



1 PRODUCT AND COMPANY IDENTIFICATION

DFO
2000 Market Street

Philadelphia, PA 19103

Information Telephone Numbers

Product Information

Product Name Forane (R) 404A
Product Synonym(s) R-404A, HFC/ HFC/ HFC-404A, FORANE FX 70

Chemical Family Hydrofluorocarbon Blend
Chemical Formula CF₃CH₂F/CF₃CHF₂/CF₃CH₃
Chemical Name 1,1,1,2-tetrafluoroethane / Pentafluoroethane / 1,1,1-trifluoroethane
EPA Reg Num
Product Use Refrigerant

EMERGENCY PHONE NUMBERS:
Chemtrec: (800) 424-9300 (24hrs) or (703) 527-3887
Medical: Rocky Mountain Poison Control Center
(866) 767-5089 (24Hrs)

Phone Number

800-245-5858

Available Hrs

8:00 am - 5:30 pm (Eastern)

2 COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient Name	CAS RegistryNumber	Typical Wt. %	OSHA
1,1,1-trifluoroethane (HFC-143a)	420-46-2	52%	Y
pentafluoroethane (HFC-125)	354-33-6	44%	Y
1,1,1,2-tetrafluoroethane (HFC-134a)	811-97-2	4%	Y

The substance(s) marked with a "Y" in the OSHA column, are identified as hazardous chemicals according to the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200)

This material is classified as hazardous under Federal OSHA regulation.

The components of this product are all on the TSCA Inventory list.

3 HAZARDS IDENTIFICATION

Emergency Overview

Colorless liquified gas with faint ether odor.

WARNING!

LIQUID AND GAS UNDER PRESSURE, OVERHEATING AND OVERPRESSURIZING MAY CAUSE GAS RELEASE OR VIOLENT CYLINDER BURSTING. MAY DECOMPOSE ON CONTACT WITH FLAMES OR EXTREMELY HOT METAL SURFACES TO PRODUCE TOXIC AND CORROSIVE PRODUCTS. VAPOR REDUCES OXYGEN AVAILABLE FOR BREATHING AND IS HEAVIER THAN AIR. HARMFUL IF INHALED AND MAY CAUSE HEART IRREGULARITIES, UNCONSCIOUSNESS OR DEATH. LIQUID CONTACT WITH EYES OR SKIN MAY CAUSE FROSTBITE.

Potential Health Effects

Skin contact and inhalation are expected to be the primary routes of occupational exposure to this material. As with most liquefied gases, contact with the rapidly volatilizing liquid can cause frostbite to any tissue. High vapor concentrations are irritating to the eyes and respiratory tract and may result in central nervous system (CNS) effects such as headache, dizziness, drowsiness and, in severe exposure, loss of consciousness and death. The dense vapor



of this material may reduce the available oxygen for breathing. Prolonged exposure to an oxygen-deficient atmosphere may be fatal. Inhalation may cause an increase in the sensitivity of the heart to adrenaline, which could result in irregular or rapid heartbeats. Medical conditions aggravated by exposure to this material include heart disease or compromised heart function.

4 FIRST AID MEASURES

IF IN EYES, immediately flush with plenty of water. Get medical attention if irritation persists.

IF ON SKIN, Flush exposed skin with lukewarm water (not hot), or use other means to warm skin slowly. Get medical attention if frostbitten by liquid or if irritation occurs.

IF SWALLOWED, Not applicable - product is a gas at ambient temperatures.

IF INHALED, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention. Do not give adrenaline, epinephrin or similar drugs following exposure to this product.

5 FIRE FIGHTING MEASURES

Fire and Explosive Properties

Auto-Ignition Temperature	NE	
Flash Point	NA - GAS	Flash Point Method
Flammable Limits- Upper	NONE	
Lower	NONE	

Extinguishing Media

Use extinguishing media appropriate to surrounding fire conditions.

Fire Fighting Instructions

Stop the flow of gas if possible. Use water spray on person making shut-off. Fire fighters and others who may be exposed to products of combustion should wear full fire fighting turn out gear (full Bunker Gear) and self-contained breathing apparatus (pressure demand NIOSH approved or equivalent). Fire fighting equipment should be thoroughly decontaminated after use.

Fire and Explosion Hazards

May decompose on contact with flames or extremely hot metal surfaces to produce toxic and corrosive products. Liquid and gas under pressure, overheating or overpressurizing may cause gas release and/or violent cylinder bursting. Container may explode if heated due to resulting pressure rise. Some mixtures of HCFCs and/or HFCs, and air or oxygen may be combustible if pressurized and exposed to extreme heat or flame.

6 ACCIDENTAL RELEASE MEASURES

In Case of Spill or Leak

Use Halogen leak detector or other suitable means to locate leaks or check atmosphere. Keep upwind. Evacuate enclosed spaces and disperse gas with floor-level forced-air ventilation. Exhaust vapors outdoors. Do not smoke or operate internal combustion engines. Remove flames and heating elements.

7 HANDLING AND STORAGE

Handling

Avoid breathing gas. Avoid contact with eyes, skin and clothing. Keep container closed. Use only with adequate ventilation. Do not enter confined spaces unless adequately ventilated.

7 HANDLING AND STORAGE

Storage

Do not apply direct flame to cylinder. Do not store cylinder in direct sun or expose it to heat above 120 F. Do not drop or refill this cylinder. Keep away from heat, sparks and flames.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls

Investigate engineering techniques to reduce exposures below airborne exposure limits. Provide ventilation if necessary to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.

Eye / Face Protection

Where there is potential for eye contact, wear chemical goggles and have eye flushing equipment available.

Skin Protection

Wear appropriate chemical resistant protective clothing and chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine appropriate type glove material for given application. Rinse contaminated skin promptly. Wash contaminated clothing and clean protective equipment before reuse. Wash skin thoroughly after handling.

Respiratory Protection

Avoid breathing gas. When airborne exposure limits are exceeded (see below), use NIOSH approved respiratory protection equipment appropriate to the material and/or its components (full facepiece recommended). Consult respirator manufacturer to determine appropriate type equipment for a given application. Observe respirator use limitations specified by NIOSH or the manufacturer. For emergency and other conditions where exposure limit may be significantly exceeded, use an approved full face positive-pressure, self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply. Respiratory protection programs must comply with 29 CFR § 1910.134.

Airborne Exposure Guidelines for Ingredients

Exposure Limit	Value
1,1,1,2-tetrafluoroethane (HFC-134a)	
WEEL TWA -	1000 ppm 4240 mg/m3
pentafluoroethane (HFC-125)	
WEEL TWA -	4900 mg/m3 1000 ppm
1,1,1-trifluoroethane (HFC-143a)	
WEEL TWA -	3400 mg/m3 1000 ppm

- Only those components with exposure limits are printed in this section.
- Skin contact limits designated with a "Y" above have skin contact effect. Air sampling alone is insufficient to accurately quantitate exposure. Measures to prevent significant cutaneous absorption may be required.
- ACGIH Sensitizer designator with a value of "Y" above means that exposure to this material may cause allergic reactions.
- WEEL-AIHA Sensitizer designator with a value of "Y" above means that exposure to this material may cause allergic skin reactions.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance/Odor	Colorless liquified gas with faint ether odor.
pH	NA
Specific Gravity	1.05 @ 25 C
Vapor Pressure	(BUBBLE) 163.3 psia @ 21.1 C (70 F)
Vapor Density	(AIR = 1) 3.39
Melting Point	NE
Freezing Point	NE
Boiling Point	-47.8 C/ -54 F
Solubility In Water	Negligible
Percent Volatile	100
Molecular Weight	97.60

10 STABILITY AND REACTIVITY

Stability

This material is chemically stable under specified conditions or storage, shipment and/or use. See HANDLING AND STORAGE section of this MSDS for specified conditions.

Incompatibility

Avoid contact with strong alkali or alkaline earth metals, finely powdered metals such as aluminum, magnesium or zinc and strong oxidizers, since they may react or accelerate decomposition.

Hazardous Decomposition Products

Thermal decomposition products could include Halogen acid (HF), Halogens, Carbon monoxide, Carbon dioxide, and Carbonyl halides.

11 TOXICOLOGICAL INFORMATION

Toxicological Information

1,1,1,2-Tetrafluoroethane (HFC-134a)

No skin allergy was observed in guinea pigs following repeated exposure. Acute inhalation exposure produced anesthetic effects in mice, dogs, cats and monkeys. Repeated inhalation exposure produced no adverse effects in rats. Inhalation, followed by intravenous injection of epinephrine to simulate stress reactions, resulted in cardiac sensitization in dogs. Following long-term inhalation studies in rats, an increased incidence of benign tumors (at high concentrations) in the testes was observed. No birth defects were noted in the offspring of rats exposed by inhalation during pregnancy, even at dosages that produced significant adverse effects in the mother. No genetic changes were observed in tests using bacteria, animal cells or animals. Single exposure (acute) studies indicate:

Inhalation - Practically Non-toxic to Rats (4-hr LC50 >500,000 ppm; 30-min LC50 ~750,000 ppm)

Eye Irritation - Slightly Irritating to Rabbits

Skin Irritation - Slightly Irritating to Rabbits (24-hr exposure)

Ethane, 1,1,1-trifluoro-

Inhalation of high concentrations of this material, followed by intravenous injection of epinephrine to simulate stress reactions, resulted in cardiac sensitization in dogs. Following repeated inhalation exposure, lung irritant effects including mild bronchitis and pneumonia were observed in rats and guinea pigs. No adverse effects were observed in long-term oral studies with rats. No birth defects were noted in the offspring of rats or rabbits exposed by inhalation during pregnancy. No genetic changes were observed in tests using animal cells or animals. Both positive and negative results have been reported in tests using bacteria. Single exposure (acute) studies indicate:

11 TOXICOLOGICAL INFORMATION

Inhalation - Practically Non-toxic to Rats (4-hr LC50 >540,000 ppm)

Ethane, pentafluoro-
Inhalation followed by intravenous injection of epinephrine to simulate stress reactions resulted in cardiac sensitization in dogs. Following repeated inhalation exposure, no adverse effects were observed in rats. No birth defects were noted in the offspring of rats or rabbits exposed by inhalation during pregnancy. No genetic changes were observed in tests using bacteria, animal cells or animals. Single exposure (acute) studies indicate:

Inhalation - Practically Non-toxic to Rats (4-hr LC50 >800,000 ppm)

12 ECOLOGICAL INFORMATION

Ecotoxicological Information

Ethane, 1,1,1-trifluoro-
This material is practically non-toxic to *Daphnia magna* (48-hr LC50 300 mg/l) and no more than slightly toxic to rainbow trout (96-hr LC50 >40 mg/l).

1,1,1,2-Tetrafluoroethane (HFC-134a)
This material is practically non-toxic to *Daphnia magna* (48-hr EC50 930 mg/l), rainbow trout (96-hr LC50 450 mg/l) and bacteria (16-hr EC10 >730 mg/l).

Chemical Fate Information

1,1,1,2-Tetrafluoroethane (HFC-134a)
This material is not readily biodegradable (3% after 28-days). Its degradation half-life in the atmosphere is 9.6-16.7 years. The ozone depletion potential (ODP) is 0 and the halocarbon global warming potential (HGWP) is 0.3. It is practically not bioaccumulable (log Pow 1.06).

Ethane, pentafluoro-
When released into the environment, this material is expected to partition almost exclusively into the atmosphere. Based on its low n-octanol/water partition coefficient (log Pow 1.48), bioaccumulation is considered unlikely. In a 28-day ready biodegradability closed bottle test, it appeared to be stable (about 10% degraded). This material does not dissociate in water.

13 DISPOSAL CONSIDERATIONS

Waste Disposal

Recover, reclaim or recycle when practical. Dispose of in accordance with federal, state and local regulations. Note: Chemical additions to, processing of, or otherwise altering this material may make this waste management information incomplete, inaccurate, or otherwise inappropriate. Furthermore, state and local waste disposal requirements may be more restrictive or otherwise different from federal laws and regulations.

14 TRANSPORT INFORMATION

DOT Name	Refrigerant Gas R 404A
DOT Technical Name	
DOT Hazard Class	2.2
UN Number	UN 3337
DOT Packing Group	PG NA
RQ	



15 REGULATORY INFORMATION

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370)

Immediate (Acute) Health	Y	Fire	N
Delayed (Chronic) Health	N	Reactive	N
		Sudden Release of Pressure	Y

The components of this product are all on the TSCA Inventory list.

Ingredient Related Regulatory Information:

SARA Reportable Quantities

1,1,1,2-tetrafluoroethane (HFC-134a)

CERCLA RQ

SARA TPQ

NE

New Jersey Right to Know

This product does contain the following chemical(s), as indicated below, currently on the New Jersey Right-to-Know Substances List.

1,1,1-trifluoroethane (HFC-143a)

16 OTHER INFORMATION

Revision Information

Revision Date 11 OCT 2004 Revision Number 10
Supercedes Revision Dated 30-SEP-2004

Revision Summary

ATOFINA Chemicals, Inc. has changed its name to Arkema Inc..

Key

NE= Not Established NA= Not Applicable (R) = Registered Trademark

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