DuPont™ Freon® 22 Refrigerant

Version 2.1

Revision Date 03/16/2015 Ref. 130000024323

This SDS adheres to the standards and regulatory requirements of the United States and may not meet the regulatory requirements in other countries.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	DuPont™ Freon® 22 Refrigerant
Tradename/Synonym	:	R-22 Freon® 22 CHLORODIFLUOROMETHANE HCFC-22 DYMEL® 22
Product Grade/Type	:	ASHRAE Refrigerant number designation: R-22
Product Use	:	Refrigerant, For industrial use only.
Restrictions on use	:	Do not use product for anything outside of the above specified uses
Manufacturer/Supplier	:	DuPont 1007 Market Street Wilmington, DE 19898 United States of America
Product Information	:	+1-800-441-7515 (outside the U.S. +1-302-774-1000)
Medical Emergency	:	1-800-441-3637 (outside the U.S. 1-302-774-1139)
Transport Emergency	:	CHEMTREC: +1-800-424-9300 (outside the U.S. +1-703-527-3887)

SECTION 2. HAZARDS IDENTIFICATION

Product hazard category

Gases under pressure Liquefied gas

Label content

Pictogram :

Signal word : Warning

Hazardous warnings : Contains gas under pressure; may explode if heated.

Hazardous prevention measures : Protect from sunlight. Store in a well-ventilated place.

Other hazards

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing., Rapid evaporation of the liquid may cause frostbite., Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects., May cause cardiac arrhythmia.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Chlorodifluoromethane (HCFC-22)	75-45-6	100 %

SECTION 4. FIRST AID MEASURES

General advice	:	Never give anything by mouth to an unconscious person. When symptoms persist or in all cases of doubt seek medical advice.
Inhalation	:	Remove from exposure, lie down. Move to fresh air. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Call a physician.
Skin contact	:	Take off all contaminated clothing immediately. Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.
Eye contact	:	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.
Ingestion	:	Is not considered a potential route of exposure.
Most important symptoms/effects, acute and delayed	:	No applicable data available.
Protection of first-aiders	:	If potential for exposure exists refer to Section 8 for specific personal protective equipment.
Notes to physician	:	Because of possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, that may be used in situations of emergency life support should be used with special caution.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	As appropriate for combustibles in area. Extinguishant for other burning material in area is sufficient to stop burning.
Unsuitable extinguishing media	:	No applicable data available.

Specific hazards	:	Cylinders are equipped with pressure and temperature relief devices, but may still rupture under fire conditions. Decomposition may occur. Contact of welding or soldering torch flame with high concentrations of refrigerant can result in visible changes in the size and colour of the torch flame. This flame effect will only occur in concentrations of product well above the recommended exposure limit. Therefore stop all work and ventilate to disperse refrigerant vapors from the work area before using any open flames. This substance is not flammable in air at temperatures up to 100 deg. C (212 deg. F) at atmospheric pressure. However, mixtures of this substance with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. This substance can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing this substance and air, or this substance in an oxygen enriched atmosphere become combustible depends on the inter-relationship of 1) the temperature 2) the pressure, and 3) the proportion of oxygen in the mixture. In general, this substance should not be allowed to exist with air above atmospheric pressure or at high temperatures; or in an oxygen enriched environment. For example this substance should NOT be mixed with air under pressure for leak testing or other purposes. Experimental data have also been reported which indicate combustibility of this substance in the presence of certain concentrations of chlorine.
Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus. Wear neoprene gloves during cleaning up work after a fire.
Further information	:	Self-contained breathing apparatus (SCBA) is required if containers rupture and contents are released under fire conditions. Cool containers/tanks with water spray. Water runoff should be contained and neutralized prior to release.

SECTION 6. ACCIDENTAL RELEASE MEASURES

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Safeguards (Personnel)	:	Evacuate personnel to safe areas. Ventilate the area. Refer to protective measures listed in sections 7 and 8.
Environmental precautions	:	Should not be released into the environment.

Spill Cleanup	:	Evaporates. Ventilate area using forced ventilation, especially low or enclosed places where heavy vapors might collect.
Accidental Release Measures	:	Ventilate area, especially low or enclosed places where heavy vapours might collect. Avoid open flames and high temperatures. Self-contained breathing apparatus (SCBA) is required if a large release occurs.

SECTION 7. HANDLING AND STORAGE

Handling (Personnel)	:	Avoid breathing vapours or mist. Avoid contact with skin, eyes and clothing. Provide sufficient air exchange and/or exhaust in work rooms. For personal protection see section 8. The product should not be mixed with air for leak testing or used with air for any other purpose above atmospheric pressure. Contact with chlorine or other strong oxidizing agents should also be avoided. Handle in accordance with good industrial hygiene and safety practice.
Handling (Physical Aspects)	:	No special protective measures against fire required.
Dust explosion class	:	No applicable data available.
Storage	:	Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems. Never attempt to lift cylinder by its cap. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Separate full containers from empty containers. Keep at temperature not exceeding 52°C. Do not store near combustible materials. Avoid area where salt or other corrosive materials are present. The product has an indefinite shelf life when stored properly.
Storage period	:	> 10 yr
Storage temperature	:	< 52 °C (< 126 °F)

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls	:	Ensure adequate ventilation, especially in confined areas. Local exhaust should be used when large amounts are released. Mechanical ventilation should be used in low or enclosed places.
Personal protective equipment		
Respiratory protection	:	Under normal manufacturing conditions, no respiratory protection is required when using this product. For rescue and maintenance work in storage tanks use self-contained breathing apparatus.
Hand protection	:	Additional protection: Impervious gloves
Hand protection	:	Additional protection: Protective gloves complying with EN 374., or, US OSHA guidelines
Eye protection	:	Safety glasses with side-shields Additionally wear a face shield where the possibility exists for face contact due to splashing, spraying or airborne contact with this material.
Protective measures	:	Self-contained breathing apparatus (SCBA) is required if a large release occurs.

Exposure Guidelines

Exposure Limit Values

Chlorodifluoromethane			
TLV	(ACGIH)	1,000 ppm	TWA

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical state	:	gaseous
Form	:	Liquefied gas
Color	:	clear
Odor	:	slight, ether-like
Odor threshold	:	No applicable data available.
pH	:	neutral

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Melting point/range	:	No applicable data available.
Boiling point/boiling range	:	Boiling point -40.8 °C (-41.4 °F) at 1,013 hPa
Flash point	:	does not flash
Evaporation rate	:	> 1 (CCL4=1.0)
Flammability (solid, gas)	:	No applicable data available.
Upper explosion limit	:	Method: None per ASTM E681
Lower explosion limit	:	Method: None per ASTM E681
Vapor pressure	:	10,439.0 hPa at 25 °C (77 °F)
Vapor density	:	3.0 at 25°C (77°F) and 1013 hPa (Air=1.0)
Density	:	1.191 g/cm3 at 25 °C (77 °F) (as liquid)
Specific gravity (Relative density)	:	1.19 at 25 °C (77 °F)
Water solubility	:	2.6 g/l at 25 °C (77 °F)
Solubility(ies)	:	No applicable data available.
Partition coefficient: n-octanol/water	:	No applicable data available.
Auto-ignition temperature	:	No applicable data available.
Decomposition temperature	:	632 °C
Viscosity, kinematic	:	No applicable data available.
Viscosity	:	No applicable data available.
% Volatile	:	100 %

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Decomposes on heating.
Chemical stability	:	Stable at normal temperatures and storage conditions.
Possibility of hazardous reactions	:	Polymerization will not occur.Other burning materials may cause HCFC 22 to burn weakly.Chlorodifluoromethane is not flammable at ambient temperatures and atmospheric pressure. However, chlorodifluoromethane has been shown in tests to be combustible at pressures as low as 60 psig at ambient temperature when mixed with air at concentrations of 65 volume % air. Experimental data have also been reported which indicate combustibility of HCFC 22 in the presence of certain concentrations of chlorine.
Conditions to avoid	:	The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air or oxygen, the mixture may become flammable. Certain mixtures of HCFCs or HFCs with chlorine may become flammable or reactive under certain conditions. Avoid open flames and high temperatures.
Incompatible materials	:	Alkali metals Alkaline earth metals, Powdered metals, Powdered metal salts
Hazardous decomposition products	:	Decomposition products are hazardous., This material can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrochloric and hydrofluoric acids, and possibly carbonyl halides., These materials are toxic and irritating., Avoid contact with decomposition products

SECTION 11. TOXICOLOGICAL INFORMATION

Chlorodifluoromethane (HCFC-22)

Inhalation 4 h LC50	:	> 150000 ppm , Mouse
Inhalation Low Observed Adverse Effect Concentration (LOAEC)	:	50000 ppm , Dog Cardiac sensitization
Inhalation No Observed Adverse Effect Concentration	:	25000 ppm , Dog Cardiac sensitization
Skin irritation	:	Not expected to cause skin irritation based on expert review of the properties of the substance.

Eye irritation	:	Not expected to cause eye irritation based on expert review of the properties of the substance.
Skin sensitization	:	Not expected to cause sensitization based on expert review of the properties of the substance.
Repeated dose toxicity	:	Inhalation Mouse - gas No toxicologically significant effects were found.
Carcinogenicity	:	Not classifiable as a human carcinogen. Overall weight of evidence indicates that the substance is not carcinogenic.
Mutagenicity	:	Animal testing did not show any mutagenic effects. Experiments showed mutagenic effects in cultured bacterial cells.
Reproductive toxicity	:	No toxicity to reproduction
Teratogenicity	:	Animal testing showed effects on embryo-fetal development at levels equal to or above those causing maternal toxicity.

Carcinogenicity

The carcinogenicity classifications for this product and/or its ingredients have been determined according to HazCom 2012, Appendix A.6. The classifications may differ than those listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or those found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition).

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, or OSHA, as a carcinogen.

SECTION 12. ECOLOGICAL INFORMATION

Aquatic Toxicity

Chlorodifluoromethane (HCFC-22)

96 h LC50	:	Zebra fish 777 mg/l
96 h EC50	:	Algae 250 mg/l

48 h EC50	:	Daphnia magna (Water flea) 433 mg/l

Environmental Fate

Chlorodifluoromethane (HCFC-22)

Biodegradability	:	According to the results of tests of biodegradability this product is not readily biodegradable.

SECTION 13. DISPOSAL CONSIDERATIONS

Waste disposal methods - Product	:	Can be used after re-conditioning. Recover, reclaim by distillation, or remove to a permitted waste disposal facility. Comply with applicable Federal, State/Provincial and Local Regulations.
Contaminated packaging	:	Empty pressure vessels should be returned to the supplier.

SECTION 14. TRANSPORT INFORMATION

DOT	UN number	:	1018
	Proper shipping name	:	Chlorodifluoromethane
	Class	:	2.2
	Labelling No.	:	2.2
IATA_C	UN number	:	1018
	Proper shipping name	:	Chlorodifluoromethane
	Class	:	2.2
	Labelling No.	:	2.2
IMDG	UN number	:	1018
	Proper shipping name	:	CHLORODIFLUOROMETHANE
	Class	:	2.2
	Labelling No.	:	2.2

SECTION 15. REGULATORY INFORMATION

TSCA	:	On the inventory, or in compliance with the inventory
SARA 313 Regulated Chemical(s)	:	Chlorodifluoromethane
PA Right to Know Regulated Chemical(s)	:	Substances on the Pennsylvania Hazardous Substances List present at a concentration of 1% or more (0.01% for Special Hazardous Substances): Chlorodifluoromethane
NJ Right to Know Regulated Chemical(s)	:	Substances on the New Jersey Workplace Hazardous Substance List present at a concentration of 1% or more (0.1% for substances identified as carcinogens, mutagens or teratogens): Chlorodifluoromethane
California Prop. 65	:	Chemicals known to the State of California to cause cancer, birth defects or any other harm: none known

SECTION 16. OTHER INFORMATION

Freon is a registered trademark of E. I. duPont de Nemours & Company, Inc.
® DuPont's registered trademark
Before use read DuPont's safety information. For further information contact the local DuPont office or DuPont's nominated distributors.

Revision Date : 03/16/2015

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.

Significant change from previous version is denoted with a double bar.

The MSDS format adheres to the standards and regulatory requirements of the United States and may not meet regulatory requirements in other countries.

Material Safety Data Sheet

USED REFRIGERANTS AND REFRIGERANT BLENDS

6116FR Revised 31-MAR-2009

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Tradenames and Synonyms

USED REFRIGERANT 11
USED REFRIGERANT 12
USED REFRIGERANT 13
USED REFRIGERANT 13B1
USED REFRIGERANT 14
USED REFRIGERANT 22
USED REFRIGERANT 23
USED REFRIGERANT 113
USED REFRIGERANT 114
USED REFRIGERANT 116
USED REFRIGERANT 123
USED REFRIGERANT 124
USED REFRIGERANT 125
USED REFRIGERANT 134a
USED REFRIGERANT 407C
USED REFRIGERANT 410A
USED REFRIGERANT 500
USED REFRIGERANT 502
USED REFRIGERANT 503
USED REFRIGERANT 508B
USED REFRIGERANT HP62
USED REFRIGERANT HP80
USED REFRIGERANT HP81
USED REFRIGERANT MP39
USED REFRIGERANT MP52
USED REFRIGERANT MP66
USED REFRIGERANT R-422D
USED REFRIGERANT R-417A
USED REFRIGERANT R-422A
USED REFRIGERANT R-423A
USED REFRIGERANT R-404A (HP62)
USED REFRIGERANT R-408A
USED REFRIGERANT R-409A
USED REFRIGERANT 407A
USED REFRIGERANT MO99 (R-438A*)

Company Identification

MANUFACTURER/DISTRIBUTOR

DuPont
1007 Market Street
Wilmington, DE 19898

PHONE NUMBERS

Product Information : 1-800-441-7515 (outside the U.S. 302-774-1000)
Transport Emergency : CHEMTREC 1-800-424-9300(outside U.S.

(CHEMICAL PRODUCT/COMPANY IDENTIFICATION - Continued)

703-527-3887)
Medical Emergency : 1-800-441-3637 (outside the U.S.
302-774-1000)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
REFRIGERANT COMPONENTS		
*METHANE, TRICHLOROFLUORO- (Refrigerant 11)	75-69-4	<100
*METHANE, DICHLORODIFLUORO- (Refrigerant 12)	75-71-8	<100
*METHANE, CHLOROTRIFLUORO- (Refrigerant 13)	75-72-9	<100
*METHANE, CHLORODIFLUORO- (Refrigerant 22)	75-45-6	<100
METHANE, TRIFLUORO- (HFC-23)	75-46-7	<100
DIFLUOROMETHANE (HFC-32)	75-10-5	<30
*1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (Refrigerant 113)	76-13-1	<100
*ETHANE, 1,2-DICHLOROTETRAFLUORO- (Refrigerant 114)	76-14-2	<100
*ETHANE, CHLOROPENTAFLUORO- (Refrigerant 115)	76-15-3	<60
*ETHANE, 2,2-DICHLORO-1,1,1-TRIFLUORO- (Refrigerant 123)	306-83-2	<100
*ETHANE, 2-DICHLORO-1,1,1,2-TETRAFLUORO- (Refrigerant 124)	2837-89-0	<100
PENTAFLUOROETHANE (HFC-125)	354-33-6	<70
ETHANE, 1,1-DIFLUORO- (Refrigerant 152a)	75-37-6	<30
*METHANE, BROMOTRIFLUORO- (Refrigerant 13B1)	75-63-8	<100
ETHANE, 1,1,1,2-TETRAFLUORO- (HFC-134a)	811-97-2	<100
ETHANE, 1,1,1-TRIFLUORO- (HFC-143a)	420-46-2	<55
HFC-227ea	431-89-0	<50
PROPANE	74-98-6	<6
ISOBUTANE	75-28-5	<5
BUTANE	106-97-8	<5
CONTAMINANTS		
REFINED MINERAL OILS	64742-52-5	<30
REFINED MINERAL OILS	64742-44-5	<30
REFINED MINERAL OILS	64741-88-4	<30

(COMPOSITION/INFORMATION ON INGREDIENTS - Continued)

ALKYL BENZENE	68648-86-2	<30
OIL MIST IF GENERATED		
POLYALKYLENE GLYCOL OIL	9038-95-3	<30
POLYOL ESTER PLUS PHOSPHATE ESTER OIL		<30
POLYALKYLENE GLYCOL OIL	9003-13-8	<30

* Disclosure as a toxic chemical is required under Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372.

Components (Remarks)

The above components represent DuPont Refrigerant and Refrigerant Blends that are returned for reclamation. Any (and/or all) components may be contained in the material returned. The information is representative for any and all components.

The specification for used refrigerant returned for reclamation is a maximum of 30% TOTAL lubricating oil content. Most used refrigerant contains significantly less.

HAZARDS IDENTIFICATION

Potential Health Effects

Potential Health Effects

Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death. Intentional misuse or deliberate inhalation may cause death without warning. Vapor reduces oxygen available for breathing and is heavier than air. Causes skin and eye irritation.

HUMAN HEALTH EFFECTS:

Human health effects of overexposure by skin contact may include skin irritation with discomfort or rash. Prolonged skin contact may cause temporary tingling, numbness, coldness or drying of skin. Skin contact with some components may cause frostbite. Eye contact may cause eye irritation with discomfort, tearing, or blurring of vision. Eye contact with some components may cause "frostbite like" effects.

Inhalation may cause temporary lung irritation effects with cough, discomfort, difficulty breathing, or shortness of breath. Inhalation or ingestion may cause temporary nervous system depression with anesthetic effects such as dizziness, headache, confusion, incoordination, and loss of consciousness. Higher exposures may cause irregular heart beat with a strange sensation in the chest, "heart thumping"

(HAZARDS IDENTIFICATION - Continued)

apprehension, lightheadedness, feeling of fainting, dizziness, weakness, sometimes progressing to loss of consciousness and death. Suffocation, if air is displaced by vapors, can occur. Ingestion may cause nonspecific discomfort, such as nausea, headache, or weakness.

The major ingestion hazard is aspiration of the liquid into the lung which may result in "chemical pneumonia". Symptoms include coughing, gasping, choking, shortness of breath, bluish discoloration of the skin, rapid breathing and heart rate and fever. Pulmonary edema or bleeding, drowsiness, confusion, coma, and seizures may occur in more serious cases. Symptoms may develop immediately or as late as 24 hours after the exposure, depending on how much chemical entered the lungs.

REFRIGERANT 12:

Refrigerant 12 has been infrequently associated with skin sensitization in humans.

REFRIGERANT 152a:

Higher exposures (>20%) to Refrigerant 152a may lead to abnormal kidney function as detected by laboratory tests.

REFINED MINERAL OILS AND ALKYL BENZENE

Prolonged skin exposure to Refined Mineral Oils and Alkyl Benzene may defat skin and cause dermatitis. Ingestion may cause cramps and diarrhea.

Individuals with preexisting diseases of the central nervous system, cardiovascular system, lungs or kidneys may have increased susceptibility to the toxicity of excessive exposures.

Carcinogenicity Information

The following components are listed by IARC, NTP, OSHA or ACGIH as carcinogens.

Material	IARC	NTP	OSHA	ACGIH
REFINED MINERAL OILS	1	X		

FIRST AID MEASURES

First Aid

INHALATION

If high concentrations are inhaled, immediately remove to fresh air. Keep person calm. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT

Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.

EYE CONTACT

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION

If swallowed, do not induce vomiting. Immediately give 2 glasses of water. Never give anything by mouth to an unconscious person. Call a physician.

Notes to Physicians

THIS MATERIAL MAY MAKE THE HEART MORE SUSCEPTIBLE TO ARRHYTHMIAS. Catecholamines such as adrenaline, and other compounds having similar effects, should be reserved for emergencies and then used only with special caution.

FIRE FIGHTING MEASURES

Flammable Properties

Flash Point : >150 C (>302 F)

Pure Refrigerants will not burn. However, the lubricating oil contaminants will burn and they may be at a high enough concentration that the mixture will burn.

Fire and Explosion Hazards:

Drums may rupture under fire conditions. Decomposition may occur.

Extinguishing Media

As appropriate for combustibles in area.

(FIRE FIGHTING MEASURES - Continued)

Fire Fighting Instructions

Use water spray or fog to cool container. Self-contained breathing apparatus (SCBA) is required if drums rupture and contents are spilled under fire conditions.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures

Ventilate area. Do not flush into sewers. Dike spill. Collect on absorbent material and transfer to steel drums for recovery or disposal. Use self-contained breathing apparatus (SCBA) for large spills. Comply with Federal, State, and local regulations on reporting releases.

HANDLING AND STORAGE

Handling (Personnel)

Avoid breathing vapors or mist. Avoid contact with eyes, skin or clothing. Wash thoroughly after handling. Use with sufficient ventilation to keep employee exposure below recommended limits.

Storage

Clean, dry area. Do not heat above 125 deg F (52 deg C).

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Normal ventilation for standard manufacturing procedures is generally adequate. Local exhaust should be used when large amounts are released. Mechanical ventilation should be used in low or enclosed places.

(EXPOSURE CONTROLS/PERSONAL PROTECTION - Continued)

Personal Protective Equipment

PROTECTIVE CLOTHING:

Impervious gloves and chemical splash goggles should be used if contact is possible.

RESPIRATOR:

Where there is potential for airborne exposures in excess of applicable limits, wear NIOSH approved respiratory protection.

Exposure Guidelines

Applicable Exposure Limits

METHANE, TRICHLOROFLUORO-

PEL	(OSHA)	: 1,000 ppm, 5,600 mg/m3, 8 Hr. TWA
TLV	(ACGIH)	: Ceiling 1,000 ppm, 5,620 mg/m3, A4
AEL *	(DuPont)	: None Established

METHANE, DICHLORODIFLUORO-

PEL	(OSHA)	: 1,000 ppm, 4,950 mg/m3, 8 Hr. TWA
TLV	(ACGIH)	: 1,000 ppm, 4,950 mg/m3, 8 Hr. TWA, A4
AEL *	(DuPont)	: None Established

METHANE, CHLORODIFLUORO-

PEL	(OSHA)	: None Established
TLV	(ACGIH)	: 1,000 ppm, 3,540 mg/m3, 8 Hr. TWA, A4
AEL *	(DuPont)	: None Established

METHANE, TRIFLUORO-

PEL	(OSHA)	: None Established
TLV	(ACGIH)	: None Established
AEL *	(DuPont)	: 1000 ppm, 8 & 12 Hr. TWA

DIFLUOROMETHANE

AEL *	(DuPont)	: 1000 ppm, 8 & 12 Hr. TWA
WEEL	(AIHA)	: 1000 ppm, 8 Hr. TWA

1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE

PEL	(OSHA)	: 1,000 ppm, 7,600 mg/m3, 8 Hr. TWA
TLV	(ACGIH)	: 1,000 ppm, 7,670 mg/m3, 8 Hr. TWA, A4 STEL 1,250 ppm, 9,590 mg/m3, A4
AEL *	(DuPont)	: None Established

ETHANE, 1,2-DICHLOROTETRAFLUORO-

PEL	(OSHA)	: 1,000 ppm, 7,000 mg/m3, 8 Hr. TWA
TLV	(ACGIH)	: 1,000 ppm, 6,990 mg/m3, 8 Hr. TWA, A4
AEL *	(DuPont)	: None Established

ETHANE, CHLOROPENTAFLUORO-

(Applicable Exposure Limits - Continued)

PEL (OSHA) : None Established
TLV (ACGIH) : 1,000 ppm, 6,320 mg/m3, 8 Hr. TWA
AEL * (DuPont) : None Established

ETHANE, 2,2-DICHLORO-1,1,1-TRIFLUORO-
PEL (OSHA) : None Established
TLV (ACGIH) : None Established
AEL * (DuPont) : 50 ppm, 8 & 12 Hr. TWA
WEEL (AIHA) : 50 ppm, 8 Hr. TWA

ETHANE, 2-DICHLORO-1,1,1,2-
PEL (OSHA) : None Established
TLV (ACGIH) : None Established
AEL * (DuPont) : 1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA) : 1000 ppm, 8 Hr. TWA

PENTAFLUOROETHANE
PEL (OSHA) : None Established
TLV (ACGIH) : None Established
AEL * (DuPont) : 1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA) : 1000 ppm, 4900 mg/m3, 8 Hr. TWA

ETHANE, 1,1-DIFLUORO-
PEL (OSHA) : None Established
TLV (ACGIH) : None Established
AEL * (DuPont) : 1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA) : 1000 ppm, 8 Hr. TWA

METHANE, BROMOTRIFLUORO-
PEL (OSHA) : 1,000 ppm, 6,100 mg/m3, 8 Hr. TWA
TLV (ACGIH) : 1,000 ppm, 6,090 mg/m3, 8 Hr. TWA
AEL * (DuPont) : None Established

ETHANE, 1,1,1,2-TETRAFLUORO-
PEL (OSHA) : None Established
TLV (ACGIH) : None Established
AEL * (DuPont) : 1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA) : 1000 ppm, 8 Hr. TWA

ETHANE, 1,1,1-TRIFLUORO-
PEL (OSHA) : None Established
TLV (ACGIH) : None Established
AEL * (DuPont) : 1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA) : 1000 ppm, 8 Hr. TWA

HFC-227ea
AEL * (DuPont) : 1000 ppm, 8 & 12 Hr. TWA

PROPANE
PEL (OSHA) : 1,000 ppm, 1,800 mg/m3, 8 Hr. TWA
AEL * (DuPont) : None Established

ISOBUTANE

(Applicable Exposure Limits - Continued)

TLV	(ACGIH)	: 1000 ppm, 8 Hr. TWA
BUTANE		
PEL	(OSHA)	: None Established
AEL *	(DuPont)	: None Established
OIL MIST IF GENERATED		
PEL	(OSHA)	: 5 mg/m3, 8 Hr. TWA
TLV	(ACGIH)	: 5 mg/m3, 8 Hr. TWA, STEL 10 mg/m3 Notice of Intended Changes (2008) 0.2 mg/m3, 8 Hr. TWA Poorly and mildly refined, A2 Highly refined, A4
AEL *	(DuPont)	: 5 mg/m3, 8 Hr. TWA

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Odor	: Slight ethereal
Form	: Liquid, compressed gas, liquefied gas
Color	: Clear, colorless, slightly yellow

STABILITY AND REACTIVITY

Chemical Stability

Material is stable. However, avoid open flames and high temperatures.

Incompatibility with Other Materials

Refrigerants are incompatible with alkali or alkaline earth metals - powdered Al, Zn, Be, etc. The Refined Mineral Oils are incompatible with strong oxidizers.

Decomposition

Decomposition products are hazardous. This compound can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrochloric and hydrofluoric acids, and possibly carbonyl halides. Refined Mineral Oils, if present, can produce carbon monoxide and carbon dioxide upon combustion.

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

Animal Data

As a class of compounds, inhalation exposure to the individual refrigerants has caused the following toxic effects in animal testing:

Nervous system effects; anesthetic effects such as tremors, dizziness, incoordination, and loss of consciousness; irregular heartbeat; and cardiac sensitization (a potentially fatal disturbance of heart rhythm associated with a heightened sensitivity to the action of epinephrine).

In animal testing, some refrigerants caused altered blood pressure; decreased body weight; altered clinical chemistry; altered respiratory function; respiratory irritation; increased liver weight; alterations in blood chemistry.

REFRIGERANT 11:

Inhalation 4-hour LC50: 26,200 ppm in rats
Oral ALD : 3,725 mg/kg in rats

In animals exposed to Refrigerant 11, various cardiovascular and circulatory abnormalities have been reported. Changes in the lungs, liver, brain and spleen were observed in a study of rats exposed by inhalation to 12 times the TLV.

REFRIGERANT 12:

Inhalation 30-minute LC50: 800,000 ppm in rats
Oral ALD : >1000 mg/kg in rats

ETHANE, 2-CHLORO-1,1,1,2-TETRAFLUORO- (HCFC-124):

4 hour Inhalation, ALC, rat: 230,000 - 300,000 ppm

REFRIGERANT 13:

Inhalation 2-hour LC50: >600,000 ppm in rats

REFRIGERANT 113:

Inhalation 4-hour LC50: 52,500 ppm in rats
Skin Absorption ALD : >11,000 mg/kg in rabbits
Oral LD50 : 43,000 mg/kg in rats

Refrigerant 113 produced weak allergic skin sensitization in a laboratory animal. High, single oral administration of the liquid, at or near lethal doses, produced lethargy within several minutes. In a reproductive toxicity study in rats with Refrigerant 113, no adverse effects on reproductive

(TOXICOLOGICAL INFORMATION - Continued)

performance were seen at concentrations of 500 ppm, and only minimal effects (slight decrease in corpora lutea) were observed at 12,500 ppm.

CFC-114:

Inhalation 30-minute LC50: 720,000 ppm in rats
Oral ALD : >2250 mg/kg in rats

Repeated inhalation exposures to rats and mice at 200,000 ppm of Refrigerant 114 caused slight hematological effects and respiratory irritation.

REFRIGERANT 123:

Inhalation 4-hour LC50: 32,000 ppm in rats
Oral ALD : 9,000 mg/kg in rats
Skin Absorption LD50 : >2,000 mg/kg in rabbits

Repeated inhalation exposures to 300 ppm of HCFC-123 resulted in alterations in blood chemistry; Inhalation exposures above 300 ppm caused reduced lymphocyte counts, enzyme alterations, increased urinary fluoride concentration in rats; dogs demonstrated slight liver damage. HCFC-123 was not neurotoxic in animals repeatedly exposed by inhalation at concentrations up to 5,000 ppm, but did cause a slight decrease in arousal at this concentration. Inhalation of 300, 1000 or 5000 ppm HCFC-123 for two years caused an increase in benign testicular and benign pancreatic tumors in male rats; an increase in benign pancreatic tumors was observed in female rats exposed to 5000 ppm. In the same study, male and female rats exposed to 5000 ppm showed an increased incidence in benign liver tumors. Smaller increases in the incidence of these benign liver tumors were observed in females at 300 and 1000 ppm, while none were observed in female controls. The tumors were late-occurring and none were judged to be life-threatening. The biological significance of these tumors to man is considered to be limited. Additionally, evidence of retinal atrophy was observed in this two-year study in both treated and control animals, although the toxicological significance is undetermined. HCFC 123 does not produce genetic damage in bacterial cell cultures or in animals; however, in one study genetic damage was produced in mammalian cell cultures.

REFRIGERANT 22:

Inhalation 4-hour LC50: 220,000 ppm in rats

In chronic inhalation studies, HCFC-22, at a concentration of 50,000 ppm (v/v), produced a small, but statistically significant increase of late-occurring tumors involving salivary glands in male rats, but not female rats or male or

(TOXICOLOGICAL INFORMATION - Continued)

female mice. In the same studies, no increased incidence of tumors was seen in either species at concentrations of 10,000 ppm or 1000 ppm (v/v). HCFC-22 was mutagenic in some strains of bacteria in bacterial cell cultures, but not mammalian cell cultures or animals. It did not cause heritable genetic damage in mammals. A slight, but significant increase in developmental toxicity was observed at high concentrations (50,000 ppm) of HCFC-22, a concentration which also produced toxic effects in the adult animal. Based on these findings, and other negative developmental studies, HCFC-22 is not considered a unique hazard to the conceptus.

HFC-152a:

Inhalation 4-hour ALC: 383,000 ppm in rats
Oral ALD : >1,500 mg/kg in rats

Effects of repeated inhalation exposure to HFC-152a include increased urinary fluoride, reduced kidney weight, and reversible kidney changes.

REFRIGERANT 115:

Inhalation 4-hour LC50: >800,000 ppm in rats
Oral ALD : >1,200 mg/kg in rats

The effects of repeated ingestion of Refrigerant 115 include mild diarrhea, salivation and increased activity.

HFC-23:

Inhalation 1-hour LC50: >900,000 ppm (species unknown)

ETHANE, 1,1,1,2-TETRAFLUORO- (HFC-134a):

4 hour, ALC, rat: 567,000 ppm

Single inhalation exposure to near lethal doses caused pulmonary edema. Repeated exposure caused increased adrenals, liver, spleen weight; decreased uterine, prostate weight. Repeated dosing of higher concentrations caused tremors. In a two-year inhalation study, HFC-134a, at a concentration of 50,000 ppm, produced an increase in late-occurring benign testicular tumors, testicular hyperplasia and testicular weight. The no-effect-level for this study was 10,000 ppm. Animal data show slight fetotoxicity but only at exposure levels producing other toxic effects in the adult animal. Reproductive data on male mice show: No change in reproductive performance. Tests have shown that this material does not cause genetic damage in bacterial or mammalian cell cultures, or in animals. In animal testing, this material has not caused permanent genetic damage in reproductive cells of mammals

(TOXICOLOGICAL INFORMATION - Continued)

(has not produced heritable genetic damage).

REFRIGERANT 13B1:

Inhalation 1-hour LC50: >770,000 ppm in rats

Lung irritation and degeneration of the liver and kidneys were seen in animals exposed repeatedly by inhalation to lethal or near lethal concentrations of Refrigerant 13B1.

The acute Oral LD50 in rats for Refined Oil (CAS 64742-52-5) is >15 g/kg.

FC-143a:

Inhalation 4 hour LC50: > 540,000 ppm in rats

Two, 4-week inhalation studies of FC-143a have been conducted. In the first study, pathological changes in the testes were observed at all exposure concentrations; no effects were observed in females. The testicular effect was considered related to the method used to expose the rats to HFC-143A. In the second study using the same exposure concentrations, no effects were noted in males at any concentration. Tests of FC-143a in bacterial cell cultures demonstrate mutagenic activity, but the compound did not induce oncogenic transformation of mammalian cells in culture. HFC-143A was not mutagenic in animals.

HFC-227ea:

Inhalation 4-hour LC50: > 788,000 ppm in rats

Repeated inhalation exposure to 105,000 ppm for 90 days did not produce exposure-related adverse effects in rats. The No Observable Adverse Effect Level (NOAEL) and the Lowest Observable Adverse Effect Level (LOAEL) for cardiac sensitization in epinephrine-challenged dogs were 90,000 ppm and 105,000 ppm, respectively. Repeated inhalation exposure to 105,000 ppm did not produce developmental toxicity in rats or rabbits. HFC-227ea did not cause genetic damage in bacterial or mammalian cell cultures.

HFC-125:

INHALATION:

4 hour, ALC, rat: > 709,000 ppm

HFC-32:

4 hour inhalation, ALC, rat: > 520,000 ppm

Animal data on HFC-32 show slight fetotoxicity but only at

(TOXICOLOGICAL INFORMATION - Continued)

exposure levels producing other toxic effects in the adult animal.

DISPOSAL CONSIDERATIONS

Waste Disposal

Comply with Federal, State, and local regulations. Remove to a permitted waste disposal facility.

TRANSPORTATION INFORMATION

Shipping Information

DOT/IMO/IATA
Proper Shipping Name: REFRIGERANT GASES, N.O.S. (FLUORINATED HYDROCARBONS)
Hazard Class : 2.2
UN No. : 1078
DOT/IMO/IATA Label : NONFLAMMABLE GAS

Shipping Containers : Cylinders
Tank Cars
Tank Trucks

THE FOLLOWING SHIPPING DESCRIPTION IS FOR USED R-11, USED R-113, AND USED R-123 ONLY:

NOT REGULATED AS A HAZARDOUS MATERIAL BY DOT, IMO, OR IATA.

Shipping Containers: Drums
Cylinders

REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
Chronic : Yes
Fire : No
Reactivity : No
Pressure : Yes

(REGULATORY INFORMATION - Continued)

LISTS:

SARA Extremely Hazardous Substance	-No
CERCLA Hazardous Substance	-Yes*
Toxic Chemicals	-(Yes)**

*For Freon 11,12
**See component section

OTHER INFORMATION

NFPA, NPCA-HMIS

NPCA-HMIS Rating

Health	: 1
Flammability	: 1
Reactivity	: 1

Personal Protection rating to be supplied by user depending on use conditions.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS	: MSDS Coordinator
>	: DuPont Fluoroproducts
Address	: Wilmington, DE 19898
Telephone	: (800) 441-7515

# Indicates updated section.

This information is based upon technical information believed to be reliable. It is subject to revision as additional knowledge and experience is gained.

End of MSDS