# SAFETY DATA SHEET

## Freon™ MO99 (R-438A) Refrigerant

| Version | Revision Date: | SDS Number: | Date of last issue: 02/27/2020 |
|---|---|---|---|
| 10.5 | 10/11/2020 | 1332410-00045 | Date of first issue: 02/27/2017 |

### SECTION 1. IDENTIFICATION

| | | |
|---|---|---|
| Product name | : | Freon™ MO99 (R-438A) Refrigerant |
| Product code | : | D12860273 |
| SDS-Identcode | : | 130000031356 |

**Manufacturer or supplier's details**

| | | |
|---|---|---|
| Company name of supplier | : | The Chemours Company FC, LLC |
| Address | : | 1007 Market Street<br>Wilmington, DE 19801 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 and industrial installation and use only. |

### SECTION 2. HAZARDS IDENTIFICATION

**GHS classification in accordance with the OSHA Hazard Communication Standard (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:**<br>P410 + P403 Protect from sunlight. Store in a well-ventilated place. |

| | | |
|---|---|---|
| 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

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

## SECTION 6. ACCIDENTAL RELEASE MEASURES

| | | |
|---|---|---|
| Personal precautions, protective equipment and emergency procedures | : | Evacuate personnel to safe areas.<br>Avoid skin contact with leaking liquid (danger of frostbite).<br>Ventilate the area.<br>Follow safe handling advice (see section 7) and personal protective equipment recommendations (see section 8). |
| Environmental precautions | : | Avoid release to the environment.<br>Prevent further leakage or spillage if safe to do so.<br>Retain and dispose of contaminated wash water. |
| Methods and materials for containment and cleaning up | : | Ventilate the area.<br>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.<br>Sections 13 and 15 of this SDS provide information regarding certain local or national requirements. |

Acutely toxic substances and mixtures
Substances and mixtures with chronic toxicity

Recommended storage temperature : < 126 °F / < 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**

| Components | CAS-No. | Value type (Form of exposure) | Control parameters / Permissible concentration | Basis |
|---|---|---|---|---|
| Pentafluoroethane | 354-33-6 | TWA | 1,000 ppm | US WEEL |
| 1,1,1,2-Tetrafluoroethane | 811-97-2 | TWA | 1,000 ppm | US WEEL |
| Difluoromethane | 75-10-5 | TWA | 1,000 ppm | US WEEL |
| Butane | 106-97-8 | TWA | 800 ppm<br>1,900 mg/m³ | NIOSH REL |
| | | STEL | 1,000 ppm | ACGIH |
| Isopentane | 78-78-4 | TWA | 1,000 ppm | ACGIH |

**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 pro-

| | | |
|---|---|---|
| | | (Air = 1.0) |
| Relative density | : | 1.15 (77 °F / 25 °C) |
| 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 | : | This substance is not flammable in air at temperatures up to 100 °C (212 °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.<br>Heat, flames and sparks. |
| Incompatible materials | : | Oxidizing agents |

icity

Acute inhalation toxicity : LC50 (Rat): > 520000 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 350000 ppm
Test atmosphere: gas
Remarks: Cardiac sensitization

Lowest observed adverse effect concentration (Dog): > 350000 ppm
Test atmosphere: gas
Remarks: Cardiac sensitization

Cardiac sensitisation threshold limit (Dog): > 735,000 mg/m³
Test atmosphere: gas
Remarks: Cardiac sensitization

Acute dermal toxicity : Assessment: The substance or mixture has no acute dermal toxicity

**Butane:**

Acute inhalation toxicity : LC50 (Rat): 570000 ppm
Exposure time: 15 min
Test atmosphere: gas
Remarks: Based on data from similar materials

**Isopentane:**

Acute oral toxicity : LD50 (Rat): > 2,000 mg/kg
Method: OECD Test Guideline 401
Assessment: The substance or mixture has no acute oral toxicity
Remarks: Based on data from similar materials

Acute inhalation toxicity : LC50 (Rat): > 20 mg/l
Exposure time: 4 h
Test atmosphere: vapor
Method: OECD Test Guideline 403
Remarks: Based on data from similar materials

**Skin corrosion/irritation**

Not classified based on available information.

**Components:**

**1,1,1,2-Tetrafluoroethane:**

Result : No skin irritation

**Difluoromethane:**

Result : No skin irritation

**Isopentane:**

| | | |
|---|---|---|
| Test Type | : | Maximization Test |
| Routes of exposure | : | Skin contact |
| Species | : | Guinea pig |
| Result | : | negative |

**Germ cell mutagenicity**

Not classified based on available information.

**Components:**

**Pentafluoroethane:**

| | | |
|---|---|---|
| Genotoxicity in vitro | : | Test Type: Bacterial reverse mutation assay (AMES)<br>Method: OECD Test Guideline 471<br>Result: negative<br><br>Test Type: In vitro mammalian cell gene mutation test<br>Result: negative<br>Remarks: Based on data from similar materials<br><br>Test Type: Chromosome aberration test in vitro<br>Method: OECD Test Guideline 473<br>Result: negative |
| Genotoxicity in vivo | : | Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)<br>Species: Mouse<br>Application Route: inhalation (gas)<br>Method: OECD Test Guideline 474<br>Result: negative |

**1,1,1,2-Tetrafluoroethane:**

| | | |
|---|---|---|
| Genotoxicity in vitro | : | Test Type: Bacterial reverse mutation assay (AMES)<br>Method: OECD Test Guideline 471<br>Result: negative<br><br>Test Type: Chromosome aberration test in vitro<br>Method: OECD Test Guideline 473<br>Result: negative |
| Genotoxicity in vivo | : | Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)<br>Species: Mouse<br>Application Route: inhalation (gas)<br>Method: OECD Test Guideline 474<br>Result: negative<br><br>Test Type: Unscheduled DNA synthesis (UDS) test with mammalian liver cells in vivo<br>Species: Rat<br>Application Route: inhalation (gas)<br>Method: OECD Test Guideline 486<br>Result: negative |

Result: negative
Remarks: Based on data from similar materials

**Carcinogenicity**

Not classified based on available information.

**Components:**

**1,1,1,2-Tetrafluoroethane:**

| | | |
|---|---|---|
| Species | : | Rat |
| Application Route | : | inhalation (gas) |
| Exposure time | : | 2 Years |
| Method | : | OECD Test Guideline 453 |
| Result | : | negative |
| Carcinogenicity - Assessment | : | Weight of evidence does not support classification as a carcinogen |

**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.

**Components:**

**Pentafluoroethane:**

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

**1,1,1,2-Tetrafluoroethane:**

| | | |
|---|---|---|
| Effects on fertility | : | Species: Mouse<br>Application Route: Inhalation<br>Result: negative |
| Effects on fetal development | : | Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test<br>Species: Rabbit<br>Application Route: inhalation (gas) |

Application Route: Ingestion
Method: OECD Test Guideline 414
Result: negative
Remarks: Based on data from similar materials

**STOT-single exposure**

Not classified based on available information.

**Components:**

**1,1,1,2-Tetrafluoroethane:**

| | | |
|---|---|---|
| Routes of exposure | : | inhalation (gas) |
| Assessment | : | No significant health effects observed in animals at concentrations of 20000 ppmV/4h or less |

**Difluoromethane:**

| | | |
|---|---|---|
| Routes of exposure | : | inhalation (gas) |
| Assessment | : | No significant health effects observed in animals at concentrations of 20000 ppmV/4h or less |

**Butane:**

| | | |
|---|---|---|
| Assessment | : | May cause drowsiness or dizziness. |
| Remarks | : | Based on data from similar materials |

**Isopentane:**

| | | |
|---|---|---|
| Assessment | : | May cause drowsiness or dizziness. |

**STOT-repeated exposure**

Not classified based on available information.

**Components:**

**1,1,1,2-Tetrafluoroethane:**

| | | |
|---|---|---|
| Routes of exposure | : | inhalation (gas) |
| Assessment | : | No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less. |

**Difluoromethane:**

| | | |
|---|---|---|
| Routes of exposure | : | inhalation (gas) |
| Assessment | : | No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less. |

**Repeated dose toxicity**

**Components:**

**Pentafluoroethane:**

| | | |
|---|---|---|
| Species | : | Rat |
| NOAEL | : | >= 50000 ppm |
| Application Route | : | inhalation (gas) |
| Exposure time | : | 13 Weeks |

## SECTION 12. ECOLOGICAL INFORMATION

**Ecotoxicity**

**Components:**

**Pentafluoroethane:**

| | | |
|---|---|---|
| Toxicity to fish | : | LC50 (Oncorhynchus mykiss (rainbow trout)): > 100 mg/l<br>Exposure time: 96 h<br>Remarks: Based on data from similar materials |
| Toxicity to daphnia and other aquatic invertebrates | : | EC50 (Daphnia magna (Water flea)): > 100 mg/l<br>Exposure time: 48 h<br>Remarks: Based on data from similar materials |
| Toxicity to algae/aquatic plants | : | ErC50 (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l<br>Exposure time: 72 h<br>Method: OECD Test Guideline 201<br>Remarks: Based on data from similar materials<br><br>NOEC (Pseudokirchneriella subcapitata (green algae)): > 1 mg/l<br>Exposure time: 72 h<br>Method: OECD Test Guideline 201<br>Remarks: Based on data from similar materials |

**1,1,1,2-Tetrafluoroethane:**

| | | |
|---|---|---|
| Toxicity to fish | : | LC50 (Oncorhynchus mykiss (rainbow trout)): 450 mg/l<br>Exposure time: 96 h<br>Method: Regulation (EC) No. 440/2008, Annex, C.1 |
| Toxicity to daphnia and other aquatic invertebrates | : | EC50 (Daphnia magna (Water flea)): 980 mg/l<br>Exposure time: 48 h<br>Method: Regulation (EC) No. 440/2008, Annex, C.2 |
| Toxicity to algae/aquatic plants | : | ErC50 (green algae): > 100 mg/l<br>Exposure time: 96 h<br>Remarks: Based on data from similar materials |

**Difluoromethane:**

| | | |
|---|---|---|
| Toxicity to fish | : | LC50 (Fish): 1,507 mg/l<br>Exposure time: 96 h<br>Method: ECOSAR (Ecological Structure Activity Relationships) |
| Toxicity to daphnia and other aquatic invertebrates | : | EC50 (Daphnia): 652 mg/l<br>Exposure time: 48 h<br>Method: ECOSAR (Ecological Structure Activity Relationships) |
| Toxicity to algae/aquatic plants | : | EC50 (green algae): 142 mg/l<br>Exposure time: 96 h |

**Bioaccumulative potential**

**Components:**

**Pentafluoroethane:**

Partition coefficient: n-octanol/water : Pow: 1.48
Method: OECD Test Guideline 107

**1,1,1,2-Tetrafluoroethane:**

Bioaccumulation : Remarks: Bioaccumulation is unlikely.

Partition coefficient: n-octanol/water : log Pow: 1.06

**Difluoromethane:**

Partition coefficient: n-octanol/water : log Pow: 0.714

**Butane:**

Partition coefficient: n-octanol/water : log Pow: 2.89

**Isopentane:**

Partition coefficient: n-octanol/water : log Pow: 4

**Mobility in soil**

No data available

**Other adverse effects**

No data available

## 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 1078
Proper shipping name : REFRIGERANT GAS, N.O.S.
(Pentafluoroethane, 1,1,1,2-Tetrafluoroethane)

**SARA 311/312 Hazards** : Gases under pressure
Simple Asphyxiant

**SARA 313** : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**US State Regulations**

**Pennsylvania Right To Know**

| | |
|---|---|
| Pentafluoroethane | 354-33-6 |
| 1,1,1,2-Tetrafluoroethane | 811-97-2 |
| Difluoromethane | 75-10-5 |
| Butane | 106-97-8 |

**California List of Hazardous Substances**

| | |
|---|---|
| Difluoromethane | 75-10-5 |
| Butane | 106-97-8 |

**California Permissible Exposure Limits for Chemical Contaminants**

| | |
|---|---|
| Butane | 106-97-8 |

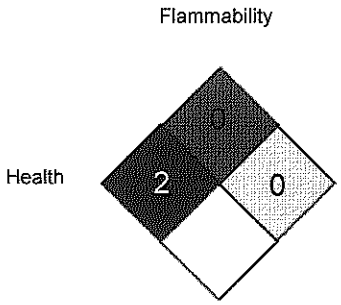
**International Regulations**

Montreal Protocol : Pentafluoroethane
1,1,1,2-Tetrafluoroethane
Difluoromethane

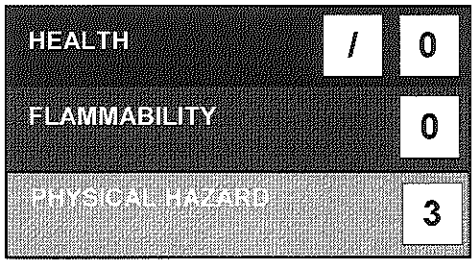
## SECTION 16. OTHER INFORMATION

**Further information**

**NFPA 704:**




**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.

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