



# MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards and EC Standards

## SECTION 1. PRODUCT IDENTIFICATION

**PRODUCT NAME:** DIFLUOROMETHANE  
**CHEMICAL NAME:** Difluoromethane  
**FORMULA:** Difluoromethane = CH<sub>2</sub>F<sub>2</sub>  
**SYNONYMS:** Methylene Fluoride, Refrigerant Gas R-32

**MANUFACTURER:** SPECTRA GASES, INC.  
**ADDRESS:** 3434 Route 22 West  
 Branchburg, NJ 08876, U.S.A.  
**PHONE:** 908/252-9300  
**FAX:** 908/252-0811

**SPECTRA GASES EMERGENCY CONTACT:** 800/932-0624 8:30 am - 7:00 pm (EST)  
**24 HOUR EMERGENCY CONTACT, CHEMTREC:** 800/424-9300, 202/484-7616  
**DATE OF PREPARATION:** January 22, 2000  
**MSDS NUMBER:** 1029  
**PRODUCT USE:** Refrigerant gas and organic synthesis.

## SECTION 2. COMPOSITION and INFORMATION ON INGREDIENTS

**COMPOSITION:** Difluoromethane 100%  
**CAS NUMBER:** Difluoromethane: 75-10-5  
**EINECS NUMBER:** Difluoromethane: 200-839-4  
**EXPOSURE LIMITS:** (10,000 ppm = 1%) Currently, there are no exposure limits for Difluoromethane.

OSHA PELs:	ACGIH TLVs:	NIOSH RELs:
None	None	None

## SECTION 3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** Difluoromethane is a colorless, flammable, liquefied gas, which is shipped under pressure. This gas may have a faint, ether-like odor in high concentrations. Difluoromethane poses a serious fire hazard when it is accidentally released, as it will form explosive mixtures with air. Vapors of Difluoromethane are heavier than air and may spread long distances; distant ignition and flash-back are possible. The main health hazard associated with releases of this gas is asphyxiation, by displacement of oxygen. In addition, inhalation of this gas may cause effects on the central nervous system, including dizziness, drowsiness and confusion. Flame or high temperature impinging on a localized area of the cylinder of Difluoromethane can cause the cylinder to rupture or burst without activating the cylinder's relief devices. Provide adequate fire protection for responders during emergency response situations.

**ROUTES OF ENTRY, SYMPTOMS OF ACUTE EXPOSURE: WARNING** - If rescue personnel need to enter an area suspected of having a high level of Difluoromethane, they should be equipped with Self-Contained Breathing Apparatus (SCBA), and, if available, a full-body chemically resistant suit. Acute overexposure to this compound may cause the following health effects:

**EYE CONTACT:** Release of a high-pressure gas may result in airborne objects.

**INGESTION:** Ingestion of this gas is not a likely route of industrial exposure.

**INHALATION:** Inhalation of this gas may cause effects on the central nervous system, including dizziness, headache, drowsiness, fatigue, incoordination, and confusion. Deliberate abuse of fluorocarbons/freons (such as Difluoromethane) by aerosol "sniffing" and use or misuse of bronchodilator aerosols have resulted in death. The cause of death is usually related to irregular heartbeat (arrhythmias) leading to cardiac arrest. These effects have not been reported in the workplace, but are possible if a high concentration of Difluoromethane is inhaled. High concentrations of this gas can cause an oxygen-deficient environment (it should be noted that before suffocation can occur, the lower flammability limit of Difluoromethane will be reached). Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. The skin of a victim may have a blue color.

### SECTION 3. HAZARD IDENTIFICATION (Continued)

**INHALATION (continued):** Under some circumstances of over-exposure, death may occur, due to the displacement of oxygen. The following effects associated with various levels of oxygen are as follows:

**CONCENTRATION**  
**of OXYGEN**

**EXPOSURE SYMPTOM**

20.9% Oxygen:

Normal oxygen concentration in air.

15-19% Oxygen:

Decreased ability to perform tasks. May impair coordination and may induce early symptoms in persons with heart, lung, or circulatory problems.

12-15% Oxygen:

Breathing increases, especially in exertion. Pulse up. Impaired coordination, perception, and judgment.

10-12% Oxygen:

Breathing further increases in rate and depth, poor coordination and judgment, lips slightly blue.

8-10% Oxygen:

Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea (upset stomach), and vomiting.

6-8% Oxygen:

8 minutes, may be fatal in 50-100% of cases; 6 minutes, may be fatal in 25 to 50% of cases; 4-5 minutes, recovery with treatment.

4-6% Oxygen:

Coma in 40 seconds, followed by convulsion, breathing failure, death.

**WARNING:** Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.

**SKIN CONTACT:** Not applicable.

**OTHER HEALTH EFFECTS:** Contact with rapidly expanding gases (which are released from under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain caused by frostbite can quickly subside, masking the injury. In addition, the sudden release of a pressurized gas (such as may occur in the event of a valve failure), presents a severe hazard of mechanical injury.

**HMIS RATINGS:** HEALTH: = 1; FLAMMABILITY: = 4; REACTIVITY: = 1;

PPE: Level B (see Section 8, Exposure Controls/Personal protective Equipment)

**ROUTES OF ENTRY, SYMPTOMS OF CHRONIC EXPOSURE:**

**ROUTE OF ENTRY:** Skin, inhalation.

**TARGET ORGANS:** Skin, cardiac system.

**SYMPTOMS:** Prolonged contact with the skin may cause defatting or dryness of the skin. Halogenated hydrocarbons (such as this gas) are known to cause cardiac sensitization in dogs, and may result in the same effect in humans. See Section 11 (Toxicology Information) for additional data on this compound.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** The aggravation of cardiac conditions is possible.

**CARCINOGENICITY:** Difluoromethane is not found on the FEDERAL OSHA Z LIST, NTP, CAL/OSHA, or IARC Carcinogenicity lists and therefore is neither considered to be nor suspected to be a cancer-causing agent by these agencies.

### SECTION 4. FIRST AID MEASURES

**THERMAL BURNS:** In the event personnel are burned as a result of a Difluoromethane release, if burns are first degree or second degree with closed blisters, flush area with cold water until pain subsides. Apply loose, moist, sterile dressings, and bandage. Treat for shock. If burns are second degree with open blisters or third degree, apply loose, dry, sterile dressings and bandage. Treat for shock. Transport victim immediately to hospital or emergency center. Burns over an area of 20% or more of body are life-threatening, medical attention should be immediately sought.

**EYE CONTACT:** If mechanical injury occurs, cover eye with bandage and seek appropriate medical attention.

**INGESTION:** Ingestion is an unlikely route of exposure for this gas.

**INHALATION:** Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

**SKIN CONTACT:** In case of frostbite, place the frostbitten part in warm water. DO NOT USE HOT WATER. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

**SECTION 4. FIRST AID MEASURES (Continued)**

**NOTES TO PHYSICIANS:** Victims of inhalation of refrigerant gases require management for hypoxic, CNS anesthetic, and cardiac symptoms. Patients must be removed from the exposure environment, and high-flow supplemental oxygen should be utilized. The respiratory system should be evaluated for injury, aspiration, or pulmonary edema and treated appropriately. CNS findings should be treated supportively; a calm environment with no physical exertion is imperative to avoid increasing endogenous adrenergic levels. Exogenous adrenergic drugs must not be used in order to avoid inducing sensitized myocardial dysrhythmias. Atropine is ineffective in treating bradyarrhythmias. For ventricular dysrhythmias, diphenylhydantoin and countershock may be effective.

**SECTION 5. FIRE FIGHTING MEASURES**

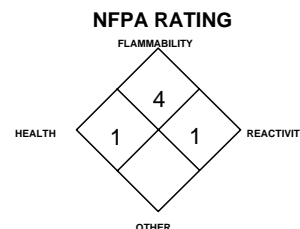
**FLASH POINT:** Flammable gas.

**AUTOIGNITION:** 647.13°C (1198°F)

**FLAMMABLE RANGE:** Lower (LEL): 14.0%; Upper (UEL): 31.0%

**NFPA RATINGS:**

HEALTH: = 1                      FLAMMABILITY: = 4  
 REACTIVITY: = 0                SPECIAL: None



**See Section 16 for  
 Definition of Ratings**

**EXTINGUISHING MEDIA:** Extinguish Difluoromethane fires by shutting-off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment.

**SPECIAL FIRE-FIGHTING PROCEDURES:** The best fire-fighting technique may be simply to let the burning gas escape from the cylinder or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished before the leak is sealed, the still-leaking gas could explosively re-ignite without warning and cause extensive damage, injury, or fatality. Consider increasing ventilation to prevent flammable or explosive mixture formation.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Releases of this gas can result in a formation of explosive mixtures in air. An extreme explosion hazard exists in areas in which the gas has been released, but the material has not yet ignited. Difluoromethane is heavier than air and vapors of the gas can travel a considerable distance to a source of ignition and flashback. Because of the decomposition product of hydrogen fluoride, when involved in a fire, the fumes can be irritating and pose a hazard to firefighters.

**DANGER!** Fires impinging (direct flame) on the outside surface of unprotected cylinders of Difluoromethane can be very dangerous. Exposure to fire could cause a catastrophic failure of the cylinder releasing the contents into a fireball and explosion of released gas. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the cylinder. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

**EXPLOSION SENSITIVITY TO MECHANICAL IMPACT:** Not sensitive.

**EXPLOSION SENSITIVITY TO STATIC DISCHARGE:** Static discharge may cause this gas to ignite explosively. Due to low electrical conductivity, this substance can generate electrostatic charges during handling operations.

**HAZARDOUS COMBUSTION PRODUCTS:** Carbon monoxide, hydrogen fluoride and possibly, carbonyl fluoride.

**SECTION 6. ACCIDENTAL RELEASE MEASURES**

**FIRST RESPONSE:** In the event of a leak of this product, operator should close the gas source, if possible to do so safely. Evacuate area in the event of a significant release. The North American Emergency Response Guidebook (Guide # 115) recommends 0.5 mile.

**TRAINED RESPONSE TEAM:** Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, gloves and Self-Contained Breathing Apparatus**. Locate and seal the source of the leaking gas. Use water spray to protect personnel attempting shut-off. Use only non-sparking tools and equipment. Eliminate any possible sources of ignition and provide maximum explosion-proof ventilation. If shut-off is not possible, allow the gas to release in-place or remove it to a safe, well-ventilated, area away from sources of ignition, and allow the gas to be released there. Allow the gas, which is heavier than air, to dissipate.

**ENTRY TO AREA:** Monitor area for combustible gas level and oxygen level. (Note that this gas is heavier than air and can form pockets low to the ground). Combustible gas concentration must be below 10% of the LEL (14.0%) prior to entry without proper fire gear and personnel protective equipment. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus (SCBA).

**REPAIR/FOLLOW-UP:** If leak was in user's gas handling equipment or system, ensure cylinder is closed and safely vent all high pressure before attempting repairs. If leak was from the cylinder, cylinder valve, or the valve pressure relief device (PRD), contact your supplier.

**THIS IS A HIGHLY FLAMMABLE GAS:** Protection of all personnel and the area must be maintained. Detection systems should be available to monitor for combustible gas levels.

**SECTION 7. HANDLING AND STORAGE**

**STORAGE:** Cylinders should be stored upright (with valve protection caps or plugs in place) and firmly secured to prevent falling or being knocked over. Cylinders should be stored in dry, well-ventilated areas. Protect from salt or other corrosive materials. Storage should be away from heavily traveled areas, walkways, elevators, platform edges or other objects or situations that could damage the cylinder wall. Do not store in a manner that will block emergency exits, fire extinguishers or other safety equipment. Do not allow storage temperature to exceed 125°F (52°C). Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. Store empty cylinders away from full cylinders. Consideration should be taken to install leak detection and alarm equipment for storage areas. **NOTE:** Use only DOT or ASME code cylinders designed for compressed gas storage. Cylinders must not be recharged except by or with the consent of owner.

Storage and use areas must meet national electrical codes for Class 1 Hazardous Areas. Post "No Smoking or Open Flames" signs. Consider installation of leak detection and alarm for storage and use areas. Have appropriate extinguishing equipment (i.e. sprinkler system, portable fire extinguishers).

Use non-sparking ventilation systems, approved explosion-proof equipment, and appropriate electrical systems. Electrical equipment used in gas-handling operations, or located in storage areas, should be non-sparking or explosion proof. Cylinders should be separated from oxygen cylinders, or other oxidizers, by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high, having a fire-resistance rating of at least 0.5 hours. Isolate from other incompatible chemicals (refer to Section 10, Stability and Reactivity).

**HANDLING: Releases of Difluoromethane can create an oxygen-deficient atmosphere.** Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of Difluoromethane could occur without any significant warning symptoms, due to oxygen-deficiency. Wearing contact lenses is not recommended when handling this gas. Cylinder valves should be inspected regularly for physical damage or corrosion (apparent by discoloration or rust). Care should be taken to inspect the following valve locations for corrosion: neck (where valve inserts into cylinder); bonnet nut (where handle attaches to valve body). Close valve after each use and when empty. Never tamper with pressure relief devices in valves and cylinders. The failure of a valve can result in violent release of the pressurized gas, creating a severe mechanical injury hazard.

Do not drag, roll, slide or drop cylinder. Use a suitable hand truck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure regulator to safely discharge product from cylinder. Use a check valve to prevent reverse flow into cylinder. Consideration should be made on the use of a flash arrestor on cylinders of Difluoromethane, due to its flammability. Once cylinder has been connected to properly purged process, open cylinder valve slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings; doing so may damage valve, causing a leak to occur. Use an adjustable strap-wrench to remove over-tight or rusted caps.

Do not heat cylinders by any means to increase the discharge rate of product from the cylinder. Never apply flame or localized heat directly to any part of the cylinder. Cylinders should not be artificially cooled as certain types of steel undergo property changes when cryogenically cooled, thus making the cylinder unstable.

**PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:** Relieve pressure, and monitor for combustible gas levels before attempting repairs.

**SPECIAL PRECAUTIONS:** Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas could occur without any significant warning symptoms. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. (telephone 703-412-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage and use.

**SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION**

**VENTILATION AND ENGINEERING CONTROLS:** Forced, explosion-proof ventilation systems for the general work area should be provided to ensure Difluoromethane does not reach its lower flammability limit of 14.0%. If appropriate, install automatic monitoring equipment to detect the level of flammable gas.

**RESPIRATORY PROTECTION:** Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen level is below 19.5%, or during emergency response to a release of this product. During an emergency situation, before entering the area, check for flammable gas level as well as oxygen-deficient atmospheres. If respiratory protection is required, follow the requirements of the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent U.S. State standards, standards of Canada, the European Standard EN166, and EC member states.

**EYE PROTECTION:** Use approved safety goggles or safety glasses, as described in OSHA 29 CFR 1910.133 or by the European Standard EN166.

**SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION (Continued)**

**SKIN PROTECTION:** Work (such as leather) gloves are recommended when handling cylinders of this gas. Wear gloves appropriate to the specific operation for which Difluoromethane is used. Use triple gloves for spill response.

**OTHER PROTECTIVE EQUIPMENT:** Use body protection appropriate for task. Cotton or Nomex clothing is recommended to prevent static build-up. Safety shoes are recommended when handling cylinders. Transfer of large quantities under pressure may require fire-retardant clothing.

**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

**MOLECULAR WEIGHT:** 52.02

**GAS DENSITY @ 21.1°C (70°F):** 0.712 lb./ft<sup>3</sup>

**BOILING POINT @ 1 atm:** -51.7°C (-61.1°F)

**FREEZING/MELTING POINT @ 1 atm:** -136°C (-212.8°F)

**SPECIFIC GRAVITY (air = 1) @ 20°C (68°F):** 1.85

**SOLUBILITY IN WATER vol/vol at 15C (59°F):** Insoluble.

**SPECIFIC VOLUME @ 25°C (77°F):** Not available.

**CRITICAL PRESSURE:** Not available.

**VAPOR PRESSURE @ 21.1°C (70°F):** 205.8 psig (220.5 psia)

**ODOR THRESHOLD:** Not determined.

**APPEARANCE, ODOR AND STATE:** Colorless gas with slight ether-like odor in high concentrations..

**WARNING PROPERTIES FOR THIS COMPOUND:** There are no good warning properties for this compound in the event of a release. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

**SECTION 10. STABILITY AND REACTIVITY**

**CHEMICAL STABILITY:** Stable.

**CONDITIONS TO AVOID:** Containers of Difluoromethane should not be exposed to temperatures in excess of 125°F (52°C).

**MATERIALS WITH WHICH GAS IS INCOMPATIBLE:** The following materials are not compatible with fluorocarbons, such as Difluoromethane: strong acids, sodium, potassium, calcium, zinc, magnesium, powdered aluminum, and other active metals.

**REACTIVITY:**

**A) HAZARDOUS DECOMPOSITION PRODUCTS:** None, except those of thermal decomposition given in Section 5 (Fire-Fighting Measures).

**B) HAZARDOUS POLYMERIZATION:** Will not occur.

**SECTION 11. TOXICOLOGICAL INFORMATION**

**TOXICITY DATA:** The following toxicological data are available for Difluoromethane.

LC (Inhalation-Rat) > 52 pph/4 hours: Brain and Coverings: recordings from specific areas of CNS	LC <sub>50</sub> (Inhalation-Mouse) 1810 gm/m <sup>3</sup> : Behavioral: changes in motor activity (specific assay), ataxia; Lungs, Thorax, or Respiration: respiratory depression	TCLo (Inhalation-Rat) 50000 ppm/6 hours: female 6-15 days after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)
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**CARCINOGENICITY:** Difluoromethane has not been found to be carcinogenic.

**IRRITANCY OF PRODUCT:** Difluoromethane is moderately irritating to contaminated tissue, depending on the duration of contact.

**SENSITIZATION OF PRODUCT:** Although there are no data for Difluoromethane causing skin or respiratory sensitization in humans, halogenated hydrocarbons (such as Difluoromethane) are known to cause cardiac sensitization in dogs and may have the same effect in humans.

**REPRODUCTIVE TOXICITY INFORMATION:** Listed below is information concerning the effects of Difluoromethane on the human reproductive system.

Mutagenicity: Difluoromethane is not expected to cause mutagenic effects in humans.

Embryotoxicity: Difluoromethane is not expected to cause embryotoxic effects in humans. Animal embryotoxic data are available for Difluoromethane; these data were obtained during clinical studies animals exposed to high doses of this compound.

Teratogenicity: Difluoromethane is not expected to cause teratogenic effects in humans.

Reproductive Toxicity: Difluoromethane is not expected to cause adverse reproductive effects in humans. Animal reproductive toxicity data are available for Difluoromethane; these data were obtained during clinical studies animals exposed to high doses of this compound.

**SECTION 11. TOXICOLOGICAL INFORMATION (Continued)**

A mutagen is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical that causes damage to a developing embryo (i.e., within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical that causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance that interferes in any way with the reproductive process.

**BIOLOGICAL EXPOSURE INDICES (BEIs):** Currently, Biological Exposure Indices (BEIs) are not applicable for Difluoromethane.

**SECTION 12. ECOLOGICAL INFORMATION**

**ENVIRONMENTAL STABILITY:** Difluoromethane will mainly volatilize from the atmosphere; however, Difluoromethane is resistant to hydrolysis so any remaining compound not lost by volatilization can persist. The estimated Tropospheric lifetime is 16 years.

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** No data are available as to the effects on plants or animals in the environment for Difluoromethane.

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** Difluoromethane not soluble in water. Currently no aquatic data are available for Difluoromethane.

**MOBILITY:** Currently, there are no data on the mobility of Difluoromethane in soil.

**PERSISTENCE AND BIODEGRADABILITY:** Persistence: This gas has an estimated Tropospheric lifetime of 16 years. There are no current data on the biodegradability of Difluoromethane.

**POTENTIAL TO BIOACCUMULATE:** No data currently available.

**OZONE-DEPLETION POTENTIAL:** Difluoromethane is not a Class I or Class II ozone depleting chemical (40 CFR Part 82).

**SECTION 13. DISPOSAL CONSIDERATIONS**

**UNUSED PRODUCT / EMPTY CONTAINER:** Do not dispose of unused product. Return used product in cylinders to: Spectra Gases, Inc., 80 Industrial Drive, Alpha, NJ 08865 or Spectra Gases, Inc., 1261 Activity Drive, Vista, CA 92083.

**DISPOSAL INFORMATION:** Residual product in user's system may be incinerated. This shall be done in accordance with U.S. Federal, State and local regulations, regulations of the provinces of Canada or EC member states.

**SECTION 14. TRANSPORT INFORMATION****U.S. SHIPPING INFORMATION:**

<b>U.S. DOT PROPER SHIPPING NAME:</b>	Difluoromethane <b>or</b> Refrigerant gas R-32
<b>HAZARD CLASS NUMBER and DESCRIPTION:</b>	2.1 (Flammable Gas)
<b>UN IDENTIFICATION NUMBER:</b>	UN 3252
<b>PACKING GROUP:</b>	Not Applicable
<b>U.S. DOT SHIPPING LABEL(S) REQUIRED:</b>	Flammable Gas
<b>PLACARD (When required):</b>	Flammable
<b>NAERG (NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK) #:</b>	115

**CANADIAN SHIPPING INFORMATION:**

**TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:** This gas is considered as dangerous goods; use the above information for the preparation of Canadian Shipments.

**INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA):**

**IATA DESIGNATION:** This gas is considered as dangerous goods, per the International Air Transport Association.

<b>PROPER SHIPPING NAME:</b>	Difluoromethane,
<b>HAZARD CLASS NUMBER and DESCRIPTION:</b>	2.1 (Flammable Gas)
<b>UN IDENTIFICATION NUMBER:</b>	UN 3252
<b>PACKING GROUP:</b>	Not Applicable
<b>HAZARD LABEL(S) REQUIRED:</b>	Flammable Gas(2.1)

<b>SECTION 14. TRANSPORT INFORMATION (Continued)</b>
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**INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA) [continued]:**

The following Packaging Information is applicable to this product:

PASSENGER AND CARGO AIRCRAFT				CARGO AIRCRAFT ONLY	
Limited Quantity		Packing Instruction	Max. Qty per Pkg	Packing Instruction	Max. Qty per Pkg
Packing Instruction	Max. Qty per Pkg				
//////	//////	Forbidden		200	150 kg

**INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO):**

**IMO DESIGNATION:** This gas is considered as dangerous goods, per the International Maritime Organization.

**PROPER SHIPPING NAME:** Difluoromethane

**HAZARD CLASS NUMBER and DESCRIPTION:** 2.1 (Flammable Gas)

**UN IDENTIFICATION NUMBER:** UN 3252

**HAZARD LABEL(S) REQUIRED:** Flammable Gas (2.1)

**STOWAGE CATEGORY:** Category D - Clear of living quarters.

**IMDG CODE:** Page 2132-1

**MARINE POLLUTANT:** Difluoromethane is not designated by the IMO to be a Marine Pollutant.

**EUROPEAN SHIPPING INFORMATION:****EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS**

**BY ROAD (ADR):** This gas is considered by the Economic Commission for Europe to be dangerous goods.

Additional information is as follows:

**SUBSTANCE IDENTIFICATION NO.:** 1049

**NAME OF SUBSTANCE:** Difluoromethane

**HAZARD IDENTIFICATION NO.:** 23

**LABEL:** 3

**CLASS AND ITEM NUMBER:** 2, 2°F

<b>SECTION 15. REGULATORY INFORMATION</b>
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**U.S. FEDERAL REGULATIONS:****EPA - ENVIRONMENTAL PROTECTION AGENCY:**

**CERCLA:** Comprehensive Environmental Response, Compensation, and Liability Act of 1990  
(40 CFR Parts 117 and 302)

Reportable Quantity (RQ): Difluoromethane = Not Applicable

**SARA TITLE III:** Superfund Amendment and Reauthorization Act

**SECTIONS 302/304:** Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: Difluoromethane is not listed.

Threshold Planning Quantity (TPQ): Difluoromethane is not listed. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

Reportable Quantity (RQ): Difluoromethane = Not Applicable

**SECTIONS 311/312:** Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: No

PRESSURE: Yes

DELAYED HEALTH: No

REACTIVITY: No

FIRE: Yes

**SECTION 313:** Toxic Chemical Release Reporting (40 CFR 372)

Releases of Difluoromethane do require reporting under Section 313.

**CLEAN AIR ACT:**

**SECTION 112 (r):** Risk Management Programs for Chemical Accidental Release  
(40 CFR Part 68)

Threshold Planning Quantity (TPQ): Difluoromethane = 10,000 lbs (4,540 kg)

**TSCA:** Toxic Substances Control Act

Difluoromethane is listed on the TSCA Inventory.

**OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:**

**29 CFR Part 1910.119:** Process Safety Management of Highly Hazardous Chemicals.

Threshold Planning Quantity (TPQ): 10,000 lbs (4,540 kg) [for all flammable gases, unless it is used as fuel]

## SECTION 15. REGULATORY INFORMATION (Continued)

**U.S. STATE REGULATORY INFORMATION:**

**CALIFORNIA PROPOSITION 65:** Difluoromethane is not a listed substance which the State of California requires warning under this statute.

Difluoromethane is covered under the following specific State regulations (more specific regulations exist in some States):

Alaska - Designated Toxic and Hazardous Substances: No.

California - Permissible Exposure Limits for Chemical Contaminants: No.

Florida - Substance List: Difluoromethane.

Illinois - Toxic Substance List: No.

Kansas - Section 302/313 List: Difluoromethane.

Massachusetts - Substance List: No.

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: No.

Missouri - Employer Information/Toxic Substance List: No.

New Jersey - Right to Know Hazardous Substance List: No.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: Difluoromethane.

Pennsylvania - Hazardous Substance List: No.

Rhode Island - Hazardous Substance List: No.

Texas - Hazardous Substance List: No.

West Virginia - Hazardous Substance List: No.

Wisconsin - Toxic and Hazardous Substances: No.

**CANADIAN FEDERAL REGULATIONS:**

**CANADIAN DSL INVENTORY STATUS:** Difluoromethane is listed on the Canadian DSL Inventory.

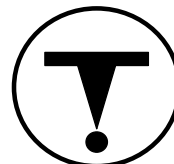
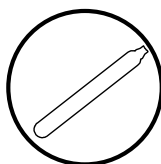
**OTHER CANADIAN REGULATIONS:** Difluoromethane is categorized as a Controlled Product, Hazard Classes A, and B1 and D2B, as per the Controlled Product Regulations. Difluoromethane is not on the CEPA Priorities Substances Lists.

**CANADIAN WHMIS SYMBOLS:**

**Class A:** Compressed Gas

**Class B1:** Flammable Gas

**Class D2B:** Toxic Material/Materials Causing Other Toxic Effects

**EUROPEAN ECONOMIC COMMUNITY REGULATIONS:**

**EC LABELING AND CLASSIFICATION:** Difluoromethane has not been classified, per the European Community Council Directive 67/548/EEC. The following information is a self-classification, based on the flammability of the gas.

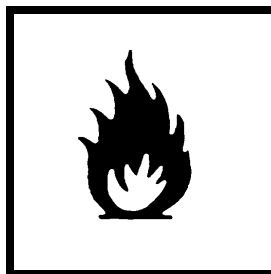
**EC EINECS/ELINCS NUMBER:** 200-839-4

**EC CLASSIFICATION:** F+; (Extremely Flammable)

**EC RISK PHRASES:** Extremely flammable. [R:12]

**EC SAFETY PHRASES:** Keep container in well-ventilated place. Keep away from sources of ignition - No smoking. Take precautionary measures against static discharges. [S:9; S: 16; S: 33]

**EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOL:** F+ (Extremely Flammable)





## DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

**CAS #:** This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

### EXPOSURE LIMITS IN AIR:

**ACGIH** - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.

**TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit (**STEL**), and the instantaneous Ceiling Level (**C**). Skin absorption effects must also be considered.

**OSHA** - U.S. Occupational Safety and Health Administration.

**PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

**IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury.

**The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL.

**NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called **Recommended Exposure Levels (RELs)**. When no exposure guidelines are established, an entry of **NE** is made for reference.

### HAZARD RATINGS:

**HAZARDOUS MATERIALS IDENTIFICATION SYSTEM:** Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

**NATIONAL FIRE PROTECTION ASSOCIATION:** Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

### FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

### TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD<sub>50</sub>** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC<sub>50</sub>** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m<sup>3</sup>** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: **EC** is the effect concentration in water.

### REGULATORY INFORMATION:

**U.S. and CANADA:** This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDSL**); the U.S. Toxic Substance Control Act (**TSCA**); Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA** or **Superfund**); and various state regulations. This section also includes information on the precautionary warnings which appear on the material's package label.

**EUROPEAN:** **EC** is the European Community (formerly known as the **EEC**, European Economic Community). **EINECS**: This is the European Inventory of Now-Existing Chemical Substances. The **ARD** is the European Agreement Concerning the International Carriage of Dangerous Goods by Road and the **RID** are the International Regulations Concerning