SDS #: Z0190

Sid Harvey Parts:

R408AX100

R408AX24

Most Recent Revision Date:

03/28/2019

ARKEMA

SAFETY DATA SHEET

FORANE® 408A

1. PRODUCT AND COMPANY IDENTIFICATION

Company

Arkema Inc.
900 First Avenue
King of Prussia, Pennsylvania 19406

Fluorochemicals

Customer Service Telephone Number: (800) 245-5858
(Monday through Friday, 8:00 AM to 5:00 PM EST)

Emergency Information

Transportation: CHEMTREC: (800) 424-9300
(24 hrs., 7 days a week)
Medical: Rocky Mountain Poison Center: (866) 767-5089
(24 hrs., 7 days a week)

Product Information

Product name: FORANE® 408A
Synonyms: R-408A, HFC 408A, FORANE FX 10
Molecular formula: Complex Mixture
Chemical family: Hydrochlorofluorocarbon
Molecular weight: 87.01 g/mol
Product use: Low temperature refrigerant, Air conditioning

2. HAZARDS IDENTIFICATION

Emergency Overview

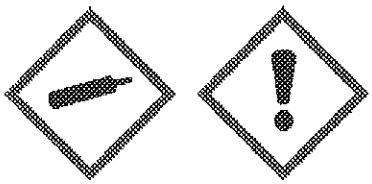
Color: Clear - colourless
Physical state: gaseous
Form: Liquefied gas
Odor: Slightly ether-like

***Classification of the substance or mixture:**
Gases under pressure, Liquefied gas, H280
Hazardous to the ozone layer, Category 1, H420

*For the full text of the H-Statements mentioned in this Section, see Section 16.

GHS-Labelling

Hazard pictograms:



Signal word: **Warning**

Hazard statements:

H280 : Contains gas under pressure; may explode if heated.
H420 : Harms public health and the environment by destroying ozone in the upper atmosphere.

Supplemental Hazard Statements:

Overheating or 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.
May cause frostbite.
May cause headache, nausea, dizziness, drowsiness, loss of consciousness.
May cause cardiac sensitization/cardiac arrhythmia.
May displace oxygen and cause rapid suffocation.

Precautionary statements:

Storage:

P403 : Store in a well-ventilated place.
P410 : Protect from sunlight.

Disposal:

P502 : Refer to manufacturer/ supplier for information on recovery/ recycling.

Supplemental information:

Potential Health Effects:

Liquid : Contact with liquid or refrigerated gas can cause cold burns and frostbite. Vapor: Gas/vapor is heavier than air and can cause suffocation by reducing oxygen available for breathing. If inhaled: Central nervous system effects: headache, nausea, dizziness, drowsiness, loss of consciousness. Stress induced heart effects: Inhalation may cause an increase in the sensitivity of the heart to adrenaline, which could result in irregular or rapid heartbeats and reduced heart function.

Medical conditions aggravated by overexposure:

Heart disease or compromised heart function.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No.	Wt/Wt	GHS Classification**
Methane, chlorodifluoro-	75-45-6	>= 30 - < 60 %	H280, H420
Ethane, 1,1,1-trifluoro-	420-46-2	>= 30 - < 60 %	H220, H280
Ethane, pentafluoro-	354-33-6	>= 5 - < 10 %	H280

**For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1. Description of necessary first-aid measures:

Inhalation:
If inhaled, remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Skin:
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. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eyes:
Immediately flush eye(s) with plenty of water.

Ingestion:
Ingestion is not applicable - product is a gas at ambient temperatures.

4.2. Most important symptoms/effects, acute and delayed:

For most important symptoms and effects (acute and delayed), see Section 2 (Hazard Statements and Supplemental Information if applicable) and Section 11 (Toxicology Information) of this SDS.

4.3. Indication of immediate medical attention and special treatment needed, if necessary:

Unless otherwise noted in Notes to Physician, no specific treatment noted; treat symptomatically.

Notes to physician:
Do not give drugs from adrenaline-ephedrine group.

5. FIREFIGHTING MEASURES

Extinguishing media (suitable):
Use extinguishing media appropriate to surrounding fire conditions.

Protective equipment:
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).

Further firefighting advice:
Fight fire with large amounts of water from a safe distance.
Stop the flow of gas if possible.
Water mist should be used to reduce vapor concentrations in air.
Cool closed containers exposed to fire with water spray.
Closed containers of this material may explode when subjected to heat from surrounding fire.
After a fire, wait until the material has cooled to room temperature before initiating clean-up activities.
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.
When burned, the following hazardous products of combustion can occur:
hydrofluoric acid
Carbon oxides
Carbonyl halides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, Emergency procedures, Methods and materials for containment/clean-up:
Prevent further leakage or spillage if you can do so without risk. Evacuate area of all unnecessary personnel. Eliminate all ignition sources. 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. Avoid breathing leaked material. Consult a regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits.

Protective equipment:
Appropriate personal protective equipment is set forth in Section 8.

7. HANDLING AND STORAGE

Handling

General information on handling:
Avoid breathing gas.
Avoid contact with skin, eyes and clothing.
Keep away from heat, sparks and flames.
Wear cold-insulating gloves/face shield/eye protection.
Keep container closed.
Use only with adequate ventilation.
Use equipment rated for cylinder pressure.
Use a backflow preventative device in piping.
Wash thoroughly after handling.
Close valve after each use and when empty.
Do not enter confined spaces unless adequately ventilated.
DO NOT CUT, DRILL, GRIND, OR WELD ON OR NEAR THIS CONTAINER.
Emptied container retains vapor and product residue.
Observe all labeled safeguards until container is cleaned, reconditioned or destroyed.

Storage

General information on storage conditions:
Keep away from direct sunlight. Keep cylinders restrained. Store in cool, dry, well ventilated area away from sources of ignition such as flame, sparks and static electricity.

Storage stability – Remarks:
Do not apply direct flame to cylinder. Do not store cylinder in direct sun or expose it to heat above 120 F (48.9 C.).
Do not drop or refill this cylinder.

Storage incompatibility – General:
Store separate from:
Finely divided metals (aluminum, magnesium...)
Alkaline earth metals
Alkali metals
Strong bases
Strong oxidizing agents

Temperature tolerance – Do not store above:
118 °F (48 °C)

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Airborne Exposure Guidelines:

Methane, chlorodifluoro- (75-45-6)

US. ACGIH Threshold Limit Values

Time weighted average	1,000 ppm

Ethane, 1,1,1-trifluoro- (420-46-2)

US. OARS. WEELs Workplace Environmental Exposure Level Guide

Time weighted average	1,000 ppm (3,400 mg/m3)
Remarks:	Listed

Ethane, pentafluoro- (354-33-6)

US. OARS. WEELs Workplace Environmental Exposure Level Guide

Time weighted average	1,000 ppm (4,900 mg/m3)
Remarks:	Listed

Only those components with exposure limits are printed in this section. Limits with skin contact designation above have skin contact effect. Air sampling alone is insufficient to accurately quantitate exposure. Measures to prevent significant cutaneous absorption may be required. Limits with a sensitizer designation above mean that exposure to this material may cause allergic reactions.

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

Monitor carbon monoxide and oxygen levels in tanks and enclosed spaces.Consult ACGIH ventilation manual, NFPA Standard 91 and NFPA Standard 654 for design of exhaust system and safe handling.

Respiratory protection:
Avoid breathing gas. Where airborne exposure is likely or airborne exposure limits are exceeded (if applicable, see above), 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 there may be a potential for significant exposure or 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.

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 immediately if skin is contaminated. Wash contaminated clothing and clean protective equipment before reuse. Wash thoroughly after handling.

Eye protection:
Use good industrial practice to avoid eye contact.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	Clear - colourless
Physical state:	gaseous
Form:	Liquefied gas
Odor:	Slightly ether-like
Odor threshold:	not determined
Flash point	Not applicable
Auto-ignition temperature:	No data available.
Lower flammable limit (LFL):	None.
Upper flammable limit (UFL):	None.
pH:	Not applicable
Density:	not determined
Specific Gravity (Relative density):	1.06 (77 °F(25 °C))
Vapor pressure:	7,834 mmHg (70.0 °F (21.1 °C))
Vapor density:	3.02 kg/m3
Boiling point/boiling range:	-46.3 °F (-43.5 °C)
Melting point/range:	No data available.
Freezing point:	not determined
Evaporation rate:	No data available
Solubility in water:	Slightly soluble
Viscosity, dynamic:	No data available
% Volatiles:	100 %
Molecular weight:	87.01 g/mol
Oil/water partition coefficient:	(No data available)

Thermal decomposition: No data available

Flammability: See GHS Classification in Section 2 if applicable

10. STABILITY AND REACTIVITY

Stability:
This material is chemically stable under normal and anticipated storage, handling and processing conditions.

Hazardous reactions:
None known.

Materials to avoid:
Finely divided metals (aluminum, magnesium...)
Alkaline earth metals
Alkali metals
Strong bases
Strong oxidizing agents

Conditions / hazards to avoid:
Heat

Hazardous decomposition products:

Thermal decomposition giving toxic and corrosive products :
Hydrogen fluoride
Carbonyl halides
Carbon oxides

11. TOXICOLOGICAL INFORMATION

Data on this material and/or its components are summarized below.

Data for Methane, chlorodifluoro- (75-45-6)

Acute toxicity

Inhalation:
No deaths occurred. (rat) 6 h LC50 (> 150000 ppm). (vapour)

Skin Irritation:
Practically non-irritating. (rabbit) (Rapid evaporation of the liquid may cause frostbite.)

Eye Irritation:
Causes mild eye irritation. (rabbit) (30 s) (gas spray)

Sensitization:
Causes cardiac sensitization. (dog, rat, mouse, rabbit and monkey) (Reaction may occur in response to stress (natural adrenaline release) or administration of epinephrine.)

Skin Sensitization:
Not a sensitizer. Repeated skin exposure. (guinea pig) No skin allergy was observed

Repeated dose toxicity
Chronic inhalation administration to rat, mouse / No adverse systemic effects reported.

Chronic oral administration to rat / No adverse systemic effects reported.

Carcinogenicity
Chronic inhalation administration to mice / No increase in tumor incidence was reported.

Chronic inhalation administration to female rat / No increase in tumor incidence was reported.

Chronic inhalation administration to male rat / affected organ(s): salivary gland / Increased incidence of tumors was reported. (not considered relevant to humans)

Genotoxicity

Assessment in Vitro:
Genetic changes were observed in laboratory tests using: bacteria

No genetic changes were observed in laboratory tests using: animal cells, yeast

Genotoxicity

Assessment in Vivo:
No genetic changes were observed in laboratory tests using: mice

Developmental toxicity
Exposure during pregnancy. Inhalation (Rat) / Birth defects were observed. (eye)
Exposure during pregnancy. Inhalation (Rabbit) / No birth defects were observed.

Reproductive effects
Reproduction test. Inhalation (rat and mouse) / No toxicity to reproduction / (males)

Human experience
Inhalation:
Lung: Asphyxia, suffocation.

Heart: Palpitation. (based on reports of occupational exposure to workers)

Human experience
Skin contact:
Skin: irritation, redness, swelling. (repeated or prolonged exposure)

Data for Ethane, 1,1,1-trifluoro- (420-46-2)

Acute toxicity

Inhalation:
No deaths occurred. (Rat) 4 h LC0 (> 591000 ppm).

Sensitization:
Causes cardiac sensitization. Inhalation. (Dog) Stress induced heart effects: Stress induced heart

effects: (Reaction may occur in response to stress (natural adrenaline release) or administration of epinephrine.)

Repeated dose toxicity
Repeated inhalation administration to rat and guinea pig / affected organ(s): lung / signs: irritation, bronchitis, pneumonia

Chronic oral administration to rat / No adverse effects reported.

Carcinogenicity
Chronic oral administration to rat / No increase in tumor incidence was reported.

Genotoxicity

Assessment in Vitro:
No genetic changes were observed in laboratory tests using: bacteria, human cells

Genotoxicity

Assessment in Vivo:
No genetic changes were observed in laboratory tests using: mice

Developmental toxicity
Exposure during pregnancy. Inhalation (rat and rabbit) / No birth defects were observed.

Data for Ethane, pentafluoro- (354-33-6)

Acute toxicity

Inhalation:
Practically nontoxic. (rat) 4 h LC0 (> 800000 ppm). (gas)

Sensitization:
Causes cardiac sensitization. inhalation. (dog) Stress induced heart effects: Stress induced heart effects: (Reaction may occur in response to stress (natural adrenaline release) or administration of epinephrine.)

Repeated dose toxicity
Subchronic inhalation administration to rat / No adverse systemic effects reported.

Genotoxicity

Assessment in Vitro:
No genetic changes were observed in laboratory tests using: bacteria, animal cells, human cells

Genotoxicity

Assessment in Vivo:
No genetic changes were observed in laboratory tests using: mice

Developmental toxicity
Exposure during pregnancy. inhalation (rat and rabbit) / No birth defects were observed.

12. ECOLOGICAL INFORMATION

Chemical Fate and Pathway
Data on this material and/or its components are summarized below.

Data for Methane, chlorodifluoro- (75-45-6)

Biodegradation:
Not readily biodegradable. (28 d) Water 0 %

Octanol Water Partition Coefficient:
log Pow: = 1.11 - 1.1668 °F (20 °C) (Method: OECD Test Guideline 107) (Practically no potential to bioaccumulate.)

Photodegradation:
Half-life direct photolysis: = 8.4 y

Mobility and Distribution in the Environment:
Moderate adsorption / Log Koc = 1.8

Global Warming Potential:
GWP 1,810 (Global warming potential with respect to CO2 (time horizon 100 years))
GWP 0.33 (Halocarbon global warming potential; HGWP; (R-11 = 1))

Ozone Depletion Potential:
ODP 0.055 (Ozone depletion potential; ODP; (R-11 = 1))

Data for Ethane, 1,1,1-trifluoro- (420-46-2)

Biodegradation:
Not readily biodegradable. (28 d) biodegradation 3 - 10 % / similar material

Octanol Water Partition Coefficient:
log Pow: = 1.73(Method: calculated)

Global Warming Potential:
GWP 3,800 (Global warming potential with respect to CO2 (time horizon 100 years))

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

Data for Ethane, pentafluoro- (354-33-6)

Biodegradation:
Not readily biodegradable. (28 d) biodegradation 5 %

Octanol Water Partition Coefficient:
log Pow: = 1.48, at 77 °F (25 °C) pH = 6.4

Global Warming Potential:
GWP 0.84 (Halocarbon global warming potential; HGWP; (R-11 = 1))
GWP 3,450 (Global warming potential with respect to CO2 (time horizon 100 years))

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

Ecotoxicology
Data on this material and/or its components are summarized below.

Data for Methane, chlorodifluoro- (75-45-6)

Aquatic toxicity data:
Practically nontoxic. Brachydanio rerio (zebrafish) 96 h LC50 = 777 mg/l

Aquatic invertebrates:
Practically nontoxic. Daphnia magna (Water flea) 48 h EC50 = 433 mg/l

Algae:
Practically nontoxic. Algae 96 h EC50 = 377.6 mg/l

Microorganisms:
Respiration inhibition / Bacteria 24 h Toxicity threshold > 400 mg/l (under anaerobic conditions)

Data for Ethane, 1,1,1-trifluoro- (420-46-2)

Aquatic toxicity data:
No adverse effects reported. Oncorhynchus mykiss (rainbow trout) 96 h LC0 >= 175 mg/l (Nominal concentration)

Aquatic invertebrates:
Practically nontoxic. Daphnia magna (Water flea) 48 h EC50 = 300 mg/l

13. DISPOSAL CONSIDERATIONS

Waste disposal:
Do not vent the container contents, or product residuals, to the atmosphere. Recover and reclaim unused contents or residuals as appropriate. Recovered/reclaimed product can be returned to an approved certified reclaimer or back to the seller depending on the material. Completely emptied disposable containers can be disposed of as recyclable steel. Returnable cylinders must be returned to seller. Dispose of in accordance with federal, state and local regulations. Consult a regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits. 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

US Department of Transportation (DOT)

UN Number	:	3163
Proper shipping name	:	Liquefied gas, n.o.s.
Technical name	:	(Chlorodifluoromethane, 1,1,1-Trifluoroethane)
Class	:	2.2
Marine pollutant	:	no

International Maritime Dangerous Goods Code (IMDG)

UN Number	:	3163
Proper shipping name	:	LIQUEFIED GAS, N.O.S.
Technical name	:	(CHLORODIFLUOROMETHANE, 1.1.1-TRIFLUOROETHANE)
Class	:	2.2
Marine pollutant	:	no

15. REGULATORY INFORMATION

Chemical Inventory Status

US. Toxic Substances Control Act	TSCA	The components of this product are all on the TSCA Inventory.
Australia. Industrial Chemical (Notification and Assessment) Act	AICS	Conforms to
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL)	DSL	All components of this product are on the Canadian DSL
Japan. Kashin-Hou Law List	ENCS (JP)	Does not conform
Korea. Existing Chemicals Inventory (KECI)	KECI (KR)	Conforms to
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	PICCS (PH)	Conforms to
China. Inventory of Existing Chemical Substances	IECSC (CN)	Conforms to

United States – Federal Regulations

SARA Title III – Section 302 Extremely Hazardous Chemicals:
The components in this product are either not SARA Section 302 regulated or regulated but present in negligible concentrations.

SARA Title III - Section 311/312 Hazard Categories:
Acute Health Hazard, Sudden Release of Pressure Hazard

SARA Title III – Section 313 Toxic Chemicals:

Chemical name	CAS-No.	De minimis concentration	Reportable threshold:
Methane, chlorodifluoro-	75-45-6	1.0 %	25000 lbs (Manufacturing and processing) 10000 lbs (Otherwise used (non-manufacturing/processing))

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - Reportable Quantity (RQ):

The components in this product are either not CERCLA regulated, regulated but present in negligible concentrations, or regulated with no assigned reportable quantity.

United States – State Regulations

New Jersey Right to Know

Chemical name	CAS-No.
Ethane, 1,1,1-trifluoro-	420-46-2
Methane, chlorodifluoro-	75-45-6

New Jersey Right to Know – Special Health Hazard Substance(s)

Chemical name	CAS-No.
Ethane, 1,1,1-trifluoro-	420-46-2

Pennsylvania Right to Know

Chemical name	CAS-No.
Ethane, pentafluoro-	354-33-6
Methane, chlorodifluoro-	75-45-6
Ethane, 1,1,1-trifluoro-	420-46-2

Pennsylvania Right to Know – Environmentally Hazardous Substance(s)

Chemical name	CAS-No.
Methane, chlorodifluoro-	75-45-6

California Prop. 65
This product does not contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive defects.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.
H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.
H420 Harms public health and the environment by destroying ozone in the upper atmosphere.

Latest Revision(s):

Reference number:	200009553
Date of Revision:	03/28/2019
Date Printed:	03/29/2019

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Arkema has implemented a Medical Policy regarding the use of Arkema products in Medical Devices applications that are in contact with the body or circulating bodily fluids (http://www.arkema.com/en/social-responsibility/responsible-product-management/medical-device-policy/index.html) Arkema has designated Medical grades to be used for such Medical Device applications. Products that have not been designated as Medical grades are not authorized by Arkema for use in Medical Device applications that are in contact with the body or circulating bodily fluids. In addition, Arkema strictly prohibits the use of any Arkema products in Medical Device applications that are implanted in the body or in contact with bodily fluids or tissues for greater than 30 days. The Arkema trademarks and the Arkema name shall not be used in conjunction with customers' medical devices, including without limitation, permanent or temporary implantable devices , and customers shall not represent to anyone else, that Arkema allows, endorses or permits the use of Arkema products in such medical devices.
It is the sole responsibility of the manufacturer of the medical device to determine the suitability (including biocompatibility) of all raw materials, products and components, including any medical grade Arkema products, in order to ensure that the final end-use product is safe for its end use; performs or functions as intended; and complies with all applicable legal and regulatory requirements (FDA or other national drug agencies) It is the sole responsibility of the manufacturer of the medical device to conduct all necessary tests and inspections and to evaluate the medical device under actual end-use requirements and to adequately advise and warn purchasers, users, and/or learned intermediaries (such as physicians) of pertinent risks and fulfill any postmarket surveillance obligations. Any decision regarding the appropriateness of a particular Arkema material in a particular medical device should be based on the judgment of the manufacturer, seller, the competent authority, and the treating physician.

SAFETY DATA SHEET

Freon™ 408A (R-408A) refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 08/15/2017
6.0	10/17/2017	1336389-00033	Date of first issue: 02/27/2017

SECTION 1. IDENTIFICATION

Product name	:	Freon™ 408A (R-408A) refrigerant
Product code	:	D10482106
SDS-Identcode	:	130000050988

Manufacturer or supplier's details

Company name of supplier	:	The Chemours Company FC, LLC
Address	:	1007 Market Street Wilmington, DE 19899 United States of America (USA)
Telephone	:	1-844-773-CHEM (outside the U.S. 1-302-773-1000)
Emergency telephone	:	Medical emergency: 1-866-595-1473 (outside the U.S. 1-302-773-2000) ; Transport emergency: +1-800-424-9300 (outside the U.S. +1-703-527-3887)

Recommended use of the chemical and restrictions on use

Recommended use	:	Refrigerant
Restrictions on use	:	For professional users only.

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with 29 CFR 1910.1200

Gases under pressure	:	Liquefied gas

Simple Asphyxiant

GHS label elements

Hazard pictograms :

Signal Word	:	Warning
Hazard Statements	:	H280 Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation.
Precautionary Statements	:	**Storage:** P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Other hazards

Dangerous for the ozone layer.
Vapors are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects.
Rapid evaporation of the product may cause frostbite.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous ingredients

Chemical name	CAS-No.	Concentration (% w/w)
Chlorodifluoromethane	75-45-6	47
1,1,1-Trifluoroethane*	420-46-2	46
Pentafluoroethane*	354-33-6	7

* Voluntarily-disclosed non-hazardous substance

SECTION 4. FIRST AID MEASURES

General advice : In the case of accident or if you feel unwell, seek medical advice immediately.
When symptoms persist or in all cases of doubt seek medical advice.

If inhaled : If inhaled, remove to fresh air.
Get medical attention if symptoms occur.

In case of skin contact : Thaw frosted parts with lukewarm water. Do not rub affected area.
Get medical attention immediately.

In case of eye contact : Get medical attention immediately.

If swallowed : Ingestion is not considered a potential route of exposure.

Most important symptoms and effects, both acute and delayed : May cause cardiac arrhythmia.
Other symptoms potentially related to misuse or inhalation abuse are
Cardiac sensitization
Anaesthetic effects
Light-headedness
Dizziness
confusion
Lack of coordination
Drowsiness
Unconsciousness
Contact with liquid or refrigerated gas can cause cold burns and frostbite.

Protection of first-aiders : No special precautions are necessary for first aid responders.

Notes to physician : Treat symptomatically and supportively.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Not applicable Will not burn
Unsuitable extinguishing media	:	Not applicable Will not burn
Specific hazards during fire fighting	:	Exposure to combustion products may be a hazard to health. If the temperature rises there is danger of the vessels bursting due to the high vapor pressure.
Hazardous combustion products	:	Carbon oxides Fluorine compounds
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Fight fire remotely due to the risk of explosion. Use water spray to cool unopened containers. Remove undamaged containers from fire area if it is safe to do so. Evacuate area.
Special protective equipment for fire-fighters	:	Wear self-contained breathing apparatus for firefighting if necessary. Use personal protective equipment.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Evacuate personnel to safe areas. Avoid skin contact with leaking liquid (danger of frostbite). Ventilate the area. Follow safe handling advice and personal protective equipment recommendations.
Environmental precautions	:	Prevent further leakage or spillage if safe to do so. Retain and dispose of contaminated wash water.
Methods and materials for containment and cleaning up	:	Ventilate the area. Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases. You will need to determine which regulations are applicable. Sections 13 and 15 of this SDS provide information regarding certain local or national requirements.

SECTION 7. HANDLING AND STORAGE

Technical measures	:	Use equipment rated for cylinder pressure. Use a backflow preventative device in piping. Close valve after each use and when empty.

Local/Total ventilation	:	Use only with adequate ventilation.
Advice on safe handling	:	Avoid breathing gas. Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment Wear cold insulating gloves/ face shield/ eye protection. Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Prevent backflow into the gas tank. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems. Close valve after each use and when empty. Do NOT change or force fit connections. Prevent the intrusion of water into the gas tank. Never attempt to lift cylinder by its cap. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Keep away from heat and sources of ignition. Take precautionary measures against static discharges. Take care to prevent spills, waste and minimize release to the environment.
Conditions for safe storage	:	Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Separate full containers from empty containers. Do not store near combustible materials. Avoid area where salt or other corrosive materials are present. Keep in properly labeled containers. Keep in a cool, well-ventilated place. Keep away from direct sunlight. Store in accordance with the particular national regulations.
Materials to avoid	:	Do not store with the following product types: Self-reactive substances and mixtures Organic peroxides Oxidizing agents Flammable liquids Flammable solids Pyrophoric liquids Pyrophoric solids Self-heating substances and mixtures Substances and mixtures which in contact with water emit flammable gases Explosives Acutely toxic substances and mixtures Substances and mixtures with chronic toxicity
Recommended storage temperature	:	< 52 °C
Storage period	:	> 10 y

Further information on storage stability : The product has an indefinite shelf life when stored properly.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Ingredients	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Chlorodifluoromethane	75-45-6	TWA	1,000 ppm	ACGIH
		ST	1,250 ppm 4,375 mg/m³	NIOSH REL
		TWA	1,000 ppm 3,500 mg/m³	NIOSH REL
1,1,1-Trifluoroethane	420-46-2	TWA	1,000 ppm	US WEEL
Pentafluoroethane	354-33-6	TWA	1,000 ppm	US WEEL

Engineering measures : Ensure adequate ventilation, especially in confined areas. Minimize workplace exposure concentrations.

Personal protective equipment

Respiratory protection : General and local exhaust ventilation is recommended to maintain vapor exposures below recommended limits. Where concentrations are above recommended limits or are unknown, appropriate respiratory protection should be worn. Follow OSHA respirator regulations (29 CFR 1910.134) and use NIOSH/MSHA approved respirators. Protection provided by air purifying respirators against exposure to any hazardous chemical is limited. Use a positive pressure air supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstance where air purifying respirators may not provide adequate protection.

Hand protection

Material : Low temperature resistant gloves

Remarks : Choose gloves to protect hands against chemicals depending on the concentration specific to place of work. For special applications, we recommend clarifying the resistance to chemicals of the aforementioned protective gloves with the glove manufacturer. Wash hands before breaks and at the end of workday. Breakthrough time is not determined for the product. Change gloves often!

Eye protection : Wear the following personal protective equipment:
Chemical resistant goggles must be worn.
Face-shield

Skin and body protection	:	Skin should be washed after contact.
Protective measures	:	Wear cold insulating gloves/ face shield/ eye protection.
Hygiene measures	:	Ensure that eye flushing systems and safety showers are located close to the working place. When using do not eat, drink or smoke. Wash contaminated clothing before re-use.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Liquefied gas
Color	:	clear, colorless
Odor	:	slight, ether-like
Odor Threshold	:	No data available
pH	:	No data available
Melting point/freezing point	:	No data available
Initial boiling point and boiling range	:	-44.6 °C
Flash point	:	Not applicable
Evaporation rate	:	Not applicable
Flammability (solid, gas)	:	Will not burn
Upper explosion limit / Upper flammability limit	:	Upper flammability limit Method: ASTM E681 None.
Lower explosion limit / Lower flammability limit	:	Lower flammability limit Method: ASTM E681 None.
Vapor pressure	:	11,710 hPa (25 °C) 33,400 hPa (70 °C)
Relative vapor density	:	3.1
Relative density	:	1.06 (25 °C)
Density	:	1.061 g/cm³ (25 °C) (as liquid)
Solubility(ies) Water solubility	:	No data available

Partition coefficient: n-octanol/water	:	Not applicable
Autoignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity Viscosity, kinematic	:	Not applicable
Explosive properties	:	Not explosive
Oxidizing properties	:	The substance or mixture is not classified as oxidizing.
Particle size	:	Not applicable

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Not classified as a reactivity hazard.
Chemical stability	:	Stable if used as directed. Follow precautionary advice and avoid incompatible materials and conditions.
Possibility of hazardous reactions	:	Can react with strong oxidizing agents.
Conditions to avoid	:	Heat, flames and sparks.
Incompatible materials	:	Oxidizing agents
Hazardous decomposition products	:	No hazardous decomposition products are known.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation
Skin contact
Eye contact

Acute toxicity

Not classified based on available information.

Ingredients:

Chlorodifluoromethane:

Acute inhalation toxicity	:	LC50 (Mouse): > 150000 ppm Exposure time: 4 h Test atmosphere: gas Lowest observed adverse effect concentration (Dog): 50000 ppm Test atmosphere: gas Symptoms: Cardiac sensitization

No observed adverse effect concentration (Dog): 25000 ppm
Test atmosphere: gas
Symptoms: Cardiac sensitization

Cardiac sensitisation threshold limit (Dog): 175,000 mg/m³
Test atmosphere: gas
Symptoms: Cardiac sensitization

1,1,1-Trifluoroethane:

Acute inhalation toxicity : LC0 (Rat): > 591000 ppm
Exposure time: 4 h
Test atmosphere: gas

Pentafluoroethane:

Acute inhalation toxicity : LC0 (Rat): > 800000 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: OECD Test Guideline 403

Skin corrosion/irritation

Not classified based on available information.

Serious eye damage/eye irritation

Not classified based on available information.

Respiratory or skin sensitization

Skin sensitization

Not classified based on available information.

Respiratory sensitization

Not classified based on available information.

Ingredients:

Chlorodifluoromethane:

Routes of exposure: Skin contact
Species: Not tested on animals
Result: negative

Germ cell mutagenicity

Not classified based on available information.

Ingredients:

Chlorodifluoromethane:

Germ cell mutagenicity - Assessment : Weight of evidence does not support classification as a germ cell mutagen.

1,1,1-Trifluoroethane:

Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)
Method: OECD Test Guideline 471

Result: negative

Test Type: Chromosome aberration test in vitro
Result: negative

Test Type: In vitro mammalian cell gene mutation test
Result: negative
Remarks: Based on data from similar materials

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
Species: Mouse
Application Route: inhalation (gas)
Result: negative

Pentafluoroethane:

Genotoxicity in vitro : Test Type: Chromosome aberration test in vitro
Method: OECD Test Guideline 473
Result: negative

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
Species: Mouse
Application Route: inhalation (gas)
Method: OECD Test Guideline 474
Result: negative

Carcinogenicity

Not classified based on available information.

Ingredients:

Chlorodifluoromethane:

Carcinogenicity - Assessment : Weight of evidence does not support classification as a carcinogen

1,1,1-Trifluoroethane:

Species: Rat
Application Route: Ingestion
Exposure time: 72 weeks
Result: negative

IARC No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

NTP No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

Reproductive toxicity

Not classified based on available information.

Ingredients:

Chlorodifluoromethane:

Reproductive toxicity - Assessment	:	Weight of evidence does not support classification for reproductive toxicity

1,1,1-Trifluoroethane:

Effects on fertility	:	Test Type: Three-generation reproduction toxicity study Species: Rat Application Route: inhalation (gas) Result: negative Remarks: Based on data from similar materials
Effects on fetal development	:	Test Type: Embryo-fetal development Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 414 Result: negative

Pentafluoroethane:

Effects on fertility	:	Test Type: One-generation reproduction toxicity study Species: Rat Application Route: inhalation (vapor) Result: negative Remarks: Based on data from similar materials
Effects on fetal development	:	Test Type: Embryo-fetal development Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 414 Result: negative

STOT-single exposure

Not classified based on available information.

STOT-repeated exposure

Not classified based on available information.

Ingredients:

Chlorodifluoromethane:

Assessment: No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

Repeated dose toxicity

Ingredients:

Chlorodifluoromethane:

Species: Mouse

NOAEL: 10000 ppm
LOAEL: 50000 ppm
Application Route: inhalation (gas)
Exposure time: 581 d
Remarks: No significant adverse effects were reported

1,1,1-Trifluoroethane:

Species: Rat
NOAEL: > 40000 ppm
Application Route: inhalation (gas)
Exposure time: 13 Weeks
Method: OECD Test Guideline 413

Pentafluoroethane:

Species: Rat
NOAEL: >= 50000 ppm
Application Route: inhalation (gas)
Exposure time: 13 Weeks
Method: OECD Test Guideline 413

Aspiration toxicity

Not classified based on available information.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Ingredients:

Chlorodifluoromethane:

Toxicity to fish	:	LC50 (Zebrafish): 777 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 433 mg/l Exposure time: 48 h
Toxicity to algae	:	EC50 (algae): 250 mg/l Exposure time: 96 h

1,1,1-Trifluoroethane:

Toxicity to fish	:	LC50 (Oncorhynchus mykiss (rainbow trout)): > 100 mg/l Exposure time: 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): > 100 mg/l Exposure time: 48 h Method: OECD Test Guideline 202
Toxicity to algae	:	EC0 (Pseudokirchneriella subcapitata (green algae)): > 44 mg/l Exposure time: 96 h Method: OECD Test Guideline 201

Remarks: Based on data from similar materials

Toxicity to microorganisms : EC0 (Pseudomonas putida): > 730 mg/l
Exposure time: 6 h

Pentafluoroethane:

Toxicity to fish : LC50 (Oncorhynchus mykiss (rainbow trout)): 450 mg/l
Exposure time: 96 h
Method: Directive 67/548/EEC, Annex V, C.1.
Remarks: Based on data from similar materials

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 980 mg/l
Exposure time: 48 h
Method: Directive 67/548/EEC, Annex V, C.2.
Remarks: Based on data from similar materials

Toxicity to algae : EC50 (Pseudokirchneriella subcapitata (green algae)): > 114 mg/l
Exposure time: 72 h
Method: OECD Test Guideline 201
Remarks: Based on data from similar materials

NOEC (Pseudokirchneriella subcapitata (green algae)): 13.2 mg/l
Exposure time: 72 h
Method: OECD Test Guideline 201
Remarks: Based on data from similar materials

Persistence and degradability

Ingredients:

Chlorodifluoromethane:

Biodegradability : Result: Not readily biodegradable.

1,1,1-Trifluoroethane:

Biodegradability : Result: Not inherently biodegradable.
Biodegradation: 3 %
Exposure time: 28 d
Remarks: Based on data from similar materials

Pentafluoroethane:

Biodegradability : Result: Not readily biodegradable.
Biodegradation: 5 %
Exposure time: 28 d
Method: OECD Test Guideline 301D

Bioaccumulative potential

Ingredients:

1,1,1-Trifluoroethane:

Partition coefficient: n-octanol/water : log Pow: 1.06 - < 1.35
Remarks: Based on data from similar materials

Pentafluoroethane:

Partition coefficient: n-octanol/water : Pow: 1.48 (25 °C)

Mobility in soil

No data available

Other adverse effects

Ingredients:

Chlorodifluoromethane:

Ozone-Depletion Potential : 0.055
Where a range of ODPs is indicated, the highest value in that range shall be used for the purposes of the Protocol. The ODPs listed as a single value have been determined from calculations based on laboratory measurements. Those listed as a range are based on estimates and are less certain. The range pertains to an isomeric group. The upper value is the estimate of the ODP of the isomer with the highest ODP, and the lower value is the estimate of the ODP of the isomer with the lowest ODP.
Regulation: UNEP - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer (Update: 2006-10-01)
Group: Annex C - Group I: HCFCs (consumption and production)

0.055
Includes all isomers of the substance, regardless of whether the isomer is explicitly listed on its own.
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class II Substances (Update: 2014-10-28)

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Dispose of in accordance with local regulations.

Contaminated packaging : Empty containers should be taken to an approved waste handling site for recycling or disposal.
Empty pressure vessels should be returned to the supplier.
If not otherwise specified: Dispose of as unused product.

SECTION 14. TRANSPORT INFORMATION

International Regulations

UNRTDG

UN number	:	UN 3163
Proper shipping name	:	LIQUEFIED GAS, N.O.S. (Chlorodifluoromethane, 1,1,1-Trifluoroethane)
Class	:	2.2
Packing group	:	Not assigned by regulation
Labels	:	2.2

IATA-DGR

UN/ID No.	:	UN 3163
Proper shipping name	:	Liquefied gas, n.o.s. (Chlorodifluoromethane, 1,1,1-Trifluoroethane)
Class	:	2.2
Packing group	:	Not assigned by regulation
Labels	:	Non-flammable, non-toxic Gas
Packing instruction (cargo aircraft)	:	200
Packing instruction (passenger aircraft)	:	200

IMDG-Code

UN number	:	UN 3163
Proper shipping name	:	LIQUEFIED GAS, N.O.S. (Chlorodifluoromethane, 1,1,1-Trifluoroethane)
Class	:	2.2
Packing group	:	Not assigned by regulation
Labels	:	2.2
EmS Code	:	F-C, S-V
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

Domestic regulation

49 CFR

UN/ID/NA number	:	UN 3163
Proper shipping name	:	Liquefied gas, n.o.s. (Chlorodifluoromethane, 1,1,1-Trifluoroethane)
Class	:	2.2
Packing group	:	Not assigned by regulation
Labels	:	NON-FLAMMABLE GAS
ERG Code	:	126
Marine pollutant	:	no

SECTION 15. REGULATORY INFORMATION

EPCRA - Emergency Planning and Community Right-to-Know

CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Gases under pressure
Simple Asphyxiant

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

Chlorodifluoromethane	75-45-6	47 %

US State Regulations

Pennsylvania Right To Know

Chlorodifluoromethane	75-45-6
1,1,1-Trifluoroethane	420-46-2
Pentafluoroethane	354-33-6

California Prop. 65

This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

California List of Hazardous Substances

Chlorodifluoromethane	75-45-6

California Permissible Exposure Limits for Chemical Contaminants

Chlorodifluoromethane	75-45-6

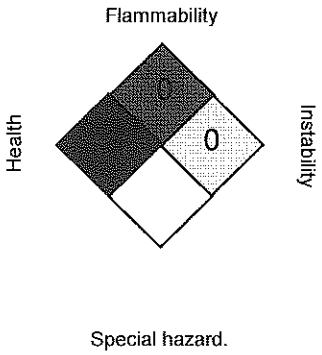
International Regulations

Montreal Protocol (Ozone Depleting Substances) : Chlorodifluoromethane

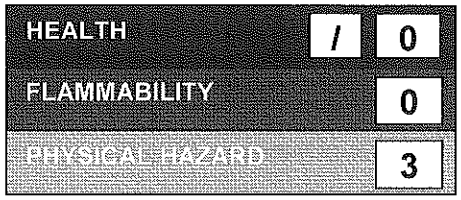
SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS® IV:



HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. The "*" represents a chronic hazard, while the "/" represents the absence of a chronic hazard.

Before use read Chemours safety information.
For further information contact the local Chemours office or nominated distributors.
All chemical substances in this material are included on or exempted from listing on the TSCA Inventory of Chemical Substances.

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
NIOSH REL	:	USA. NIOSH Recommended Exposure Limits
US WEEL	:	USA. Workplace Environmental Exposure Levels (WEEL)
ACGIH / TWA	:	8-hour, time-weighted average
NIOSH REL / TWA	:	Time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek
NIOSH REL / ST	:	STEL - 15-minute TWA exposure that should not be exceeded at any time during a workday
US WEEL / TWA	:	8-hr TWA

AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health

Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

Sources of key data used to compile the Material Safety Data Sheet : Internal technical data, data from raw material SDSs, OECD eChem Portal search results and European Chemicals Agency, http://echa.europa.eu/

Revision Date : 10/17/2017

Items where changes have been made to the previous version are highlighted in the body of this document by two vertical lines.

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 is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and shall not be considered a warranty or quality specification of any type. The information provided relates only to the specific material identified at the top of this SDS and may not be valid when the SDS material is used in combination with any other materials or in any process, unless specified in the text. Material users should review the information and recommendations in the specific context of their intended manner of handling, use, processing and storage, including an assessment of the appropriateness of the SDS material in the user's end product, if applicable.

US / Z8

ARKEMA
INNOVATIVE CHEMISTRY

SAFETY DATA SHEET

FORANE® 408A

1. PRODUCT AND COMPANY IDENTIFICATION

Company

Arkema Inc.
900 First Avenue
King of Prussia, Pennsylvania 19406

Fluorochemicals

Customer Service Telephone Number: (800) 245-5858
(Monday through Friday, 8:00 AM to 5:00 PM EST)

Emergency Information

Transportation: CHEMTREC: (800) 424-9300
(24 hrs., 7 days a week)
Medical: Rocky Mountain Poison Center: (866) 767-5089
(24 hrs., 7 days a week)

Product Information

Product name: FORANE® 408A
Synonyms: R-408A, HFC 408A, FORANE FX 10
Molecular formula: Complex Mixture
Chemical family: Hydrochlorofluorocarbon
Molecular weight: 87.01 g/mol
Product use: Low temperature refrigerant, Air conditioning

2. HAZARDS IDENTIFICATION

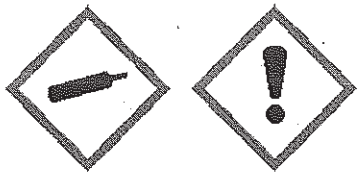
Emergency Overview
Color: Clear - colourless
Physical state: gaseous
Form: Liquefied gas
Odor: Slightly ether-like

***Classification of the substance or mixture:**
Gases under pressure, Liquefied gas, H280
Hazardous to the ozone layer, Category 1, H420

*For the full text of the H-Statements mentioned in this Section, see Section 16.

GHS-Labelling

Hazard pictograms:



Signal word: **Warning**

Hazard statements:

H280 : Contains gas under pressure; may explode if heated.
H420 : Harms public health and the environment by destroying ozone in the upper atmosphere.

Supplemental Hazard Statements:

Overheating or 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. May cause frostbite. May cause headache, nausea, dizziness, drowsiness, loss of consciousness. May cause cardiac sensitization/cardiac arrhythmia. May displace oxygen and cause rapid suffocation.

Precautionary statements:

Storage:

P403 : Store in a well-ventilated place.
P410 : Protect from sunlight.

Disposal:

P502 : Refer to manufacturer/ supplier for information on recovery/ recycling.

Supplemental information:

Potential Health Effects:

Liquid : Contact with liquid or refrigerated gas can cause cold burns and frostbite. Vapor: Vapor is heavier than air and can cause suffocation by reducing oxygen available for breathing. If inhaled: Central nervous system effects: headache, nausea, dizziness, drowsiness, loss of consciousness. Stress induced heart effects: Inhalation may cause an increase in the sensitivity of the heart to adrenaline, which could result in irregular or rapid heartbeats and reduced heart function.

Medical conditions aggravated by overexposure:

Heart disease or compromised heart function.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No.	Wt/Wt	GHS Classification**
Methane, chlorodifluoro-	75-45-6	>= 30 - < 60 %	H280
Ethane, 1,1,1-trifluoro-	420-46-2	>= 30 - < 60 %	H220, H280
Ethane, pentafluoro-	354-33-6	>= 5 - < 10 %	H280

**For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1. Description of necessary first-aid measures:

Inhalation:
If inhaled, remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Skin:
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. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eyes:
Immediately flush eye(s) with plenty of water.

Ingestion:
Ingestion is not applicable - product is a gas at ambient temperatures.

4.2. Most important symptoms/effects, acute and delayed:

For most important symptoms and effects (acute and delayed), see Section 2 (Hazard Statements and Supplemental Information) and Section 11 (Toxicology Information) of this SDS.

4.3. Indication of immediate medical attention and special treatment needed, if necessary:

Unless otherwise noted in Notes to Physician, no specific treatment noted; treat symptomatically.

Notes to physician:
Do not give drugs from adrenaline-ephedrine group.

5. FIREFIGHTING MEASURES

Extinguishing media (suitable):
Use extinguishing media appropriate to surrounding fire conditions.

Protective equipment:
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).

Further firefighting advice:
Fight fire with large amounts of water from a safe distance.
Stop the flow of gas if possible.
Water mist should be used to reduce vapor concentrations in air.
Cool closed containers exposed to fire with water spray.
Closed containers of this material may explode when subjected to heat from surrounding fire.
After a fire, wait until the material has cooled to room temperature before initiating clean-up activities.
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.
When burned, the following hazardous products of combustion can occur:
hydrofluoric acid
Carbon oxides
Carbonyl halides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, Emergency procedures, Methods and materials for containment/clean-up:
Prevent further leakage or spillage if you can do so without risk. Evacuate area of all unnecessary personnel. Eliminate all ignition sources. 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. Avoid breathing leaked material. Consult a regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits.

Protective equipment:
Appropriate personal protective equipment is set forth in Section 8.

7. HANDLING AND STORAGE

Handling

General information on handling:
Avoid breathing gas.
Avoid contact with skin, eyes and clothing.
Keep away from heat, sparks and flames.
Wear cold-insulating gloves/face shield/eye protection.
Keep container closed.
Use only with adequate ventilation.
Use equipment rated for cylinder pressure.
Use a backflow preventative device in piping.
Wash thoroughly after handling.
Close valve after each use and when empty.
Do not enter confined spaces unless adequately ventilated.
DO NOT CUT, DRILL, GRIND, OR WELD ON OR NEAR THIS CONTAINER.
Emptied container retains vapor and product residue.
Observe all labeled safeguards until container is cleaned, reconditioned or destroyed.

Storage

General information on storage conditions:
Keep away from direct sunlight. Keep cylinders restrained. Store in cool, dry, well ventilated area away from sources of ignition such as flame, sparks and static electricity.

Storage stability – Remarks:
Do not apply direct flame to cylinder. Do not store cylinder in direct sun or expose it to heat above 120 F (48.9 C.).
Do not drop or refill this cylinder.

Storage incompatibility – General:
Store separate from:

Finely divided metals (aluminium, magnesium, zinc...)

Strong bases

Alkali metals

Alkaline earth metals

Strong oxidizing agents

Temperature tolerance – Do not store above:
118 °F (48 °C)

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Airborne Exposure Guidelines:

Methane, chlorodifluoro- (75-45-6)

US. ACGIH Threshold Limit Values

Time weighted average	1,000 ppm

Ethane, 1,1,1-trifluoro- (420-46-2)

US. OARS. WEELs Workplace Environmental Exposure Level Guide

Time weighted average	1,000 ppm (3,400 mg/m3)
time weighted average	1,000 ppm (3,400 mg/m3)
Remarks:	Listed

Ethane, pentafluoro- (354-33-6)

US. OARS. WEELs Workplace Environmental Exposure Level Guide

Time weighted average	1,000 ppm (4,900 mg/m3)
Remarks:	Listed
Time weighted average	1,000 ppm (4,900 mg/m3)

Only those components with exposure limits are printed in this section. Limits with skin contact designation above have skin contact effect. Air sampling alone is insufficient to accurately quantitate exposure. Measures to prevent significant cutaneous absorption may be required. Limits with a sensitizer designation above mean that exposure to this material may cause allergic reactions.

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

Monitor carbon monoxide and oxygen levels in tanks and enclosed spaces.Consult ACGIH ventilation manual, NFPA Standard 91 and NFPA Standard 654 for design of exhaust system and safe handling.

Respiratory protection:
Avoid breathing gas. Where airborne exposure is likely or airborne exposure limits are exceeded (if applicable, see above), 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 there may be a potential for significant exposure or 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.

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 immediately if skin is contaminated. Wash contaminated clothing and clean protective equipment before reuse.

Wash thoroughly after handling.

Eye protection:
Use good industrial practice to avoid eye contact.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	Clear - colourless
Physical state:	gaseous
Form:	Liquefied gas
Odor:	Slightly ether-like
Odor threshold:	not determined
Flash point	Not applicable
Auto-ignition temperature:	not determined
Lower flammable limit (LFL):	None.
Upper flammable limit (UFL):	None.
pH:	Not applicable
Density:	not determined
Specific Gravity (Relative density):	1.06 (77 °F(25 °C))
Vapor pressure:	7,834 mmHg (70.0 °F (21.1 °C))
Vapor density:	3.02 kg/m3
Boiling point/boiling range:	-46.3 °F (-43.5 °C)
Melting point/range:	No data available.
Freezing point:	not determined
Evaporation rate:	No data available
Solubility in water:	Slightly soluble
Viscosity, dynamic:	No data available
% Volatiles:	100 %

Molecular weight:	87.01 g/mol
Oil/water partition coefficient:	No data available
Thermal decomposition	No data available
Flammability:	See GHS Classification in Section 2

10. STABILITY AND REACTIVITY

Stability:
This material is chemically stable under normal and anticipated storage, handling and processing conditions.

Hazardous reactions:
None known.

Materials to avoid:
Alkaline earth metals
Strong oxidizing agents
Finely divided metals (aluminium, magnesium, zinc...)
Alkali metals
Strong bases

Conditions / hazards to avoid:
Heat

Hazardous decomposition products:

Thermal decomposition giving toxic and corrosive products :
Hydrogen fluoride
Carbonyl halides
Carbon oxides

11. TOXICOLOGICAL INFORMATION

Data on this material and/or its components are summarized below.

Data for Methane, chlorodifluoro- (75-45-6)

Acute toxicity

Inhalation:
Practically nontoxic. (Rat) 4 h LC50 220000 ppm. (Gas)

Skin Irritation:
Practically non-irritating. (Rabbit) (Rapid evaporation of the liquid may cause frostbite.)

Eye Irritation:

Causes mild eye irritation. (Rabbit) (30 s) signs: Rapid evaporation of the liquid may cause frostbite (gas spray)

Sensitization:
Causes cardiac sensitization. (dog, rat, mouse, rabbit and monkey) irregular heart beat, rapid heart beat, in some cases, sudden death (Reaction may occur in response to stress (natural adrenaline release) or administration of epinephrine.)

Skin Sensitization:
Not a sensitizer. Repeated skin exposure. (Guinea pig) No skin allergy was observed

Repeated dose toxicity
Chronic inhalation administration to rat, mouse / No adverse systemic effects reported.

Chronic oral administration to Rat / No adverse systemic effects reported.

Carcinogenicity
Chronic inhalation administration to mice / signs: No increase in tumor incidence was reported.

Chronic inhalation administration to female rat / signs: No increase in tumor incidence was reported.

Chronic inhalation administration to male rat / affected organ(s): salivary gland / signs: Increased incidence of tumors was reported.

Genotoxicity

Assessment in Vitro:
Genetic changes were observed in laboratory tests using: bacteria

No genetic changes were observed in laboratory tests using: animal cells, yeast

Genotoxicity

Assessment in Vivo:
No genetic changes were observed in laboratory tests using: mice

Developmental toxicity

Exposure during pregnancy. inhalation (Rat) / Birth defects were observed. (eye)
Exposure during pregnancy. inhalation (Rabbit) / No birth defects were observed.

Reproductive effects
Reproduction test. inhalation (rat and mouse) / No toxicity to reproduction / (males)

Human experience
Inhalation:
Lung: Asphyxia, suffocation.

Heart: Palpitation. (based on reports of occupational exposure to workers)

Human experience
Skin contact:
Skin: irritation, redness, swelling. (repeated or prolonged exposure)

Data for Ethane, 1,1,1-trifluoro- (420-46-2)

Acute toxicity

Inhalation:
No deaths occurred. (Rat) 4 h LC0 > 591000 ppm.

Sensitization:
Causes cardiac sensitization. Inhalation. (Dog) Stress induced heart effects: irregular heart beat, rapid heart beat, in some cases, sudden death (Reaction may occur in response to stress (natural adrenaline release) or administration of epinephrine.)

Repeated dose toxicity
Repeated inhalation administration to rat and guinea pig / affected organ(s): lung / signs: irritation, bronchitis, pneumonia

Chronic oral administration to rat / No adverse effects reported.

Carcinogenicity
Chronic oral administration to rat / signs: No increase in tumor incidence was reported.

Genotoxicity

Assessment in Vitro:
No genetic changes were observed in laboratory tests using: bacteria, human cells

Genotoxicity

Assessment in Vivo:
No genetic changes were observed in laboratory tests using: mice

Developmental toxicity

Exposure during pregnancy. Inhalation (rat and rabbit) / No birth defects were observed.

Data for Ethane, pentafluoro- (354-33-6)

Acute toxicity

Inhalation:
Practically nontoxic. (Rat) 4 h LC50 > 800000 ppm. (Gas)

Sensitization:
Causes cardiac sensitization. inhalation. (Dog) Stress induced heart effects: irregular heart beat, rapid heart beat, in some cases, sudden death (Reaction may occur in response to stress (natural adrenaline release) or administration of epinephrine.)

Repeated dose toxicity
Subchronic inhalation administration to Rat / No adverse systemic effects reported.

Genotoxicity

Assessment in Vitro:
No genetic changes were observed in laboratory tests using: bacteria, animal cells, human cells

Genotoxicity

Assessment in Vivo:
No genetic changes were observed in laboratory tests using: mice

Developmental toxicity

Exposure during pregnancy. inhalation (rat and rabbit) / No birth defects were observed.

12. ECOLOGICAL INFORMATION

Chemical Fate and Pathway
Data on this material and/or its components are summarized below.

Data for Methane, chlorodifluoro- (75-45-6)

Biodegradation:
Not readily biodegradable. (28 d) biodegradation 0 %

Octanol Water Partition Coefficient:
log Pow = 1.08 (Practically no potential to bioaccumulate.)

Photodegradation:
Half-life direct photolysis: = 8.4 y

Mobility and Distribution in the Environment:
Moderate adsorption / Log Koc = 1.8

Global Warming Potential:
GWP 1,810 (Global warming potential with respect to CO2 (time horizon 100 years))
GWP 0.33 (Halocarbon global warming potential; HGWP; (R-11 = 1))

Ozone Depletion Potential:
ODP 0.055 (Ozone depletion potential; ODP; (R-11 = 1))

Data for Ethane, 1,1,1-trifluoro- (420-46-2)

Biodegradation:
Not readily biodegradable. (28 d) biodegradation 3 - 10 % / similar material

Octanol Water Partition Coefficient:
log Pow = 1.73 (calculated)

Global Warming Potential:
GWP 3,800 (Global warming potential with respect to CO2 (time horizon 100 years))

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

Data for Ethane, pentafluoro- (354-33-6)

Biodegradation:
Not readily biodegradable. (Closed Bottle test, 28 d) biodegradation 5 %

Octanol Water Partition Coefficient:
log Pow = 1.48

Global Warming Potential:
GWP 0.84 (Halocarbon global warming potential; HGWP; (R-11 = 1))
GWP 3,450 (Global warming potential with respect to CO2 (time horizon 100 years))

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

Ecotoxicology
Data on this material and/or its components are summarized below.

Data for Methane, chlorodifluoro- (75-45-6)

Aquatic toxicity data:
Practically nontoxic. Brachydanio rerio (zebrafish) 96 h LC50 = 777 mg/l

Aquatic invertebrates:
Practically nontoxic. Daphnia magna (Water flea) 48 h EC50 = 433 mg/l

Microorganisms:
Bacteria 24 h Toxicity threshold > 400 mg/l (under anaerobic conditions)

Data for Ethane, 1,1,1-trifluoro- (420-46-2)

Aquatic toxicity data:
No adverse effects reported. Oncorhynchus mykiss (rainbow trout) 96 h LC0 >= 175 mg/l (Nominal concentration)

Aquatic invertebrates:
Practically nontoxic. Daphnia magna (Water flea) 48 h EC50 = 300 mg/l

13. DISPOSAL CONSIDERATIONS

Waste disposal:
Do not vent the container contents, or product residuals, to the atmosphere. Recover and reclaim unused contents or residuals as appropriate. Recovered/reclaimed product can be returned to an approved certified reclaimer or back to the seller depending on the material. Completely emptied disposable containers can be disposed of as recyclable steel. Returnable cylinders must be returned to seller. Dispose of in accordance with federal, state and local regulations. Consult a regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits. 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

US Department of Transportation (DOT)

UN Number	:	3163
Proper shipping name	:	Liquefied gas, n.o.s.

Technical name	:	(Chlorodifluoromethane, 1,1,1-Trifluoroethane)
Class	:	2.2
Marine pollutant	:	no

International Maritime Dangerous Goods Code (IMDG)

UN Number	:	3163
Proper shipping name	:	LIQUEFIED GAS, N.O.S.
Technical name	:	(CHLORODIFLUOROMETHANE, 1.1.1-TRIFLUOROETHANE)
Class	:	2.2
Marine pollutant	:	no

15. REGULATORY INFORMATION

Chemical Inventory Status

EU. EINECS	EINECS	Conforms to
US. Toxic Substances Control Act	TSCA	The components of this product are all on the TSCA Inventory.
Australia. Industrial Chemical (Notification and Assessment) Act	AICS	Conforms to
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL)	DSL	All components of this product are on the Canadian DSL
Japan. Kashin-Hou Law List	ENCS (JP)	Does not conform
Korea. Existing Chemicals Inventory (KECI)	KECI (KR)	Conforms to
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	PICCS (PH)	Conforms to
China. Inventory of Existing Chemical Substances	IECSC (CN)	Conforms to
China. Inventory of Existing Chemical Substances	IECSC (CN)	Conforms to

United States – Federal Regulations

SARA Title III – Section 302 Extremely Hazardous Chemicals:

The components in this product are either not SARA Section 302 regulated or regulated but present in negligible concentrations.

SARA Title III - Section 311/312 Hazard Categories:
Acute Health Hazard, Sudden Release of Pressure Hazard

SARA Title III – Section 313 Toxic Chemicals:

Chemical name	CAS-No.	De minimis concentration	Reportable threshold:
Methane, chlorodifluoro-	75-45-6	1.0 %	25000 lbs (Manufacturing and processing) 10000 lbs (Otherwise used (non-manufacturing/processing))

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - Reportable Quantity (RQ):

The components in this product are either not CERCLA regulated, regulated but present in negligible concentrations, or regulated with no assigned reportable quantity.

United States – State Regulations

New Jersey Right to Know

Chemical name	CAS-No.
Methane, chlorodifluoro-	75-45-6
Ethane, 1,1,1-trifluoro-	420-46-2

New Jersey Right to Know – Special Health Hazard Substance(s)

Chemical name	CAS-No.
Ethane, 1,1,1-trifluoro-	420-46-2

Pennsylvania Right to Know

Chemical name	CAS-No.
Methane, chlorodifluoro-	75-45-6
Ethane, pentafluoro-	354-33-6
Ethane, 1,1,1-trifluoro-	420-46-2

Pennsylvania Right to Know – Environmentally Hazardous Substance(s)

Chemical name	CAS-No.
Methane, chlorodifluoro-	75-45-6

California Prop. 65
This product does not contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive defects.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.
H420 Harms public health and the environment by destroying ozone in the upper atmosphere.

Latest Revision(s):

Revised Section(s):	chapter 4 update
Reference number:	000000057861
Date of Revision:	05/06/2016
Date Printed:	05/10/2016

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DuPont™ Suva® 408A Refrigerant

Version 2.0

Revision Date 04/16/2015 Ref. 130000050988

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™ Suva® 408A Refrigerant
Tradename/Synonym	:	HFC-125/HFC-143a/HCFC-22 BLEND
Product Grade/Type	:	ASHRAE Refrigerant number designation: R-408A
Product Use	:	Refrigerant, For professional users 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
Misuse or intentional inhalation abuse may lead to death without warning.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Rapid evaporation of the liquid may cause frostbite.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Chlorodifluoromethane (HCFC-22)	75-45-6	47 %
1,1,1-Trifluoroethane (HFC-143a)	420-46-2	46 %
Pentafluoroethane (HFC-125)	354-33-6	7 %

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. Consult a physician.

Skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes. Take off all contaminated clothing immediately. Consult a physician. Wash contaminated clothing before re-use. Treat for frostbite if necessary by gently warming affected area.
Eye contact	:	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Consult a physician if necessary.
Ingestion	:	Is not considered a potential route of exposure.
Most important symptoms/effects, acute and delayed	:	Anaesthetic effects Light-headedness irregular heartbeat with a strange sensation in the chest, heart thumping, apprehension, feeling of fainting, dizziness or weakness
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	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
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	:	No applicable data available.
Further information	:	Cool containers/tanks with water spray. Self-contained breathing apparatus (SCBA) is required if containers rupture and contents are released under fire conditions. 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 area, especially low or enclosed places where heavy vapours might collect. Refer to protective measures listed in sections 7 and 8.
Environmental precautions	:	Should not be released into the environment. In accordance with local and national regulations.
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 and eyes. Use sufficient ventilation to keep employee exposure below recommended limits.
Handling (Physical Aspects)	:	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.
Dust explosion class	:	Not applicable
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. Keep away from heat. 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	:	Refrigerant Concentration monitors may be necessary to determine vapor concentrations in work areas prior to use of torches or other open flames, or if employees are entering enclosed areas. Use sufficient ventilation to keep employee exposure below recommended limits. 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.
Hand protection	:	Additional protection: Impervious gloves
Eye protection	:	Wear 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
1,1,1-Trifluoroethane			
AEL *	(DUPONT)	1,000 ppm	8 & 12 hr. TWA
Pentafluoroethane			
AEL *	(DUPONT)	1,000 ppm	8 & 12 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.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

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

pH	:	No applicable data available.
Melting point/range	:	No applicable data available.
Boiling point/boiling range	:	Boiling point/boiling range -44.6 °C (-48.3 °F)
Flash point	:	does not flash
Evaporation rate	:	No applicable data available.
Flammability (solid, gas)	:	Not applicable
Upper explosion limit	:	Method: None per ASTM E681
Lower explosion limit	:	Method: None per ASTM E681
Vapor pressure	:	11,669 hPa at 25 °C (77 °F)
Vapor density	:	3.1 at 25°C (77°F) and 1013 hPa (Air=1.0)
Specific gravity (Relative density)	:	1.06 at 25 °C (77 °F)
Water solubility	:	not determined
Solubility(ies)	:	No applicable data available.
Partition coefficient: n-octanol/water	:	No applicable data available.
Auto-ignition temperature	:	No applicable data available.
Decomposition temperature	:	No applicable data available.
Viscosity, kinematic	:	No applicable data available.
Viscosity	:	No applicable data available.
% Volatile	:	100 %

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Stable at normal ambient temperature and pressure.
Chemical stability	:	Stable at normal temperatures and storage conditions.
Possibility of hazardous reactions	:	Polymerization will not occur.
Conditions to avoid	:	Avoid open flames and high temperatures.
Incompatible materials	:	Alkali metals Alkaline earth metals, Powdered metals, strong oxidizers
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.

Further information : Cardiac sensitisation threshold limit : 175000 mg/m3

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

Inhalation 4 h LC50 : > 591000 ppm , Rat

Inhalation No Observed Adverse Effect Concentration : 250000 ppm , Dog
Cardiac sensitization

Inhalation Low Observed Adverse Effect Concentration (LOAEC) : 300000 ppm , Dog
Cardiac sensitization

Skin sensitization : Does not cause respiratory sensitisation., human

Repeated dose toxicity : Inhalation
Rat
-
gas
NOAEL: > 40000, Method: OECD Test Guideline 413
No toxicologically significant effects were found.

Carcinogenicity : Not classifiable as a human carcinogen.
Animal testing did not show any carcinogenic effects.

Mutagenicity : Animal testing did not show any mutagenic effects.
Tests on bacterial or mammalian cell cultures did not show mutagenic effects.

Reproductive toxicity : No toxicity to reproduction
No effects on or via lactation
Animal testing showed no reproductive toxicity.

Teratogenicity : Animal testing showed no developmental toxicity.

Further information : Cardiac sensitisation threshold limit : 862068.97 mg/m3

Pentafluoroethane (HFC-125)

Inhalation 4 h LC50	:	> 800000 ppm , Rat
Inhalation No Observed Adverse Effect Concentration	:	100000 ppm , Dog Cardiac sensitization
Inhalation Low Observed Adverse Effect Concentration (LOAEC)	:	75000 ppm , Dog Cardiac sensitization
Skin sensitization	:	Does not cause respiratory sensitisation., human
Repeated dose toxicity	:	Inhalation Rat - gas NOAEL: > 50000, 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. Evidence suggests this substance does not cause genetic damage in cultured mammalian cells. Did not cause genetic damage in cultured bacterial cells.
Reproductive toxicity	:	No toxicity to reproduction Animal testing showed no reproductive toxicity.
Teratogenicity	:	Animal testing showed no developmental toxicity.
Further information	:	Cardiac sensitisation threshold limit : 490000 mg/m3

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 from 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

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

96 h LC50	:	Oncorhynchus mykiss (rainbow trout) > 40 mg/l OECD Test Guideline 203
96 h ErC50	:	Pseudokirchneriella subcapitata (green algae) > 44 mg/l OECD Test Guideline 201
48 h EC50	:	Daphnia magna (Water flea) 300 mg/l OECD Test Guideline 202

Pentafluoroethane (HFC-125)

96 h LC50	:	Oncorhynchus mykiss (rainbow trout) 450 mg/l Information given is based on data obtained from similar substances.
96 h ErC50	:	Algae 142 mg/l Information given is based on data obtained from similar substances.
72 h NOEC	:	Pseudokirchneriella subcapitata (green algae) 13.2 mg/l Information given is based on data obtained from similar substances.
48 h EC50	:	Daphnia magna (Water flea) 980 mg/l Information given is based on data obtained from similar substances.

Environmental Fate

Chlorodifluoromethane (HCFC-22)

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

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

Bioaccumulation	:	Information given is based on data obtained from similar substances.

SECTION 13. DISPOSAL CONSIDERATIONS

Waste disposal methods - Product	:	Can be used after re-conditioning. Recover 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	:	3163
	Proper shipping name	:	Liquefied gas, n.o.s. (Chlorodifluoromethane, 1,1,1-Trifluoroethane)
	Class	:	2.2
	Labelling No.	:	2.2
IATA_C	UN number	:	3163
	Proper shipping name	:	Liquefied gas, n.o.s. (Chlorodifluoromethane, 1,1,1-Trifluoroethane)
	Class	:	2.2
	Labelling No.	:	2.2
IMDG	UN number	:	3163
	Proper shipping name	:	LIQUEFIED GAS, N.O.S. (Chlorodifluoromethane, 1,1,1-Trifluoroethane)
	Class	:	2.2
	Labelling No.	:	2.2

SECTION 15. REGULATORY INFORMATION

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): 1,1,1-Trifluoroethane, 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

® 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 : 04/16/2015

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.

DuPont™ SUVA® 408A Refrigerant

Version 2.0

Revision Date 04/22/2011 Ref. 130000050988

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™ SUVA® 408A Refrigerant
Product Grade/Type	:	ASHRAE Refrigerant number designation: R-408A
Tradename/Synonym	:	HFC-125/HFC-143a/HCFC-22 BLEND
MSDS Number	:	130000050988
Product Use	:	Refrigerant
Manufacturer	:	DuPont 1007 Market Street Wilmington, DE 19898
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

Emergency Overview

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

Potential Health Effects

Skin	:	Contact with liquid or refrigerated gas can cause cold burns and frostbite.
Eyes	:	Contact with liquid or refrigerated gas can cause cold burns and frostbite.

Inhalation : Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects.
Other symptoms potentially related to misuse or inhalation abuse are: Anaesthetic effects, Light-headedness, dizziness, confusion, incoordination, drowsiness, or unconsciousness, irregular heartbeat with a strange sensation in the chest, heart thumping, apprehension, feeling of fainting, dizziness or weakness.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Carcinogenicity

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 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Chlorodifluoromethane (HCFC-22)	75-45-6	47 %
1,1,1-Trifluoroethane (HFC-143a)	420-46-2	46 %
Pentafluoroethane (HFC-125)	354-33-6	7 %

SECTION 4. FIRST AID MEASURES

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes. Take off all contaminated clothing immediately. Consult a physician. Wash contaminated clothing before re-use. Treat for frostbite if necessary by gently warming affected area.

Eye contact : In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Consult a physician if necessary.

Inhalation	:	Remove from exposure, lie down. Move to fresh air. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Consult a physician.
Ingestion	:	Is not considered a potential route of exposure.
General advice	:	Never give anything by mouth to an unconscious person. When symptoms persist or in all cases of doubt seek medical advice.
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. FIRE-FIGHTING MEASURES

Flammable Properties

Flash point	:	does not flash
Lower explosion limit	:	Method : None per ASTM E681
Upper explosion limit	:	Method : None per ASTM E681
Fire and Explosion Hazard	:	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.

Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Firefighting Instructions : Cool containers / tanks with water spray. Self-contained breathing apparatus (SCBA) is required if containers rupture and contents are released under fire conditions.
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.

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 and eyes. Use sufficient ventilation to keep employee exposure below recommended limits.

Storage : Valve protection caps and valve cutlet 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. Keep away from heat. 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.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Personal protective equipment

Respiratory protection : Under normal manufacturing conditions, no respiratory protection is required when using this product.

Hand protection : Additional protection: Impervious gloves

Eye protection : Wear 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

1,1,1-Trifluoroethane

AEL *	(DUPONT)	1,000 ppm	8 & 12 hr. TWA

Pentafluoroethane

AEL *	(DUPONT)	1,000 ppm	8 & 12 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.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	Liquefied gas
Color	:	clear, colourless
Odor	:	slight, ether-like
Boiling point/boiling range	:	-44.6 °C (-48.3 °F)
% Volatile	:	100 %
Vapour Pressure	:	11,669 hPa at 25 °C (77 °F)
Specific Gravity	:	1.06 at 25 °C (77 °F)
Water solubility	:	not determined
Vapour density	:	3.1 at 25°C (77°F) and 1,013 hPa (Air=1.0)

SECTION 10. STABILITY AND REACTIVITY

Stability	:	Stable at normal temperatures and storage conditions.
Conditions to avoid	:	Avoid open flames and high temperatures.
Incompatibility	:	Alkali metals Alkaline earth metals, Powdered metals, strong oxidizers
Hazardous decomposition products	:	Hydrogen fluoride, Hydrogen chloride, Carbon monoxide, carbon dioxide, Chlorine, Carbonyl halides, These materials are toxic and irritating., Avoid contact with decomposition products

SECTION 11. TOXICOLOGICAL INFORMATION

Chlorodifluoromethane (HCFC-22)

Dermal	:	not applicable
Oral	:	not applicable
Inhalation 4 h LC50	:	220000 ppm , rat
Inhalation	:	dog Cardiac sensitization

Skin irritation	:	No skin irritation, rabbit Not expected to cause skin irritation based on expert review of the properties of the substance.
Eye irritation	:	No eye irritation, rabbit Not expected to cause eye irritation based on expert review of the properties of the substance.
Skin sensitization	:	Did not cause sensitization on laboratory animals., guinea pig Not expected to cause sensitization based on expert review of the properties of the substance.
Repeated dose toxicity	:	Inhalation mouse No toxicologically significant effects were found.
Carcinogenicity	:	An increased incidence of tumours was observed in some laboratory animals but not in others. Overall weight of evidence indicates that the substance is not carcinogenic.
Mutagenicity	:	Did not cause genetic damage in animals. Did not cause genetic damage in cultured mammalian cells. Experiments showed mutagenic effects in cultured bacterial cells.
Reproductive toxicity	:	Evidence suggests the substance is not a reproductive toxin in animals.
Teratogenicity	:	Animal testing showed effects on embryo-fetal development at levels equal to or above those causing maternal toxicity.
Further information	:	Cardiac sensitisation threshold limit : 175000 mg/m3

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

Dermal	:	not applicable
Oral	:	not applicable
Inhalation 4 h LC50	:	> 540000 ppm , rat Anaesthetic effects
Inhalation 4 h LC50	:	591000 ppm , rat

Inhalation	:	dog Cardiac sensitization
Skin irritation	:	No skin irritation, Not tested on animals Not expected to cause skin irritation based on expert review of the properties of the substance.
Eye irritation	:	No eye irritation, Not tested on animals Not expected to cause eye irritation based on expert review of the properties of the substance.
Skin sensitization	:	Not tested on animals Not expected to cause sensitization based on expert review of the properties of the substance. There are no reports of human respiratory sensitization.
Repeated dose toxicity	:	Inhalation rat No toxicologically significant effects were found.
Carcinogenicity	:	Animal testing did not show any carcinogenic effects.
Mutagenicity	:	Did not cause genetic damage in animals. Did not cause genetic damage in cultured mammalian cells. Did not cause genetic damage in cultured bacterial cells.
Teratogenicity	:	Animal testing showed no developmental toxicity.
Further information	:	Cardiac sensitisation threshold limit : 1040000 mg/m3

Pentafluoroethane (HFC-125)

Dermal	:	not applicable
Oral	:	not applicable
Inhalation 4 h LC50	:	> 800000 ppm , rat
Inhalation	:	dog Cardiac sensitization
Skin irritation	:	No skin irritation, Not tested on animals

		Not expected to cause skin irritation based on expert review of the properties of the substance.
Eye irritation	:	No eye irritation, Not tested on animals Not expected to cause eye irritation based on expert review of the properties of the substance.
Skin sensitization	:	Does not cause skin sensitization., Not tested on animals Not expected to cause sensitization based on expert review of the properties of the substance. There are no reports of human respiratory sensitization.
Repeated dose toxicity	:	Inhalation rat No toxicologically significant effects were found.
Carcinogenicity	:	Overall weight of evidence indicates that the substance is not carcinogenic.
Mutagenicity	:	Did not cause genetic damage in animals. Did not cause genetic damage in cultured mammalian cells. Did not cause genetic damage in cultured bacterial cells.
Reproductive toxicity	:	Animal testing showed no reproductive toxicity. Information given is based on data obtained from similar substances.
Teratogenicity	:	Animal testing showed no developmental toxicity.
Further information	:	Cardiac sensitisation threshold limit : 490000 mg/m3

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

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

96 h LC50	:	Oncorhynchus mykiss (rainbow trout) > 100 mg/l
	:	not applicable
48 h EC50	:	Daphnia 300 mg/l

Pentafluoroethane (HFC-125)

96 h LC50	:	Oncorhynchus mykiss (rainbow trout) > 81.8 mg/l Information given is based on data obtained from similar substances.
96 h LC50	:	Danio rerio (zebra fish) > 200 mg/l Information given is based on data obtained from similar substances.
96 h LC50	:	Oncorhynchus mykiss (rainbow trout) 450 mg/l Information given is based on data obtained from similar substances.
72 h EC50	:	Pseudokirchneriella subcapitata (green algae) > 118 mg/l Information given is based on data obtained from similar substances.
72 h EC50	:	Pseudokirchneriella subcapitata (green algae) > 114 mg/l Information given is based on data obtained from similar substances.
96 h EC50	:	Algae 142 mg/l Information given is based on data obtained from similar substances.
48 h EC50	:	Daphnia magna (Water flea) > 200 mg/l Information given is based on data obtained from similar substances.
48 h EC50	:	Daphnia magna (Water flea) > 97.9 mg/l Information given is based on data obtained from similar substances.

Environmental Fate

Chlorodifluoromethane (HCFC-22)

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

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

Biodegradability	:	Not readily biodegradable.

SECTION 13. DISPOSAL CONSIDERATIONS

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

SECTION 14. TRANSPORT INFORMATION

DOT	UN number	:	3163
	Proper shipping name	:	Liquefied gas, n.o.s. (Chlorodifluoromethane, 1,1,1-Trifluoroethane)
	Class	:	2.2
	Labelling No.	:	2.2
	Reportable Quantity	:	Chlorodifluoromethane
IATA_C	UN number	:	3163
	Proper shipping name	:	Liquefied gas, n.o.s. (Chlorodifluoromethane, 1,1,1-Trifluoroethane)
	Class	:	2.2
	Labelling No.	:	2.2
IMDG	UN number	:	3163
	Proper shipping name	:	Liquefied gas, n.o.s. (Chlorodifluoromethane, 1,1,1-Trifluoroethane)
	Class	:	2.2
	Labelling No.	:	2.2

SECTION 15. REGULATORY INFORMATION

SARA 313 Regulated Chemical(s)	:	Chlorodifluoromethane

CERCLA Reportable Quantity	:	2 lbs Based on the percentage composition of this chemical in the product.: Chlorodifluoromethane
California Prop. 65	:	Chemicals known to the State of California to cause cancer, birth defects or any other harm: none known
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): 1,1,1-Trifluoroethane , Chlorodifluoromethane

SECTION 16. OTHER INFORMATION

		HMIS
Health	:	1
Flammability	:	0
Reactivity/Physical hazard	:	1

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