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		Cancel and replace : 11.05.2007

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

Identification of the preparation : FORANE 427A

Recommended use : Refrigerant fluid

Supplier : ARKEMA – France
FLUORES
420 rue d'Estienne d'Orves
92705 Colombes Cedex
France
Téléphone : +33 (0)1 49 00 80 80
Télécopie : +33 (0)1 49 00 83 96
<http://www.arkema.com>

Email address : pars-drp-fds@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 : National Chemical Emergency Centre Tel: 01865 407 333

2. HAZARDS IDENTIFICATION

Most important hazards:

Environmental Effects : Not readily biodegradable.

Physical and chemical hazards : Thermal decomposition giving toxic and corrosive products
Decomposition products: See chapter 10

The product does not need to be labelled in accordance with EC directives or respective national laws.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components

Chemical Name *)	EC-No.	CAS-No.	Concentration	Classification
Norflurane	212-377-0	811-97-2	50 %	–
Pentafluoroethane	206-557-8	354-33-6	25 %	–
1,1,1-Trifluoroethane	206-996-5	420-46-2	10 %	F+; R12
Difluoromethane	200-839-4	75-10-5	15 %	F+; R12

*) See chapter 14 for Proper Shipping Name

For the full text of the R phrases mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

Inhalation : Move patient from contaminated area to fresh air.

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Oxygen or artificial respiration if needed.
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
- Ingestion : Hospitalise
- 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 : Thermal decomposition giving toxic and corrosive products :
Hydrogen fluoride
Carbon oxides
One of the components of this preparation gives flammable mixtures with air
- 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 : Wear self-contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions : Avoid contact with skin and eyes and inhalation of vapours
In enclosed areas : ventilate or wear a self-contained breathing apparatus (risk of anoxia)
Remove all sources of ignition.
Do not smoke.
- Environmental precautions : Avoid release to the environment. Refer to special instructions/ Safety data sheets.

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 and contact with hot surfaces - DO NOT SMOKE
- Storage
- Technical measures/Storage : Store at room temperature in the original container.
Keep away from open flames, hot surfaces and sources of ignition.

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conditions

Keep in a cool, well-ventilated place.
Protect full containers from sources of heat to avoid overpressurization

Packaging material

Recommended : Ordinary 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	2006	TWA	1,000	4,240	–

Pentafluoroethane

Source	Date	Value type	Value (ppm)	Value (mg/m3)	Remarks
WEEL	2006	TWA	1,000	4,900	–

Difluoromethane

Source	Date	Value type	Value (ppm)	Value (mg/m3)	Remarks
ARKEMA		TWA	1,000	2,130	Value recommended by the "Comité Valeur limite d'exposition" of ARKEMA
WEEL	2006	TWA	1,000	2,200	–

1,1,1-Trifluoroethane

Source	Date	Value type	Value (ppm)	Value (mg/m3)	Remarks
WEEL	2006	TWA	1,000	3,400	–

Personal protective equipment

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Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment.
Hand protection : 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 : compressed liquefied gas
Colour : colourless
Odour : slightly ether-like
pH : not applicable
Boiling point/boilingrange : -42.7 - -35.5 °C
Flammability (solid, gas) : Non flammable product
Method: Standard : ASTM E 681-85
Vapour pressure : 0.97 MPa (20 °C)
2.08 MPa (50 °C)
Density : 1,172 kg/m³ (20 °C)
Solubility
Water solubility : Does not dissociate in water
Partition coefficient: n-octanol/water : DIFLUOROMETHANE :
log Kow : 0.21 (OECD Guideline 107)
PENTAFLUOROETHANE :
log Kow : 1.48 (measured)
NORFLURANE :
log Kow : 1.06
1,1,1-TRIFLUOROETHANE :
log Kow : 1.49 (calculated)
Henry constant : NORFLURANE:
Henry constant: 506.0E+01 Pa.m³/mol

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DIFLUOROMETHANE:
Henry constant: 296.00E+02 Pa.m³/mol

PENTAFLUOROETHANE:
Henry constant: 309.000E+03 Pa.m³/mol

1,1,1-TRIFLUOROETHANE:
Henry constant: 780.00E+02 Pa.m³/mol

|| Critical point : Critical pressure: 4.39 MPa
Critical temperature: 85.3 °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
- 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 : Effects of breathing high concentrations of vapour may include:
headache
Drowsiness
Dizziness

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
LC50/4 h/rat: > 500000 ppm

Local effects

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- Skin contact : Ejection of liquefied gas : frostbite possible
- Eye contact : Ejection of liquefied gas : frostbite possible
- Sensitisation
- Skin contact : NORFLURANE :
Not a skin sensitizer
guinea pig
- Repeated dose toxicity : Studies of prolonged inhalation in animals have not shown sub-chronic toxic effects
DIFLUOROMETHANE :
Inhalation: 3 Months / rat

No Observed Adverse Effect Level (NOAEL): 50000 ppm

PENTAFLUOROETHANE :
Inhalation: 3 Months / rat

No Observed Adverse Effect Level (NOAEL): 50000 ppm

1,1,1-TRIFLUOROETHANE :
Inhalation: 3 Months / rat

No Observed Adverse Effect Level (NOAEL): 40000 ppm
- Specific effects
- Genotoxicity : According to available experimental data
Not genotoxic
- Carcinogenicity : NORFLURANE :
Inhalation
rat
Experimentation on animals has not shown clear evidence of carcinogenic effect

1,1,1-TRIFLUOROETHANE :
According to available experimental data
- By oral route
rat
Absence of carcinogenic effects
- Toxicity to reproduction
- Fertility : NORFLURANE :
According to limited available data in animals :
Absence of toxic effects on fertility
Inhalation/mouse
- Foetal development : According to available experimental data
Absence of congenital malformations and embryotoxic effects in rodents at non-toxic doses for the mothers
rabbit, rat/- By inhalation

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12. ECOLOGICAL INFORMATION

According to its composition :
Not readily biodegradable.

Mobility

: DIFLUOROMETHANE :
In soils and sediments:
Very slight adsorption:

PENTAFLUOROETHANE :
In aqueous environment:
Volatilization 1/2 life time: 3.2 h (estimation)
In soils and sediments:
Slight adsorption:
log Koc 1.3 - 1.7

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

NORFLURANE:
Henry constant: 506.0E+01 Pa.m³/mol

DIFLUOROMETHANE:
Henry constant: 296.00E+02 Pa.m³/mol

PENTAFLUOROETHANE:
Henry constant: 309.000E+03 Pa.m³/mol

1,1,1-TRIFLUOROETHANE:
Henry constant: 780.00E+02 Pa.m³/mol

Persistence and degradability
In water

: DIFLUOROMETHANE :
Not readily biodegradable.:
5 % after 28 d
(OECD Guideline 301 D)

PENTAFLUOROETHANE :
Not readily biodegradable.:
5 % after 28 d
(OECD Guideline 301 D)

NORFLURANE :
Not readily biodegradable.:
3 % after 28 d
(OECD Guideline 301 D)

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in air

: DIFLUOROMETHANE :
Degradation by radicals OH :
Direct photolysis (Half-life) : 1,472 d

PENTAFLUOROETHANE :
Degradation in the troposphere :
Overall half-life time: 28.3 y
(estimation)

NORFLURANE :
Direct photolysis :
Overall half-life time: 8.6 - 16.7 y

1,1,1-TRIFLUOROETHANE :
Overall half-life time: 36 y

DIFLUOROMETHANE:
Global warming potential with respect to CO₂ (time horizon 100 years)
Value: 650

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

PENTAFLUOROETHANE
Global warming potential with respect to CO₂ (time horizon 100 years)
Value: 2,800

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

NORFLURANE
Global warming potential with respect to CO₂ (time horizon 100 years)
Value: 1,300

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

1,1,1-TRIFLUOROETHANE:
Global warming potential with respect to CO₂ (time horizon 100 years)
Value: 3,800

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

Bioaccumulation

: DIFLUOROMETHANE :
Practically not bioaccumulable
log Kow : 0.21 (OECD Guideline 107)

PENTAFLUOROETHANE :
Practically not bioaccumulable
log Kow : 1.48 (measured)

NORFLURANE :
Practically not bioaccumulable
log Kow : 1.06

1,1,1-TRIFLUOROETHANE :
log Kow : 1.49 (calculated)

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Aquatic toxicity

Acute toxicity
fish

: NORFLURANE :
Slightly harmful to fish
LC50, 96 h (Oncorhynchus mykiss (rainbow trout)) : 450 mg/l

1,1,1-TRIFLUOROETHANE :
Slightly harmful to fish
LC50, 96 h (Oncorhynchus mykiss) : > 40 mg/l

Aquatic invertebrates

: NORFLURANE :
Practically not harmful to daphnia
EC(I)50, 48 h : 980 mg/l

1,1,1-TRIFLUOROETHANE :
Slightly harmful to daphnia
EC(I)50, 48 h : 300 mg/l

microorganisms

: NORFLURANE :
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

UN Number : 3163
Proper shipping name : LIQUEFIED GAS, N.O.S.
(PENTAFLUOROETHANE, 1,1,1,2-TETRAFLUOROETHANE,
TRIFLUOROETHANE/DIFLUOROMETHANE 25/50/10/15)
Class : 2
Classification Code : 2A
Hazard identification No : 20
Label : 2.2

ADNR

UN Number : 3163
Proper shipping name : LIQUEFIED GAS, N.O.S.
(PENTAFLUOROETHANE, 1,1,1,2-TETRAFLUOROETHANE,
TRIFLUOROETHANE/DIFLUOROMETHANE 25/50/10/15)
Class : 2
Classification Code : 2A
Label : 2.2

RID

UN Number : 3163
Proper shipping name : LIQUEFIED GAS, N.O.S.
(PENTAFLUOROETHANE, 1,1,1,2-TETRAFLUOROETHANE,
TRIFLUOROETHANE/DIFLUOROMETHANE 25/50/10/15)
Class : 2

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Classification Code : 2A
Hazard identification No : 20
Label : 2.2

IATA Cargo

UN Number : 3163
Proper shipping name : Liquefied gas, n.o.s.
(PENTAFLUOROETHANE, 1,1,1,2-TETRAFLUOROETHANE)
Class : 2.2
Label : 2.2

IATA Passenger

UN Number : 3163
Proper shipping name : Liquefied gas, n.o.s.
(PENTAFLUOROETHANE, 1,1,1,2-TETRAFLUOROETHANE)
Class : 2.2
Label : 2.2

IMDG

UN Number : 3163
Proper shipping name : LIQUEFIED GAS, N.O.S.
(PENTAFLUOROETHANE, 1,1,1,2-TETRAFLUOROETHANE)
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 : according to Regulation (EU) No. 1907/2006

EC classification / labelling

Dangerous Preparations : D. 1999/45/EC amended by D. 2001/60/CE

Further information : The product does not need to be labelled in accordance with EC directives or respective national laws.

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: This product contains one or several components that are not on the Canadian DSL nor NDSL lists.

ENCS (JP): Conforms to
KECI (KR): Conforms to
PICCS (PH): Conforms to
INV (CN): Conforms to

