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SDS No.: 000941-001 Version 1.0 Date 28.02.2007

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

Substance name : FORANE 134a

Recommended use : Refrigerant
Blowing agent
Aerosol propellants

Supplier : ARKEMA – France
FLUORES
Cours Michelet - La Défense 10
92091 PARIS LA DEFENSE CEDEX
FRANCE
Téléphone : +33 (0)1 49 00 80 80
Télécopie : +33 (0)1 49 00 83 96
<http://www.arkema.com>

National importer : ARKEMA Ltd
6270 Bishop's Court
Solihull Parkway
Birmingham Business Park
B37 7YB
UNITED KINGDOM
Tel: 0121 779 5459

Emergency telephone number : National Chemical Emergency Centre Tel: 01865 407 333

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name of the substance : FORANE 134a
Halogenated hydrocarbon

Components

Chemical Name *)	EC-No.	CAS-No.	Concentration	Classification
Norflurane	212-377-0	811-97-2	100 %	–

No dangerous ingredients according to Directive 2001/58/EC

*) See chapter 14 for Correct Shipping Name

Chemical formula : C₂H₂F₄

3. HAZARDS IDENTIFICATION

Most important hazards:

Physical and chemical hazards : The gaseous product in presence of air can form, under certain conditions of temperature and pressure, a flammable mixture
Decomposition products: See chapter 10

Specific hazards / EC : This substance is not classified as dangerous according to Directive 67/548/EEC.

4. FIRST AID MEASURES

Inhalation : Move patient from contaminated area to fresh air.

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- In case of persistent problems :
Consult a physician.
- Skin contact : Frostbite : treat as thermal burns
- Eye contact : Wash immediately, abundantly and thoroughly with water
If irritation persists, consult an ophthalmologist
- Protection of first-aiders : In case of insufficient ventilation, wear suitable respiratory equipment.
- Notes to physician : Do not administer catecholamines (because of the cardiac effect
caused by the product)

5. FIRE-FIGHTING MEASURES

- Specific hazards : At high temperature:
Thermal decomposition giving toxic and corrosive products :
Hydrogen fluoride
Carbon oxides
- Specific methods : Prohibit all sources of sparks and ignition - Do not smoke.
Cool containers / tanks with water spray.
Ensure a system for the rapid emptying of containers
In case of fire nearby, remove exposed containers
- Special protective equipment for fire-fighters : In the event of fire, wear self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions : Avoid contact with the skin and the eyes.
In enclosed areas : ventilate or wear a self-contained breathing
apparatus (risk of anoxia)
Remove all sources of ignition.
Do not smoke.

7. HANDLING AND STORAGE

- Handling
- Technical measures/Precautions : Storage and handling precautions applicable to products:
Gases under pressure
Provide appropriate exhaust ventilation at machinery.
- Safe handling advice : Prohibit ignition sources near the point where containers are opened -
Do not smoke
- Storage
- Technical measures/Storage conditions : Keep in a cool, well-ventilated place.
Keep away from heat and sources of ignition. Do not smoke
Keep away from open flames, hot surfaces and sources of ignition.
Protect full containers from sources of heat to avoid
overpressurization
- Incompatible products : Alkaline hydroxides
Alkaline earth metals
Strong oxidizing agents

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Finely divided metals :

Packaging material

Recommended : Ordinary steel
Stainless steel

Materials to avoid : Alloys containing more than 2% of magnesium
Plastic materials

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General protective measures : Provide sufficient air exchange and/or exhaust in work rooms.

Control parameters

Exposure limit(s)

Norflurane

Source	Date	Value type	Value (ppm)	Value (mg/m3)	Remarks
EH40 WEL	2005	TWA	1,000	4,240	–
ARKEMA		VME (FR)	1,000	4,240	Value recommended by the "Comité Valeur limite d'exposition" of ARKEMA
WEEL	2005	TWA	1,000	4,240	–

Personal protective equipment

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment.

Hand protection : Leather gloves

Eye protection : Safety glasses with side-shields

Skin and body protection : Protective clothing (cotton)

Hygiene measures : Do not smoke.
Avoid contact with the skin and the eyes.
Avoid inhalation of vapours

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C) : gaseous

Form : Liquefied gas

Colour : colourless

Odour : Slightly ether-like

pH : not applicable

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Boiling point/range	:	-26.4 °C
Melting point/range	:	-101 °C
Decomposition temperature	:	> 370 °C
Flash point	:	No flash point in test conditions
Autoignition temperature	:	743 °C(1 bar) 215 °C(3 bar)
Vapour pressure	:	0.665 MPa (25 °C) 1.32 MPa (50 °C) 2.12 MPa (70 °C)
Vapour density	:	4.26 kg/m3 (25 °C)
Density	:	1,206 kg/m3 (25 °C) 1,102 kg/m3 (50 °C) 996 kg/m3 (70 °C)
Relative density Water=1	:	1.21 (20 °C) 1.1 (50 °C)
Solubility		
Water solubility	:	0.9 g/l (25 °C) Does not dissociate in water 0.97 g/l (25 °C) Solubility of water in the product
Partition coefficient (n-octanol/water)	:	log Kow : 1.06
Henry constant	:	1.53E+00Pa.m3/mole
Molecular Weight	:	102 g/mol
Critical point	:	Critical pressure: 4.07 MPa Critical temperature: 101 °C

10. STABILITY AND REACTIVITY

Conditions to avoid	:	Keep away from heat and sources of ignition. Avoid contact with flames and red hot metallic surfaces
Thermal decomposition	:	Decomposition temperature: > 370 °C
Materials to avoid	:	Alkaline hydroxides Alkaline earth metals Strong oxidizing agents Finely divided metals :

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- Hazardous decomposition products : At high temperature:
Thermal decomposition giving toxic and corrosive products :
Gaseous hydrogen fluoride (HF).
Carbon oxides
- Further information : The product is stable at ambient temperature
The gaseous product in presence of air can form, under certain conditions of temperature and pressure, a flammable mixture

11. TOXICOLOGICAL INFORMATION

Acute toxicity

- Inhalation : As with other volatile aliphatic halogenated compounds, through vapour accumulation and/or inhalation of large quantities, the product can cause :
Loss of consciousness and cardiac disorders aggravated by stress and lack of oxygen, risk of mortality
- Experimental effects on animals :
Practically not harmful by inhalation
Central nervous system depression
narcosis
LC50/4 h/rat: > 500000 ppm
(50 %)

Local effects

- Skin contact : Ejection of liquefied gas : frostbite possible
- Eye contact : Ejection of liquefied gas : frostbite possible

Sensitization

- Skin contact : Not a skin sensitizer
guinea pig
- Repeated dose toxicity : Studies of prolonged inhalation in animals showed no specific chronic toxic effects

Specific effects

- Genotoxicity : According to available experimental data
Not genotoxic
- Carcinogenicity : • In animals:
- By inhalation
rat
Absence of carcinogenic effects
- By oral route
rat
Absence of carcinogenic effects

Toxicity to reproduction

- Fertility : Absence of toxic effects on fertility
- By inhalation/mouse

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Foetal development : Absence of congenital malformations and embryotoxic effects in rodents at non-toxic doses for the mothers
rat, rabbit/- By inhalation

12. ECOLOGICAL INFORMATION

Mobility : In soils and sediments:
Slight adsorption:
log Koc 1.5 (calculated)

Volatilization 1/2 life time: 8.6 - 16.7 y (calculated)

Henry constant: 1.53E+00Pa.m3/mole

Persistence and degradability
In water : Not readily biodegradable.:
3 % after 28 d
(OECD Guideline 301 D)

in air : Degradation in the atmosphere :
Direct photolysis (Half-life) : 8.6 - 16.7 y

Halocarbon global warming potential; HGWP; (R-11 = 1)
Value: 0.3

Ozone depletion potential; ODP; (R-11 = 1)
Value: 0

Bioaccumulation : Practically not bioaccumulable
log Kow : 1.06

Aquatic toxicity

Acute toxicity
fish : Slightly harmful to fish
LC50, 96 h (Oncorhynchus mykiss) : 450 mg/l

Aquatic invertebrates : Practically not harmful to daphnia
EC(I)50, 48 h : 930 mg/l

microorganisms : Bacteria
EC10, 6 h (Pseudomonas putida) : > 730 mg/l

13. DISPOSAL CONSIDERATIONS

Disposal of product : Recycle or incinerate at an approved waste disposal site
In accordance with local and national regulations.

14. TRANSPORT INFORMATION

ADR

ARKEMA – FRANCE

Cours Michelet – La Défense 10 F-92091 PARIS LA DEFENSE CEDEX – FRANCE

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UN Number : 3159
Proper shipping name : REFRIGERANT GAS R 134a
Class : 2
Classification Code : 2A
Risk No. : 20
Label : 2.2

ADNR

UN Number : 3159
Proper shipping name : REFRIGERANT GAS R 134a
Class : 2
Classification Code : 2A
Label : 2.2

RID

UN Number : 3159
Proper shipping name : REFRIGERANT GAS R 134a
Class : 2
Classification Code : 2A
Risk No. : 20
Label : 2.2

IATA Cargo

UN Number : 3159
Proper shipping name : 1,1,1,2-Tetrafluoroethane

IATA Cargo

UN Number : 3159
Proper shipping name : 1,1,1,2-Tetrafluoroethane
Class : 2.2
Label : 2.2
Class : 2.2
Label : 2.2

IATA Passenger

UN Number : 3159
Proper shipping name : 1,1,1,2-Tetrafluoroethane

IATA Passenger

UN Number : 3159
Proper shipping name : 1,1,1,2-Tetrafluoroethane
Class : 2.2
Label : 2.2
Class : 2.2
Label : 2.2

IMDG

UN Number : 3159
Proper shipping name : REFRIGERANT GAS R 134a
Class : 2.2
Label : 2.2
EmS Number : F-C, S-V
Marine pollutant : no

15. REGULATORY INFORMATION

UK REGULATION : Chip3: Chemical (Hazard Information and Packaging for Supply) Regulations 2002

EEC DIRECTIVE

Safety data sheets : D. 91/155/EEC amended by D.93/112/EC and D.2001/58/EC:

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Dangerous substances and preparations

EC classification / labelling

Dangerous Substances : D.67/548/EEC amended - Guide to classification and packaging

This substance is not classified as dangerous according to Directive 67/548/EEC.

Substances damaging to the ozone layer : Regulation EC 2037/2000 amended by regulation EC 1804/2003

Inventories : EINECS: Conforms to
TSCA: Conforms to
AICS: Conforms to
DSL: All components of this product are on the Canadian DSL list.
ENCS (JP): Conforms to
KECI (KR): Conforms to
PICCS (PH): Conforms to
INV (CN): Conforms to

16. OTHER INFORMATION

Bibliography : Encyclopédie des gaz (Air Liquide - Ed. 1976 - ELSEVIER AMSTERDAM)

This information applies to the PRODUCT AS SUCH and conforming to specifications of ARKEMA

In case of formulations or mixtures, it is necessary to ascertain that a new danger will not appear

The information contained is based on our knowledge of the product, at the date of publishing and it is given quite sincerely.

Users are advised of possible additional hazards when the product is used in applications for which it was not intended. This sheet shall only be used and reproduced for prevention and security purposes.

The references to legislative, regulatory and codes of practice documents cannot be considered as exhaustive.

It is the responsibility of the person receiving the product to refer to the totality of the official documents concerning the use, the possession and the handling of the product.

It is also the responsibility of the handlers of the product to pass on to any subsequent persons who will come into contact with the product (usage, storage, cleaning of containers, other processes) the totality of the information contained within this safety data sheet and necessary for safety at work, the protection of health and the protection of environment.