



SAFETY DATA SHEET (SDS)

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

1.1. Product identifier

Identification of the substance:

Name: R1234yf
CAS Number: 754-12-1
EC Number: 468-710-7

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

Recommended use:

Refrigerant

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

Competent person responsible for the safety data sheet:

rsg.inquiry@tazzetti.com

1.4. Emergency telephone number

Tel. +39 02 66101029 (24h / 24h)

2. HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

Directive criteria 67/548/CE, 99/45/CE and following amendments thereof:

Properties / Symbols:

F+ Extremely flammable

R Phrases:

R12 Extremely flammable.

EC regulation criteria 1272/2008 (CLP):

Warning, Flam. Gas 1, Extremely flammable gas.

Warning, Press. Gas, Contains gas under pressure.

2.2. Label elements

Symbols:



Danger

Hazard statements:

H220 Extremely flammable gas

H280 Contains gas under pressure; may explode if heated.

Precautionary statements:

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.



P260 Do not breathe dust / fume / gas / mist / vapours / spray
P308 + P313 IF exposed or concerned: Get medical advice/ attention
P377 Leaking gas fire: do not extinguish, unless leak can be stopped safely.
P381 Eliminate all ignition sources if safe to do so
P410+403: Protect from sunlight. Store in a well ventilated place
Special Provisions:
None

2.3. Other Hazards

vPvB Substances: None - PBT Substances: None

Rapid evaporation of the liquid may cause frostbite. May irritate eye

In high concentration may be asphyxiant.

Causes asphyxiation in high concentrations. The victim will not realize that he/she is suffocating.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Identification of the substance:

Name: R1234yf
Chemical name: 2,3,3,3-Tetrafluoroprop-1-ene

3.2. Mixtures Not applicable

4. FIRST AID MEASURES

4.1. Description of first aid measures

In case of skin contact:

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

Take off all contaminated clothing immediately.

In case of contact with liquid, thaw frosted parts with water, then remove clothing carefully. Wash with plenty of water. Wash contaminated clothing before re-use. Consult a physician.

In case of eyes contact:

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

In case of ingestion:

Obtain medical assistance.

In case of 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

No data available.

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

Treatment: Adrenaline derivatives are contra-indicated., Treat symptomatically.

See Section 11 for more detailed information on health effects and symptoms.

5. FIRE-FIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media:

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Extinguishing media which must not be used for safety reasons:

None in particular.



5.2. Special hazards arising from the substance or mixture

Extremely flammable.

Some risk may be expected of corrosive and toxic decomposition products.

In case of fire hazardous decomposition products may be produced such as:

Carbon monoxide

Hydrogen halides

Carbonyl halides

Pyrolysis products containing fluoride

Cool closed containers exposed to fire with water spray.

Heating will cause pressure rise with risk of bursting and subsequent explosion.

5.3. Advice for fire-fighters

Use self-contained breathing apparatus and chemically protective clothing.

Collect separately contaminated water used to extinguish the fire. Not be discharged into drains.

If feasible in terms of safety, move from immediate danger undamaged containers.

Cool the containers exposed to the fire with water. Fight fire remotely due to the risk of explosion.

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.

Provide adequate ventilation.

Remove all sources of ignition.

Evacuate area.

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

Wear breathing apparatus if exposed to vapours/dusts/aerosols.

Pay attention to the spreading of gases especially at ground level (heavier than air) and to the direction of the wind.

See protective measures under point 7 and 8.

6.2. Environmental precautions

Do not allow to enter into soil/subsoil. Do not allow to enter into surface water or drains.

Retain contaminated washing water and dispose it.

In case of gas escape or of entry into waterways, soil or drains, inform the responsible authorities.

6.3. Methods and materials for containment and cleaning up

Reduce vapour with fog or fine water spray.

Provide containment for water used

Wash with plenty of water

Ventilate area

6.4. Reference to other sections

See also section 8 and 13

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

Take precautionary measures against static discharge.

Keep away from ignition sources (including static discharges).

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

Use localized ventilation system.

Don't use empty container before they have been cleaned.



Before making transfer operations, assure that there aren't any incompatible material residuals in the containers.

Contaminated clothing should be changed before entering eating areas.

Do not eat or drink while working.

Do not smoke while working.

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.

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

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

See also section 8 for recommended protective equipment.

Purge air from system before introducing gas.

Ensure the complete gas system was (or is regularly) checked for leaks before use.

Assess the risk of potentially explosive atmosphere and the need for explosion-proof equipment.

Consider the use only non-sparking tools.

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

If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.

7.2. Conditions for safe storage, including any incompatibilities

Observe all regulations and local requirements regarding storage of containers.

All electrical equipment in the storage areas should be compatible with the risk of potentially explosive atmosphere.

Keep container below 50°C in a well ventilated area.

Keep away from ignition sources (including static discharges).

Do not store near oxidizing containers.

Always keep in a well ventilated place.

Keep away from unguarded flame, sparks, and heat sources.

Keep away from food, drink and feed.

Segregate from oxidant gases and other oxidants in store.

Incompatible materials:

None in particular. See also section 10.

Instruction as regards storage premises:

Adequately ventilated.

Containers should not be stored in conditions likely to encourage corrosion. Containers should be protected against falling down

7.3. Specific end use(s)

No data available

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Components: 2,3,3-Tetrafluoroprop-1-ene; Basis: WEEL; Value type: TWA; Control parameters: 500 ppm;

Remarks: we are not aware of any national exposure limit.

No DNEL-data available.

No PNEC data available.

8.2. Exposure controls

Appropriate engineering controls:

Product to be handled in a closed system

Ensure that the exposure is well below the occupational exposure limits.

Consider work permit system e.g. for maintenance activities.

Ensure adequate local and general air ventilation.



If required to risk assessment, please use the following PPE

Eye protection:

Wear goggles and face shield during transfer operations or disconnection

Protection for skin:

Keep suitable chemically resistant protective clothing readily available for emergency use.

Protection for hands:

Protective gloves against cold.

Respiratory protection:

Keep self contained breathing apparatus readily available for emergency use.

Use full face mask with gas filter when exposure limits may be exceeded for a short time, for example when connecting or disconnecting containers

Never use any kind of filtering respiratory protection equipment when working with this substance due to it having poor or no warning properties.

Gas filters do not protect against oxygen deficiency.

Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing

Thermal Hazards:

Contact with liquid may cause cold burns/frostbite.

Environmental exposure controls:

Refer to environment legislation

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance and colour:	Compressed liquefied gas
Odour:	Ether
pH:	N.A.
Melting point / freezing point:	N.A.
Initial boiling point and boiling range:	-29.4 °C
Solid/gas flammability:	Extremely flammable
Upper/lower flammability or explosive limits:	6.2 a 12.3 % (V)
Vapour density:	>1 (air=1)
Flash point:	N.A.
Evaporation rate:	N.A.
Vapor pressure:	6.067 hPa (21.1 °C); 14.203 hPa (54.4 °C)
Density:	1.1 g/cm ³ (at 25 °C)
Solubility in water:	198.2 mg/l (at 24 °C)
Partition coefficient (n-octanol/water):	log Pow 2.15
Autoignition temperature:	405 °C
Relative vapour density:	4
Decomposition temperature:	N.A.
Viscosity:	N.A.
Explosive properties:	N.A.
Oxidising properties:	N.A.

9.2. Other informations

N.A.

10. STABILITY AND REACTIVITY

10.1. Reactivity

Stable under normal conditions.



10.2. Chemical stability

N.A.

10.3. Possibility of hazardous reactions

Hazardous polymerisation does not occur.

Note: Stable under normal conditions.

10.4. Conditions to avoid

Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.

Heat, flames and sparks

10.5. Incompatible materials

Reactions with alkali metals.

Reactions with light metals.

Zinc

Magnesium.

10.6. Hazardous decomposition products

In case of fire hazardous decomposition products may be produced such as:

Hydrogen fluoride

Carbonyl halides

Carbon monoxide

Carbon dioxide (CO₂).

11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Toxicological information of the substance:

Acute toxicity:

CL50/4h - Inhalation - Rat= >400000 ppm. Exposure time: 4 h

Skin irritation: slight irritation

Eye irritation: slight irritation

Sensitisation: Cardiac sensitization, Species: dogs, Result: No effects observed for exposures up to 12% (120,189 ppm).

Repeated dose toxicity:

Species: Rat, Application Route: Inhalation, Exposure time: 2 Weeks, NOEL : 50000 ppm

Species: Rat, Application Route: Inhalation, Exposure time: 4 Weeks, NOEL : 50000 ppm

Species: Rat, Application Route: Inhalation, Exposure time: 13 Weeks, NOEL : 50000 ppm

Species: Rabbit, male, Application Route: Inhalation, Exposure time: 28 d, NOEL : 500 ppm

Species: Rabbit, female, Application Route: Inhalation, Exposure time: 28 d, NOEL : 1000 ppm

Species: Mini-pig, Application Route: Inhalation, Exposure time: 28 d, NOAEL : 10,000 ppm, Note: highest exposure tested

Genotoxicity in vitro:

Test Method: Ames test, Result: 20% and higher, positive in TA 100 and e. coli WP2, uvrA, negative in TA98, TA100, and TA1535.

Test Method: Chromosome aberration test in vitro, Cell type: Human lymphocytes, Result: negative, Note: Dose 760,000 ppm

Test Method: Chromosome aberration test in vitro, Cell type: Chinese Hamster Lung Cells, Result: negative

Genotoxicity in vivo:

Species: Mouse, Cell type: Micronucleus, Dose: up to 200,000 ppm (4 hour), Result: negative

Test Method: Unscheduled DNA synthesis, Dose: up to 50,000 ppm (4 weeks), Result: negative

Species: Rat, Cell type: Micronucleus, Dose: up to 50,000 ppm (4 weeks), Result: negative

Reproductive Toxicity/Fertility

Species: Rat, Application Route: Inhalation exposure, Exposure time: Two-generation reproductive toxicity
NOAEL,parent: 50,000 ppm, NOAEL,F1: 50,000 ppm, NOAEL,F2: 50,000 ppm



Teratogenicity and developmental toxicity

Species: Rat, Dose: NOAEL (No observed adverse effect level) - 50,000 ppm

Species: Rabbit, Dose: NOAEL (No observed adverse effect level) - 4,000 ppm

12. ECOLOGICAL INFORMATION

12.1. Toxicity

Toxicity to fish: CL50/96h/Cyprinus carpio (Carp): >197 mg/l

Toxicity to aquatic plants: EC50 Scenedesmus capricornutum: >100 mg/l

Toxicity to aquatic invertebrates: EC50/48h/daphnia magna: > 83 mg/l

12.2. Persistence and degradability: not readily biodegradable

12.3. Bioaccumulative potential: no data available

12.4. Mobility in soil: no data available

12.5. Results of PBT and vPvB assessment

No data available

12.6. Other adverse effects:

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Recover, if possible. Send to authorised disposal plants or for incineration under controlled conditions. In so doing, comply with the local and national regulations currently in force.

Avoid discharge in atmosphere.

Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor.

Contact supplier if guidance is required.

14. TRANSPORT INFORMATIONS

14.1. UN Number

ONU ADR/RID/IMDG/IATA -Number: 3161

14.2. UN proper shipping name

ADR/RID/IMDG - shipping name: Liquefied Gas, Flammable, N.O.S.

IATA Technical name: Liquefied Gas, Flammable, N.O.S.

14.3. Transport hazard class(es)

ADR/RID - Class: 2

ADR - Label: 2.1

RID - Label: 2.1 (+13)

ADR/RID - Hazard identification number: 23

Classification code: 2F

IATA/IMDG - Class: 2.1

14.4. Packing group

ADR - Packing group: -

14.5. Environmental hazards: No



14.6. Special precautions for user

ADR-Tunnel restriction code: B/D

IATA - Passenger aircraft: N.D.

IATA - Cargo Aircraft: N.D.

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: N.A.

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. 453/2010 (Annex I).

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: No

16. OTHER INFORMATION

Revised safety data sheet in accordance with commission regulation (EU) No 453/2010

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:

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 (divisione della 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.
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).
N.A.	Not available
WEEL:	Workplace Environmental Exposure Level