

SAFETY DATA SHEET

FROSTBERG® R-410A



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Frostberg®R-410A

MSDS Number : 000000005784

Product Use Description : Refrigerant

Chemical Family : Hydrofluorocarbon (HFC)

Molecular Formula : $\text{CH}_2\text{F}_2/\text{CHF}_2\text{CF}_3$

Company : FROSTBERG INTERNATIONAL LLC
16192 Coastal Highway Lewes,
Delaware 19958, USA

For more information : www.frostbergint.com



SECTION 2 . COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Mixture

Chemical Name	CAS -No.	Concentration
Pentafluoroethane	354-33-6	50.00 %
Difluoromethane	75-10-5	50.00 %

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Form : Gas (Liquefied)

Color : Colorless

Odor : Weak

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Hazard Summary : High pressure gas.
Non-flammable at ambient temperature and pressure.
Gas is heavier than air and reduces oxygen available for breathing, causing asphyxiation in high concentrations.
Inhalation may cause central nervous system effects.
May cause frostbite.
May cause drowsiness, dizziness and unconsciousness.
Products may include hydrofluoric acid (HF) and carbonyl halides. The ACGIH Threshold Limit Values (2007) for Hydrogen Fluoride are TLV -TWA 0.5 ppm and Ceiling exposure Limit 2 ppm.

Potential Health Effects

Eyes : Causes serious eye irritation.
May cause frostbite.

Skin : May cause frostbite.
Irritating to skin.

Ingestion : Unlikely route of exposure.
Effects due to ingestion may include:
Gastrointestinal discomfort.

Inhalation : Gas reduces oxygen available for breathing.
Causes asphyxiation in high concentrations. The victim will not realize that he/she is suffocating.
Inhalation may cause central nervous system effects.
May cause cardiac arrhythmia.
Vapours may cause drowsiness and dizziness.

Chronic Exposure : None known.

Carcinogenicity

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



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SECTION 4. FIRST AID MEASURES

Eye contact	: Immediately flush eyes with plenty of water, also under the eyelids for at least 15 minutes.
Skin contact	: After contact with skin, wash immediately with plenty of water. In case of frostbite, bathe (do not rub) with lukewarm (not hot) water. In case of unavailability of water, cover with a clean, soft cloth or similar covering. If symptoms persist, call a physician.
Inhalation	: Move victim to fresh air. If breathing is difficult, provide artificial respiration. Use oxygen as required, provided a qualified operator is present. Call a physician.
Ingestion	: Because the product is a gas at ambient temperature so ingestion is not applicable..
Notes to physician	Do not give drugs from adrenaline -ephedrine group.
Treatment	: Because of the possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, should be used with special caution and only in situations of emergency life support. Treat frost-bitten areas as needed. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.

SECTION 5. FIREFIGHTING MEASURES

Auto-ignition temperature	: Not determined
Flash point	: Not applicable
Suitable extinguishing media	: The product is not flammable. Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Specific hazards during fire fighting	: Contents under high pressure.



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Firefighting

At ambient temperatures and pressure, this product is not flammable.
However, this material can ignite when mixed with air under pressure and exposed to strong ignition sources.
Container may rupture on heating.
Cool closed containers exposed to fire with water spray.
Do not allow run-off from fire-fighting to enter drains or water courses.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
In case of fire hazardous decomposition products may be produced such as:
Hydrogen halides
Hydrogen fluoride
Carbon monoxide
Carbon dioxide (CO₂)
Carbonyl halides

Special protective equipment for firefighters

: In the event of fire and/or explosion do not breathe fumes.
Wear self-contained breathing apparatus and protective suit.
No unprotected exposed skin areas.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions

: Immediately evacuate personnel to safe areas.
Keep people away from spill/leak.
Wear personal protective equipment. Unprotected persons must be kept away.
Remove all sources of ignition.
Avoid skin contact with leaking liquid (danger of frostbite).
Ventilate the area.
After release, disperses into the air.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Avoid accumulation of vapours in low areas.
Unprotected personnel should not return until air has been tested and determined safe.
Ensure that the oxygen content is $\geq 19.5\%$.

Environmental precautions

: Prevent further leakage or spillage if safe to do so.

Methods for cleaning up

The product evaporates readily.
Ventilate the area.



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SECTION 7. HANDLING AND STORAGE

Handling

Handling :

- Handle with care.
- Avoid inhalation of vapour or mist.
- Do not get in eyes, on skin, or on clothing.
- Wear personal protective equipment.
- Use only in well -ventilated areas.
- Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C.
- Follow all standard safety precautions for handling and use of compressed gas cylinders.
- Use authorized cylinders only.
- Protect cylinders from physical damage.
- Do not puncture or drop cylinders, expose them to open flame or excessive heat.
- Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.
- Do not remove screw cap until immediately ready for use.
- Always replace cap after use.

Advice on protection against fire and explosion :

- The product is not flammable.
- Can form a combustible mixture with air at pressures above atmospheric pressure.

Storage

Requirements for storage areas and containers :

- Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use.
- Keep containers tightly closed in a dry, cool and well - ventilated place.
- Storage rooms must be properly ventilated.
- Ensure adequate ventilation, especially in confined areas. Protect cylinders from physical damage.
- Store away from incompatible substances.



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SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- | | |
|--------------------------|--|
| Protective measures | : Do not breathe vapour.
Avoid contact with skin, eyes and clothing.
Ensure that eyewash stations and safety showers are close to the workstation location. |
| Engineering measures | : General room ventilation is adequate for storage and handling.
Perform filling operations only at stations with exhaust ventilation facilities. |
| Eye protection | : Wear as appropriate:
Safety glasses with side shields
If splashes are likely to occur, wear:
Goggles or face shield, giving complete protection to eyes |
| Hand protection | : Leather gloves
In case of contact through splashing:
Protective gloves
Neoprene gloves
Polyvinyl alcohol or nitrile - butyl-rubber gloves |
| Skin and body protection | : Avoid skin contact with leaking liquid (danger of frostbite).
Wear cold insulating gloves/ face shield/ eye protection. |
| Respiratory protection | : In case of insufficient ventilation, wear suitable respiratory equipment.
Wear a positive pressure supplied-air respirator.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
For rescue and maintenance work in storage tanks use self-contained breathing apparatus. |
| Hygiene measures | : Handle in accordance with good industrial hygiene and safety practice.
Ensure adequate ventilation, especially in confined areas.
Avoid contact with skin, eyes and clothing.
Remove and wash contaminated clothing before re-use.
Keep working clothes separately. |
| Hygiene measures | : Handle in accordance with good industrial hygiene and safety practice.
Ensure adequate ventilation, especially in confined areas.
When using do not eat, drink or smoke. |



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Remove and wash contaminated clothing before re-use.
 Keep working clothes separately.
 Do not breathe vapour.
 Avoid contact with skin, eyes and clothing.

Exposure Guidelines

Components	CAS -No.	Value	Control parameters	Update
Difluoromethane	75-10-5	TWA : time weighted average	(1,000 ppm)	1994
Difluoromethane	75-10-5	TWA : time weighted average	2,200 mg/m3 (1,000 ppm)	2007
Pentafluoroethane	354-33-6	TWA : time weighted average	(1,000 ppm)	
Pentafluoroethane	354-33-6	TWA : time weighted average	4,900 mg/m3 (1,000 ppm)	2007

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state : Gas (Liquefied)
 Color : Colorless
 Odor : Weak



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pH	: neutral
Melting point/freezing point	: not determined
Boiling point/boiling range	: -48.5 °C
Flash point	: Note: not applicable
Evapouration rate	: > 1 Method: Compared to CCl4.
lower flammability limit	: Note: None
upper flammability limit	: Note: None
Vapor pressure	: 14,844 hPa at 21.1 °C(70.0 °F) 33,798 hPa at 54.4 °C(129.9 °F)
Vapor density	: 3 Note: (Air = 1.0)
Density	: 1.08 g/cm3 at 21.1 °C
Water solubility	: Note: no data available
Partition coefficient: n-octanol/water	: log Pow: 1.48 Test substance: Ethane, pentafluoro - (HFC -125) log Pow: 0.21 Test substance: Difluoromethane (HFC -32)
Ignition temperature	: > 750 °C



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Decomposition temperature : > 250 °C

Global warming potential (GWP) : 1,975

Ozone depletion potential (ODP) : 0 (ODP=1 for R 11)

SECTION 10. STABILITY AND REACTIVITY

Chemical stability : Stable under normal conditions.

Possibility of hazardous reactions : Hazardous polymerisation does not occur.

Conditions to avoid : Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C.
Decomposes under high temperature.
Some risk may be expected of corrosive and toxic decomposition products.
Can form a combustible mixture with air at pressures above atmospheric pressure.
Do not mix with oxygen or air above atmospheric pressure.

Incompatible materials to avoid : Finely divided aluminium
Potassium
Calcium
Powdered metals
Aluminium
Magnesium
Zinc

Hazardous decomposition products : In case of fire hazardous decomposition products may be produced such as:
Hydrogen fluoride
Carbonyl halides
Carbon monoxide
Carbon dioxide (CO₂)



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SECTION 11. TOXICOLOGICAL INFORMATION

Acute inhalation toxicity Pentafluoroethane	: LC50: > 800 000 ppm Exposure time: 4 h Species: rat
Difluoromethane	: LC50: > 520 000 ppm Exposure time: 4 h Species: rat
Sensitisation Pentafluoroethane	: Cardiac sensitization Species: dogs Note: No -observed -effect level 75 000 ppm Lowest observable effect level 100 000 ppm
Difluoromethane	: Cardiac sensitization Species: dogs Note: No -observed -effect level >350 000 ppm
Repeated dose toxicity Pentafluoroethane	: Species: rat Application Route: Inhalation Exposure time: (4 Weeks) NOEL: 50 000 ppm Subchronic toxicity
Difluoromethane	: Species: rat Application Route: Inhalation Exposure time: (90 days) NOEL: 50 000 ppm Subchronic toxicity
Genotoxicity in vitro Pentafluoroethane	: Test Method: Ames test Result: negative
Difluoromethane	: Test Method: Ames test Result: negative



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- : Cell type: Human lymphocytes
Result: negative
- : Cell type: Chinese Hamster Ovary Cells
Result: negative
- : Cell type: Human lymphocytes
Result: negative
Method: Mutagenicity (in vitro mammalian cytogenetic test)
- : Test Method: Chromosome aberration test in vitro
Result: negative

Genotoxicity in vivo Difluoromethane

- : Species: mouse
Cell type: Bone marrow
Method: Mutagenicity (micronucleus test)
Result: negative

Teratogenicity Pentafluoroethane

- : Species: rabbit
Application Route: Inhalation exposure
NOEL, Teratog: 50,000 ppm
NOEL, Maternal: 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.
- Species: rat
Application Route: Inhalation exposure
NOEL, Teratog: 50,000 ppm
NOEL, Maternal: 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.

Difluoromethane

- : Species: rat
Dose: NOEL - 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.
- Species: rabbit
Dose: NOEL - 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.



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Further information : Acute toxicity vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Rapid evaporation of the liquid may cause frostbite. May cause cardiac arrhythmia.

SECTION 12. ECOLOGICAL INFORMATION

Biodegradability

Pentafluoroethane : Result: Not readily biodegradable.
Value: 5 %
Method: OECD 301 D

Difluoromethane : Note: Minimal

Further information on ecology

Additional ecological information : This product is subject to U.S. Environmental Protection Agency Clean Air Act Regulations at 40 CFR Part 82. This product contains greenhouse gases which may contribute to global warming. Do NOT vent to the atmosphere. To comply with provisions of the U.S. Clean Air Act, any residual must be recovered.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods : Observe all Federal, State, and Local Environmental regulations.

Note : This product is subject to U.S. Environmental Protection Agency Clean Air Act Regulations Section 60.8 in 40 CFR Part 82 regarding refrigerant recycling.

SECTION 14. TRANSPORT INFORMATION

TDG UN/ID No. : UN 3163



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	Proper shipping name	: LIQUEFIED GAS, N.O.S. (PENTAFLUOROETHANE, DIFLUOROMETHANE)
	Class	2.2
	Packing group	
	Hazard Labels	2.2
IATA	UN/ID No.	: UN 3163
	Description of the goods	: LIQUEFIED GAS, N.O.S. (Pentafluoroethane, Difluoromethane)
	Class	: 2.2
	Hazard Labels	: 2.2
	Packing instruction (cargo aircraft)	: 200
	Packing instruction (passenger aircraft)	: 200
IMDG	UN/ID No.	: UN 3163
	Description of the goods	: LIQUEFIED GAS, N.O.S. (PENTAFLUOROETHANE, DIFLUOROMETHANE)
	Class	: 2.2
	Hazard Labels	: 2.2
	EmS Number	: F-C, S -V
	Marine pollutant	: no

SECTION 15. REGULATORY INFORMATION

Inventories

US. Toxic Substances Control Act : On TSCA Inventory

Australia. Industrial Chemical (Notification and Assessment) Act : On the inventory, or in compliance with the inventory

Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL) : All components of this product are on the Canadian DSL.

Japan. Kashin -Hou Law List : On the inventory, or in compliance with the inventory



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Korea. Toxic Chemical Control Law (TCCL) List : On the inventory, or in compliance with the inventory

Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act : On the inventory, or in compliance with the inventory

China. Inventory of Existing Chemical Substances : On the inventory, or in compliance with the inventory

NZIOC - New Zealand : On the inventory, or in compliance with the inventory

National regulatory information

WHMIS Classification : A-Compressed Gas
This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

WHMIS
WHMIS Ingredient Disclosure List (IDL) : No component is listed on the WHMIS ingredients disclosure list.

NPRI
Components : 1-Chloro-1,2,2,2-tetrafluoroethane 2837-89-0
: Chloromethane 74-87-3
: Dichloromethane 75-09-2

Global warming potential : 1,975

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

