

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue:
11.0	2025/05/27	1332359-00054	2025/03/05
			Date of first issue: 2017/02/27

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Freon™ MO99 (R-438A) Refrigerant

SDS-Identcode : 130000031356

Manufacturer or supplier's details

Company : The Chemours Chemical (Shanghai) Co., Ltd.

Address : 9F, SCG Parkside, 868 Yinghua Road, Pudong New District
201204, Shanghai, China

Telephone : 86 400 8056 528

Emergency telephone number : 86 532 8388 9090

E-mail address : SDS.ChinaPSR@chemours.com

Telefax : 86 21 2612 0862

Recommended use of the chemical and restrictions on use

Recommended use : Refrigerant

Restrictions on use : For professional and industrial installation and use only.

2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	:	Liquefied gas
Colour	:	colourless
Odour	:	slight, ether-like

Contains gas under pressure; may explode if heated.

GHS Classification

Gases under pressure : Liquefied gas

GHS label elements

Hazard pictograms :



Signal word : Warning



SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



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Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

Hazard statements : H280 Contains gas under pressure; may explode if heated.

Precautionary statements : **Storage:**
P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Physical and chemical hazards

Contains gas under pressure; may explode if heated.

Health hazards

Not classified based on available information.

Environmental hazards

Not classified based on available information.

Other hazards which do not result in classification

Vapours 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.

May displace oxygen and cause rapid suffocation.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Components

Chemical name	CAS-No.	Concentration (% w/w)
Pentafluoroethane#	354-33-6	45
1,1,1,2-Tetrafluoroethane#	811-97-2	44.2
Difluoromethane#	75-10-5	8.5
Butane	106-97-8	1.7
Isopentane	78-78-4	0.6

Voluntarily-disclosed substance

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.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.
Get medical attention immediately.

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

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

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 sensitisation
Anaesthetic effects
Light-headedness
Dizziness
confusion
Lack of coordination
Drowsiness
Unconsciousness
Gas reduces oxygen available for breathing.
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 : 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.

5. FIREFIGHTING 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 : Fluorine compounds
Carbon oxides
Hydrogen fluoride
carbonyl fluoride

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

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

so.
Evacuate area.

Special protective equipment : Wear self-contained breathing apparatus for firefighting if necessary.
for firefighters Use personal protective equipment.

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 (see section 7) and personal protective equipment recommendations (see section 8).

Environmental precautions : Avoid release to the environment.
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.

7. HANDLING AND STORAGE

Handling

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.
Prevent backflow into the gas tank.
Use a check valve or trap in the discharge line to prevent haz-

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

ardous back flow into the cylinder.
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.

Avoidance of contact : Oxidizing agents

Storage

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 labelled 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:
Explosives

Recommended storage temperature : < 52 °C

Storage period : > 10 yr

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

Packaging material : Unsuitable material: None known.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Butane	106-97-8	STEL	1,000 ppm	ACGIH
Isopentane	78-78-4	PC-TWA	500 mg/m3	CN OEL
		PC-STEL	1,000 mg/m3	CN OEL

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue:
11.0	2025/05/27	1332359-00054	2025/03/05
			Date of first issue: 2017/02/27

		TWA	1,000 ppm	ACGIH
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Engineering measures : Ensure adequate ventilation, especially in confined areas.
Minimize workplace exposure concentrations.

Personal protective equipment

|| Respiratory protection : Use a positive pressure air supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown.

Eye/face 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.

Hand protection
Material : Low temperature resistant gloves

Remarks : Choose gloves to protect hands against chemicals depending on the concentration and quantity of the hazardous substance and 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!

Protective measures : Wear cold insulating gloves/ face shield/ eye protection.

Hygiene measures : If exposure to chemical is likely during typical use, provide eye flushing systems and safety showers close to the working place.
When using do not eat, drink or smoke.
Wash contaminated clothing before re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Liquefied gas

Colour : colourless

Odour : slight, ether-like

Odour Threshold : No data available

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version 11.0	Revision Date: 2025/05/27	SDS Number: 1332359-00054	Date of last issue: 2025/03/05 Date of first issue: 2017/02/27
-----------------	------------------------------	------------------------------	---

pH	:	No data available
Melting point/freezing point	:	No data available
Initial boiling point and boiling range	:	-42.3 °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.
Vapour pressure	:	11,171 hPa (25 °C)
Relative vapour density	:	3.5 (Air = 1.0)
Relative density	:	1.15 (25 °C)
Solubility(ies) Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	Not applicable
Auto-ignition 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 characteristics Particle size	:	Not applicable

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version 11.0	Revision Date: 2025/05/27	SDS Number: 1332359-00054	Date of last issue: 2025/03/05 Date of first issue: 2017/02/27
-----------------	------------------------------	------------------------------	---

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.
Heat, flames and sparks. |
| Incompatible materials | : Oxidizing agents |
| Hazardous decomposition products | : No hazardous decomposition products are known. |

11. TOXICOLOGICAL INFORMATION

- | | |
|-----------------|---|
| Exposure routes | : Inhalation
Skin contact
Eye contact |
|-----------------|---|

Acute toxicity

Not classified based on available information.

Components:

Pentafluoroethane:

- | | |
|---------------------------|--|
| Acute inhalation toxicity | : LC50 (Rat): > 800000 ppm
Exposure time: 4 h
Test atmosphere: gas |
|---------------------------|--|

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue:
11.0	2025/05/27	1332359-00054	2025/03/05
			Date of first issue: 2017/02/27

Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 75000 ppm
Remarks: Cardiac sensitisation

Cardiac sensitisation threshold limit (Dog): 368.159 mg/m3
Remarks: Cardiac sensitisation

1,1,1,2-Tetrafluoroethane:

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

Acute inhalation toxicity : LC50 (Rat): > 567000 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 40000 ppm
Test atmosphere: gas
Remarks: Cardiac sensitisation

Lowest observed adverse effect concentration (Dog): 80000 ppm
Test atmosphere: gas
Symptoms: May cause cardiac arrhythmia.

Cardiac sensitisation threshold limit (Dog): 334,000 mg/m3
Test atmosphere: gas
Symptoms: May cause cardiac arrhythmia.

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

Difluoromethane:

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

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 sensitisation

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

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

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

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: vapour
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:

Species : Rabbit
Result : No skin irritation
Remarks : Based on data from similar materials

Assessment : Repeated exposure may cause skin dryness or cracking.

Serious eye damage/eye irritation

Not classified based on available information.



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according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

Components:

1,1,1,2-Tetrafluoroethane:

Result : No eye irritation

Difluoromethane:

Result : No eye irritation

Isopentane:

Species : Rabbit
Result : No eye irritation
Method : OECD Test Guideline 405
Remarks : Based on data from similar materials

Respiratory or skin sensitisation

Skin sensitisation

Not classified based on available information.

Respiratory sensitisation

Not classified based on available information.

Components:

1,1,1,2-Tetrafluoroethane:

Exposure routes : Skin contact
Result : negative

Exposure routes : Inhalation
Species : Rat
Result : negative

Exposure routes : Inhalation
Species : Humans
Result : negative

Difluoromethane:

Exposure routes : Skin contact
Result : negative

Isopentane:

Test Type : Maximisation Test
Exposure routes : Skin contact
Species : Guinea pig
Result : negative

Germ cell mutagenicity

Not classified based on available information.

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

Components:

Pentafluoroethane:

Genotoxicity in vitro	: Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: negative Test Type: In vitro mammalian cell gene mutation test Result: negative Remarks: Based on data from similar materials 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

1,1,1,2-Tetrafluoroethane:

Genotoxicity in vitro	: Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: negative 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 Test Type: Unscheduled DNA synthesis (UDS) test with mammalian liver cells in vivo Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 486 Result: negative
Germ cell mutagenicity - Assessment	: Weight of evidence does not support classification as a germ cell mutagen.

Difluoromethane:

Genotoxicity in vitro	: Test Type: Bacterial reverse mutation assay (AMES)
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SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue:
11.0	2025/05/27	1332359-00054	2025/03/05
			Date of first issue: 2017/02/27

	Method: OECD Test Guideline 471 Result: negative
	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
Germ cell mutagenicity - Assessment	: Weight of evidence does not support classification as a germ cell mutagen.

Butane:

Genotoxicity in vitro	: Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: negative
	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: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 474 Result: negative Remarks: Based on data from similar materials

Isopentane:

Genotoxicity in vitro	: Test Type: Bacterial reverse mutation assay (AMES) Result: negative
	Test Type: Chromosome aberration test in vitro Method: Directive 67/548/EEC, Annex V, B.10. Result: negative Remarks: Based on data from similar materials
Genotoxicity in vivo	: Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Rat Application Route: inhalation (vapour) Method: Directive 67/548/EEC, Annex V, B.12. Result: negative Remarks: Based on data from similar materials

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

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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
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Reproductive toxicity

Not classified based on available information.

Components:

Pentafluoroethane:

Effects on fertility	: Test Type: One-generation reproduction toxicity study Species: Rat Application Route: inhalation (vapour) Result: negative Remarks: Based on data from similar materials
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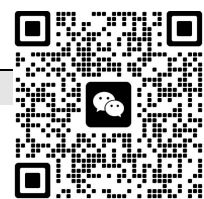
Effects on foetal development	: Test Type: Embryo-foetal development Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 414 Result: negative
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1,1,1,2-Tetrafluoroethane:

Effects on fertility	: Species: Mouse Application Route: Inhalation Result: negative
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Effects on foetal development	: Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test Species: Rabbit Application Route: inhalation (gas) Method: OECD Test Guideline 414 Result: negative
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Reproductive toxicity - Assessment	: Weight of evidence does not support classification for reproductive toxicity
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SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

Difluoromethane:

Effects on fertility	: Species: Mouse Application Route: Inhalation Result: negative Remarks: Based on data from similar materials
Effects on foetal development	: Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 414 Result: negative Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test Species: Rabbit Application Route: inhalation (gas) Method: OECD Test Guideline 414 Result: negative
Reproductive toxicity - Assessment	: Weight of evidence does not support classification for reproductive toxicity

Butane:

Effects on fertility	: Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 422 Result: negative
Effects on foetal development	: Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 422 Result: negative

Isopentane:

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

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version 11.0	Revision Date: 2025/05/27	SDS Number: 1332359-00054	Date of last issue: 2025/03/05 Date of first issue: 2017/02/27
-----------------	------------------------------	------------------------------	---

Remarks: Based on data from similar materials

STOT - single exposure

Not classified based on available information.

Components:

1,1,1,2-Tetrafluoroethane:

Exposure routes	: inhalation (gas)
Assessment	: No significant health effects observed in animals at concentrations of 20000 ppmV/4h or less

Difluoromethane:

Exposure routes	: 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.
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STOT - repeated exposure

Not classified based on available information.

Components:

1,1,1,2-Tetrafluoroethane:

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

Difluoromethane:

Exposure routes	: 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)

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

Exposure time : 13 Weeks
Method : OECD Test Guideline 413

1,1,1,2-Tetrafluoroethane:

Species : Rat, male and female
NOAEL : 50000 ppm
LOAEL : >50000 ppm
Application Route : inhalation (gas)
Exposure time : 2 yr
Method : OECD Test Guideline 453

Difluoromethane:

Species : Rat, male and female
NOAEL : 49100 ppm
LOAEL : > 49100 ppm
Application Route : inhalation (gas)
Exposure time : 13 Weeks
Method : OECD Test Guideline 413

Butane:

Species : Rat
NOAEL : ≥ 9000 ppm
Application Route : inhalation (gas)
Exposure time : 6 Weeks
Method : OECD Test Guideline 422

Isopentane:

Species : Rat
NOAEL : > 250 ppm
Application Route : inhalation (gas)
Exposure time : 13 Weeks
Method : OECD Test Guideline 413
Remarks : Based on data from similar materials

Aspiration toxicity

Not classified based on available information.

Components:

1,1,1,2-Tetrafluoroethane:

No aspiration toxicity classification

Difluoromethane:

No aspiration toxicity classification



SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue:
11.0	2025/05/27	1332359-00054	2025/03/05
			Date of first issue: 2017/02/27

Isopentane:

The substance or mixture is known to cause human aspiration toxicity hazards or has to be regarded as if it causes a human aspiration toxicity hazard.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

Pentafluoroethane:

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

1,1,1,2-Tetrafluoroethane:

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

Difluoromethane:

Toxicity to fish	: LC50 (Fish): 1,507 mg/l Exposure time: 96 h Method: ECOSAR (Ecological Structure Activity Relation-
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SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue:
11.0	2025/05/27	1332359-00054	2025/03/05
			Date of first issue: 2017/02/27

	ships)
Toxicity to daphnia and other aquatic invertebrates	: EC50 (Daphnia (water flea)): 652 mg/l Exposure time: 48 h Method: ECOSAR (Ecological Structure Activity Relationships)
Toxicity to algae/aquatic plants	: EC50 (green algae): 142 mg/l Exposure time: 96 h Method: ECOSAR (Ecological Structure Activity Relationships)

Isopentane:

Toxicity to fish	: LC50 (Oncorhynchus mykiss (rainbow trout)): > 1 - 10 mg/l Exposure time: 96 h Remarks: Based on data from similar materials
Toxicity to daphnia and other aquatic invertebrates	: EC50 (Daphnia magna (Water flea)): 2.3 mg/l Exposure time: 48 h
Toxicity to algae/aquatic plants	: NOEC (Scenedesmus capricornutum (fresh water algae)): > 1 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 Remarks: Based on data from similar materials
	ErC50 (Scenedesmus capricornutum (fresh water algae)): > 10 - 100 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 Remarks: Based on data from similar materials

Persistence and degradability

Components:

Pentafluoroethane:

Biodegradability	: Result: Not readily biodegradable. Biodegradation: 5 % Exposure time: 28 d Method: OECD Test Guideline 301D
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1,1,1,2-Tetrafluoroethane:

Biodegradability	: Result: Not readily biodegradable. Method: OECD Test Guideline 301D
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Difluoromethane:

Biodegradability	: Result: Not readily biodegradable. Method: OECD Test Guideline 301D
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SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

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Butane:

Biodegradability : Result: Readily biodegradable.
Remarks: Based on data from similar materials

Isopentane:

Biodegradability : Result: Readily biodegradable.
Biodegradation: 71.43 %
Exposure time: 28 d
Method: OECD Test Guideline 301F

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

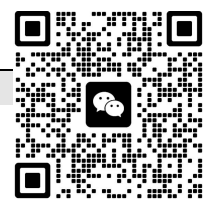
No data available

Other adverse effects

Components:

Pentafluoroethane:

Ozone-Depletion Potential : Permits required



SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

Regulation: Regulations of Ozone Depleting Substances Management (Update: 2021-10-25)
Number: 2903399047

1,1,1,2-Tetrafluoroethane:

Ozone-Depletion Potential : Permits required
Regulation: Regulations of Ozone Depleting Substances Management (Update: 2021-10-25)
Number: 2903399046

Difluoromethane:

Ozone-Depletion Potential : Permits required
Regulation: Regulations of Ozone Depleting Substances Management (Update: 2021-10-25)
Number: 2903399042

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.

14. TRANSPORT INFORMATION

International Regulations

UNRTDG

UN number : UN 1078
Proper shipping name : REFRIGERANT GAS, N.O.S.
(Pentafluoroethane, 1,1,1,2-Tetrafluoroethane)
Class : 2.2
Packing group : Not assigned by regulation
Labels : 2.2
Environmentally hazardous : no

IATA-DGR

UN/ID No. : UN 1078
Proper shipping name : Refrigerant gas, n.o.s.
(Pentafluoroethane, 1,1,1,2-Tetrafluoroethane)
Class : 2.2
Packing group : Not assigned by regulation
Labels : Non-flammable, non-toxic Gas
Packing instruction (cargo aircraft) : 200

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

Packing instruction (passenger aircraft) : 200

IMDG-Code

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

National Regulations

GB 6944/12268

UN number	: UN 1078
Proper shipping name	: REFRIGERANT GAS, N.O.S. (Pentafluoroethane, 1,1,1,2-Tetrafluoroethane)
Class	: 2.2
Packing group	: Not assigned by regulation
Labels	: 2.2
Marine pollutant	: no

Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

15. REGULATORY INFORMATION

National regulatory information

Law on the Prevention and Control of Occupational Diseases

Regulations on Safety Management of Hazardous Chemicals

Catalogue of Hazardous Chemicals	: This product is not listed in the catalogue of hazardous chemicals and it does not meet the definition of hazardous chemicals and its principles of determination.
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Identification of Major Hazard Installations for Hazardous Chemicals (GB 18218)	: Not listed
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Hazardous Chemicals for Priority Management under SAWS	: Not listed
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Catalogue of Specially Controlled Hazardous Chemicals	: Not listed
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SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue:
11.0	2025/05/27	1332359-00054	2025/03/05
			Date of first issue: 2017/02/27

List of Explosive Precursors : Not listed

Regulations on Labour Protection in Workplaces where Toxic Substances are Used

Catalogue of Highly Toxic Chemicals : Not listed

Regulation of Environmental Management on the First Import of Chemicals and the Import and Export of Toxic Chemicals

China Severely Restricted Toxic Chemicals for Import and Export : Not listed

Regulation on the Administration of Precursor Chemicals

Catalogue and Classification of Precursor Chemicals : Not listed

Yangtze River Protection Law

This product does not contain any dangerous chemicals prohibited for inland river transport.

Regulations of Ozone Depleting Substances Management

List of Controlled Ozone Depleting Substances Import and Export : Listed

List of Controlled Ozone Depleting Substances : Listed

Environmental Protection Law

List of Priority Controlled Chemicals : Not listed

List of Key Controlled New Pollutants : Not listed

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

16. OTHER INFORMATION

Revision Date : 2025/05/27

Other information : Freon™ and any associated logos are trademarks or copyrights of The Chemours Company FC, LLC.
Chemours™ and the Chemours Logo are trademarks of The Chemours Company.
Before use read Chemours safety information.
For further information contact the local Chemours office or nominated distributors.

Further information

Sources of key data used to compile the Safety Data : Internal technical data, data from raw material SDSs, OECD eChem Portal search results and European Chemicals Agen-

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue:
11.0	2025/05/27	1332359-00054	2025/03/05
			Date of first issue: 2017/02/27

Sheet cy, <http://echa.europa.eu/>

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

Date format : yyyy/mm/dd

Full text of other abbreviations

ACGIH : USA. ACGIH Threshold Limit Values (TLV)
CN OEL : Occupational exposure limits for hazardous agents in the workplace - Chemical hazardous agents.

ACGIH / TWA : 8-hour, time-weighted average
ACGIH / STEL : Short-term exposure limit
CN OEL / PC-TWA : Permissible concentration - time weighted average
CN OEL / PC-STEEL : Permissible concentration - short term exposure limit

AIIC - Australian Inventory of Industrial Chemicals; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; 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; 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; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; 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; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TECI - Thailand Existing Chemicals 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; WHMIS - Workplace Hazardous Materials Information System

SAFETY DATA SHEET

according to GB/T 16483 and GB/T 17519



Freon™ MO99 (R-438A) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2025/03/05
11.0	2025/05/27	1332359-00054	Date of first issue: 2017/02/27

Disclaimer

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.

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