine: 13936 mg/m³
2,3,3,3-tetrafluoroprop-1-ene : Lavoratori/effetti sistemici a lungo termine: 23000 mg/m³
Trans-1,3,3,3-tetrafluoroprop-1-ene : Lavoratori/effetti sistemici a lungo termine: 3902 mg/m³
Difluoromethane : Acqua dolce: 0.142 mg/l; sedimento di acqua dolce: 0.534 mg/kg dw
Pentafluoroethane : Acqua dolce: 0.1 mg/l; sedimento di acqua dolce: 0.6 mg/kg dw
1,1,1,2-tetrafluoroethane : Acqua dolce: 0.1 mg/l; sedimento di acqua dolce: 0.75 mg/kg
2,3,3,3-tetrafluoroprop-1-ene : Acqua di mare: >0.01 mg/l; Sedimento di acqua dolce:>1.77 mg/kg
Trans-1,3,3,3-tetrafluoroprop-1-ene : Acqua dolce: 0.1 mg/l

8.2. Exposure controls

The product should be handled in a closed circuit.

Provide adequate general and local ventilation.

Make sure the exposure is well below the occupational exposure limits.

If the risk assessment indicates this is necessary, use the following protection

Eye protection:

If foreseeable a risk of spurts or squirts, please wear safety glasses with lateral protection in compliance with rule of law EN 166.

Protection for skin:

Protective clothing

Protection for hands:

If foreseeable a direct contact with liquid or with cold machineries/equipments for which exist a risk of cold burn, please use cold protection gloves in compliance with rule of law EN511 – 020.

Respiratory protection:

Wear self-contained breathing apparatus in compliance with EN 137 when entering area unless atmosphere is proved to be safe.

Thermal Hazards:

Contact with liquid may cause cold burns/frostbite.

Environmental exposure controls:

Refer to environment legislation. Please observe section 13 (Waste treatment methods).

Contact with liquid may cause cold burns/frostbite.

In high concentrations may cause asphyxiation.

Vapour heavier than air, may accumulate below ground level and cause choking.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance and colour:	Gas, Incolour
Odour:	Ethereal
Odour threshold:	Information not available
pH:	Not applicable to substance
Melting point / freezing point:	Information not available
Initial boiling point and boiling range:	Information not available
Solid/gas flammability:	Not applicable to substance
Upper/lower flammability or explosive limits:	Not applicable to substance
Vapour density:	Information not available
Flash point:	Not applicable to substance
Evaporation rate:	Information not available
Vapour pressure:	1.120 kPa a 21.1 °C; 2.588 kPa a 54.4 °C
Relative density:	Information not available
Solubility in water:	Not soluble
Solubility (in other substances):	Alcohols, chlorinated solvents, esthers
Partition coefficient n-octanol/water (POW):	Not tested
Auto-ignition temperature:	Not applicable to substance
Decomposition temperature:	Not tested
Viscosity:	Not tested
Explosive properties:	Not applicable to substance
Oxidizing properties:	Not applicable to substance

9.2. Other information

No data available

SECTION 10. STABILITY AND REACTIVITY

10.1. Reactivity

The product is not flammable in air, in a normal temperature and pressure conditions. Certain mixtures of the product with air, under certain pressure conditions which may be flammable. Avoiding product mixtures with air under pressure.

Certain product mixtures and chlorine may be flammable or reactive under certain conditions. Thermal decomposition gas emissions very toxic and corrosive fumes (hydrogen fluoride)

10.2. Chemical stability

Stable in normal conditions

10.3. Possibility of hazardous reactions

Can react violently if in contact with alkali metals, alkaline earth metals.

10.4. Conditions to avoid

Avoid all possible sources of ignition (spark or flame). Don't smoke.

10.5. Incompatible materials

Finely divided metals, magnesium and alloys containing more than 2% magnesium, powdered metal salts.

10.6. Hazardous decomposition products

Hydrogen fluoride by thermal decomposition and hydrolysis, carbon oxides, carbonyl fluoride, fluorocarbons.



SECTION 11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Toxicological information of the substance:

Acute inhalation toxicity:

1,1,1,2-tetrafluoroethane: CL50/4h - inhalation - rat = >567000 ppm

2,3,3,3-tetrafluoropropene: CL50/4h - inhalation - rat = >405000 ppm

Difluoromethane: CL50/4h - inhalation - rat = >520000 ppm

Pentafluoroethane: CL50/4h - inhalation - rat > 800000 ppm

Skin irritation: not known

Eye irritation: not known

Sensitisation: not known

Mutagenicity: not known

Carcinogenicity: not known

Toxicity to reproduction assessment: not known

STOT — single exposure: not known

STOT — repeated exposure: not known

Aspiration hazard: not known

SECTION 12. ECOLOGICAL INFORMATION

12.1. Toxicity

1,1,1,2-tetrafluoroethane:

Toxicity to fish: LC50/96h/rainbow trout (*Oncorhynchus mykiss*): 450 mg/l

Toxicity to aquatic plants: EC50/72h/algae: >118 mg/l ⁽¹⁾

Toxicity to aquatic invertebrates: EC50/48h/daphnia magna: 980 mg/l

2,3,3,3-tetrafluoropropene:

Toxicity to fish: CL50/96h/*Cyprinus carpio*: > 197 mg/l

Toxicity to aquatic plants: CE50/72h/algae: > 100 mg/l

Toxicity to aquatic invertebrates: CE50/48h/daphnia magna: > 100 mg/l

Pentafluoroethane:

Toxicity to fish: LC50/96h/zebra fish (*Danio rerio*): >200 mg/l ⁽¹⁾

Toxicity to fish: LC50/96h/Rainbow trout (*Oncorhynchus mykiss*): 450 mg/l ⁽¹⁾

Toxicity to aquatic plants: EC50/96h/algae: 142 mg/l ⁽¹⁾

Toxicity to aquatic invertebrates: EC50/48h/daphnia magna: >200 mg/l ⁽¹⁾

Difluoromethane:

Toxicity to fish: CL50/96h/ poisson: 1507 mg/l

Toxicity to aquatic plants: CE50/96h/alga: 142 mg/l

Toxicity to aquatic invertebrates: CE50/48h/daphnia magna: 652 mg/l

⁽¹⁾ : Information given is based on data obtained from similar substances.

12.2. Persistence and degradability

Not easily biodegradable

12.3. Bioaccumulative potential

Bioaccumulation is unlikely

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB assessment

vPvB Substances: None - PBT Substances: None



12.6. Other adverse effects

Contains fluorinated greenhouse gases covered by the Kyoto protocol.

GWP: 1387

SECTION 13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Recover if possible. In so doing, comply with the local and national regulations currently in force.

Destruction should be on licensed premises equipped to absorb and neutralize acid gases and other toxic processing products.

Avoid release to the environment

Avoid discharge to atmosphere.

Recovering according to the supplier's instructions.

SECTION 14. TRANSPORT INFORMATION

14.1. UN number

ADR/RID/IMDG/IATA - UN number: 1078

In case a substance is inside a refrigerating machine is applied the following n° ONU: 2857

14.2. UN proper shipping name:

ADR/RID/IMDG - Shipping name: REFRIGERANT GAS N.O.S.

IATA-Technical name: REFRIGERANT GAS N.O.S.

In case a substance is inside a refrigerating machine the shipping name will be: REFRIGERATING MACHINES containing non-flammable, no-toxic, gases or ammonia solutions (N° ONU 2672).

14.3. Transport hazard class(es)

ADR/RID-Class: 2

ADR-Label: 2.2

RID-Label: 2.2 (+13)

ADR/RID - Hazard identification number: 20

Classification code: 2A

IATA/IMDG - Class: 2.2

14.4. Packing Group

ADR- Packing Group: -

14.5. Environmental hazards: No

14.6. Special Precautions for User

ADR-Tunnel restriction code: C/E

Ensure there is adequate ventilation

Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.

Compliance with applicable regulations.

Before transporting product containers :

- Ensure that containers are firmly secured.
- Ensure cylinder valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.

Avoid transport on vehicles where the load space is not separated from the driver's compartment.

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable



SECTION 15. REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
Dir. 67/548/EEC (Classification, packaging and labelling of dangerous substances). Dir. 99/45/EEC (Classification, packaging and labelling of dangerous preparations). Dir. 98/24/EC (Risks related to chemical agents at work). Dir. 2000/39/EC (Occupational exposure limit values); Dir. 2006/8/CE. Regulation (CE) n. 1907/2006 (REACH), Regulation (CE) n. 1272/2008 (CLP), Regulation (CE) n. 790/2009 (1° ATP CLP), Regulation (EU) n. 2015/830.

Where applicable, refer to the following regulatory provisions :

Directive 2003/105/CE ('Activities linked to risks of serious accidents') and subsequent amendments.
1999/13/EC (VOC directive)

15.2. Chemical Safety Assessment: yes

SECTION 16. OTHER INFORMATION

Revised safety data sheet in accordance with commission regulation (EU) No 2015/830

Ensure operators understand the flammability hazard.

Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard.

This document was prepared by a competent person who has received appropriate training.

Main bibliographic sources:

ECHA: European chemical agency

ECDIN - Environmental Chemicals Data and Information Network - Joint Research Centre, Commission of the European Communities

SAX's DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS - Eight Edition - Van Nostrand Reinold

CCNL - Appendix 1. EIGA

The information contained herein is based on our state of knowledge at the above-specified date. It refers solely to the product indicated and constitutes no guarantee of particular quality.

It is the duty of the user to ensure that this information is appropriate and complete with respect to the specific use intended.

Classification in accordance with calculation methods of regulation (EC) 1272/2008 CLP / (EC) 1999/45 DPD. The MSDS cancels and replaces any preceding release.

ADR:	European Agreement concerning the International Carriage of Dangerous Goods by Road.
CAS:	Chemical Abstracts Service (division of the American Chemical Society).
CLP:	Classification, Labeling, Packaging..
DNEL:	Derived No Effect Level.
EINECS:	European Inventory of Existing Commercial Chemical Substances.
GHS:	Globally Harmonized System of Classification and Labeling of Chemicals.
IATA:	International Air Transport Association.
IATA-DGR:	Dangerous Goods Regulation by the "International Air Transport Association" (IATA).
ICAO:	International Civil Aviation Organization.
ICAO-TI:	Technical Instructions by the "International Civil Aviation Organization" (ICAO).
IMDG:	International Maritime Code for Dangerous Goods.
LC50:	Lethal concentration, for 50 percent of test population.
LD50:	Lethal dose, for 50 percent of test population.
LTE:	Long-term exposure.
PNEC:	Predicted No Effect Concentration.
RID:	Regulation Concerning the International Transport of Dangerous Goods by Rail.



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STE: Short-term exposure.
STEL: Short Term Exposure limit.
STOT: Specific Target Organ Toxicity.
TLV: Threshold Limiting Value.
TWATLV: Threshold Limit Value for the Time Weighted Average 8 hour day.
(ACGIH Standard).