

2,3,3,3-Tetrafluoroprop-1-ene, HFO-1234yf

Version 1.11

Revision Date 15.07.2008

Print Date 01.10.2008

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

Product information

Trade name : 2,3,3,3-Tetrafluoroprop-1-ene, HFO-1234yf

Use of the Substance/Preparation : Refrigerant

Company/Undertaking Identification

Company : Honeywell Fluorine Products Europe B.V.
Laarderhoogtweg 18
1101 EA Amsterdam
Telephone : (31) 020 5656911
Telefax : (31) 020 5656600
Emergency telephone : (32) 14584545
For further information, please contact: : SafetyDataSheet@Honeywell.com

2. HAZARDS IDENTIFICATION

Risk advice to man and the environment

F+, Extremely flammable

R12 Extremely flammable.

Additional advice : Rapid evaporation of the liquid may cause frostbite.
High vapour concentrations can cause headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical characterization

Chemical Name : 2,3,3,3-Tetrafluoroprop-1-ene, HFO-1234yf
CAS-No. : 754-12-1
EC-No. : 468-710-7

Hazardous components

Chemical Name	CAS-No.	EC-No.	Index-No.	Classification	Concentration [%]
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	468-710-7		F+; R12	<= 100

Occupational Exposure Limit(s), if available, are listed in Section 8.
For the full text of the R-phrases mentioned in this Section, see Section 16.

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4. FIRST AID MEASURES

- General advice : First aider needs to protect himself.
Take off all contaminated clothing immediately.
- Inhalation : When inhaled remove to fresh air and seek medical aid.
If breathing is irregular or stopped, administer artificial respiration.
If unconscious place in recovery position and seek medical advice.
- Skin contact : Rapid evaporation of the liquid may cause frostbite.
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.
- Eye contact : Protect unharmed eye.
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Call a physician immediately.
- Ingestion : Rinse mouth.
Call a physician immediately.

Notes to physician

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

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

5. FIRE-FIGHTING MEASURES

- Suitable extinguishing media : Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
- Specific hazards during fire fighting : 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
- Special protective equipment for fire-fighters : Wear self-contained breathing apparatus and protective suit.
- Further information : In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions : Keep people away from and upwind of spill/leak.
Ventilate the area.
Wear self-contained breathing apparatus and protective suit.

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- Environmental precautions : The product evaporates readily.
Prevent product from entering drains.
- Methods for cleaning up : Use low-sparking handtools and explosion-proof electrical equipment
Allow to evaporate.
- Additional advice : Inform the responsible authorities in case of gas leakage, or of entry into waterways, soil or drains.
Pay attention to the spreading of gases especially at ground level (heavier than air) and to the direction of the wind.

For personal protection see section 8.

7. HANDLING AND STORAGE

Handling

- Advice on safe handling : Exhaust ventilation at the object is necessary.
Use explosion-proof equipment.
Pressurized container: Protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use.
- Advice on protection against fire and explosion : Use only in explosion-proof areas.
Keep product and empty container away from heat and sources of ignition.
Use only explosion-proof equipment.
Fire or intense heat may cause violent rupture of packages.

Storage

- Further information on storage conditions : Keep containers tightly closed in a cool, well-ventilated place.
Containers should be protected against falling down.
Protect from warmth.
Do not store at temperature exceeding 50 °C
Keep away from direct sunlight.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational exposure controls

Components	Basis	Value type	Control parameters	Exceeding Factor	Form of exposure	Remarks
2,3,3,3-Tetrafluoroprop-1-ene	HONEYWELL	Time Weighted Average (TWA):	400 ppm			We are not aware of any national exposure limit.

Engineering measures

Highly effective exhaust ventilation

Personal protective equipment

Respiratory protection : Remarks: In case of insufficient ventilation wear suitable

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	respiratory equipment.
Hand protection	: Wear suitable gloves. Heat insulating gloves
Eye protection	: Goggles
Skin and body protection	: Wear suitable protective equipment.
Hygiene measures	: Provide adequate ventilation. Do not smoke. When using do not eat or drink.
Protective measures	: The Personal Protective Equipment must be in accordance with EN standards:respirator EN 136, 140, 149; safety glasses EN 166; protective suit: EN 340, 463, 468, 943-1, 943-2; gloves EN 374, safety shoes EN-ISO 20345.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	: compressed liquefied gas
Colour	: colourless
Odour	: slight, original odour
molecular weight	: 114 g/mol

Safety data

Flash point	: Remarks: not applicable
Flammability (solid, gas)	: Extremely flammable gas. Method: Flammability (gases)
Auto ignition temperature	: 405 °C Method: 92/69/EEC, A.15
Lower explosion limit	: 6,2 %(V)
Upper explosion limit	: 12,3 %(V)
Vapour pressure	: 6.067 hPa at 21,1 °C
Vapour pressure	: 14.203 hPa at 54,4 °C
pH	: Remarks: no data available
Water solubility	: 198,2 mg/l at 24 °C Method: 92/69/EEC, A.6

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Partition coefficient: n-octanol/water : POW: 2,15
Method: 92/69/EEC, A.8

Relative vapour density : 4

Evaporation rate : Remarks: not determined

10. STABILITY AND REACTIVITY

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.

Materials to avoid : Reactions with alkali metals.
Reactions with light metals.
Finely divided aluminium
Zinc
Magnesium

Hazardous decomposition products : Risk of formation of toxic pyrolysis products containing fluorine.
Carbon monoxide
Carbon dioxide (CO₂)
Carbonyl halides
Hydrogen halides

11. TOXICOLOGICAL INFORMATION

Acute inhalation toxicity : LC₅₀
Species: rat
Dose: > 400000 ppm
Exposure time: 4 h

Skin irritation : Remarks: slight irritation

Eye irritation : Remarks: slight irritation

Repeated dose toxicity : Species: rat
Route of exposure: Inhalation
NOEL: 233 mg/kg
NOEL: 50000 ppm

Further information : Remarks: Concentration above the admissible concentration at the workplace may cause dizziness, headache and inebriation.
2,3,3,3-Tetrafluoropropene: Mouse Micronucleus (4-hour): No toxicological significant signs reported. No increase in the frequency of micronuclei. Cardiac Sensitization: No effects for exposures up to 12% (120, 189 ppm).

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

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Toxicity to fish	:	LC50 Species: Cyprinus carpio (Carp) Value: > 197 mg/l Exposure time: 96 h Method: OECD Test Guideline 203 Remarks: No demonstrable toxic effect in saturated solution.
Toxicity to aquatic plants	:	EC50 Species: Scenedesmus capricornutum (fresh water algae) Value: > 100 mg/l
Acute toxicity to aquatic invertebrates	:	EC50 Species: Daphnia magna (Water flea) Value: > 83 mg/l Exposure time: 48 h Method: OECD Test Guideline 202
Additional ecological information	:	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

13. DISPOSAL CONSIDERATIONS

Product	:	Dispose according to legal requirements.
Packaging	:	Legal requirements are to be considered in regard of reuse or disposal of used packaging materials

14. TRANSPORT INFORMATION

ADR

UN Number	:	3161
Description of the goods	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (2,3,3,3-TETRAFLUOROPROP-1-ENE)
Class	:	2
Classification Code	:	2F
Hazard identification No	:	23
Hazard Label	:	2.1

IATA

UN Number	:	3161
Description of the goods	:	Liquefied gas, flammable, n.o.s. (2,3,3,3-Tetrafluoroprop-1-ene)
Class	:	2.1
Hazard Label	:	2.1
Packing instruction (cargo aircraft)	:	200

IMDG

UN Number	:	3161
Description of the goods	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (2,3,3,3-TETRAFLUOROPROP-1-ENE)
Class	:	2.1
Hazard Label	:	2.1

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EmS Number : F-D
Marine pollutant : no

RID

UN Number : 3161
Description of the goods : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(2,3,3,3-TETRAFLUOROPROP-1-ENE)
Class : 2
Classification Code : 2F
Hazard identification No : 23
Hazard Label : 2.1

15. REGULATORY INFORMATION

Labelling according to EC Directives 67/548/EEC

Symbol(s) : F+ Extremely flammable
R-phrase(s) : R12 Extremely flammable.
S-phrase(s) : S 9 Keep container in a well-ventilated place.
S16 Keep away from sources of ignition - No smoking.

Hazardous components which must be listed on the label:

- 2,3,3,3-Tetrafluoroprop-1- 754-12-1
ene

16. OTHER INFORMATION

Text of R-phrases referred to under heading 3

2,3,3,3-Tetrafluoroprop-1- : R12 Extremely flammable.
ene

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. Final determination of suitability of any material is the sole responsibility of the user.

This information should not constitute a guarantee for any specific product properties.