DuPont™ ISCEON® MO49 Plus™ (R-437A) refrigerant

Version 3.0
Revision Date 23.11.2012 Ref. 130000033955

This SDS adheres to the standards and regulatory requirements of Great Britain and may not meet the regulatory requirements in other countries.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name	:	DuPont™ ISCEON® MO49 Plus™ (R-437A) refrigerant
Types	:	ASHRAE Refrigerant number designation: R-437A
Synonyms	:	ISCEON MO49+ MO49+ MO49 Plus R-437A

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the Substance/Mixture	Refrigerant

1.3. Details of the supplier of the safety data sheet

Company	:	Du Pont de Nemours (Nederland) B.V. Baanhoekweg 22 NL-3313 LA Dordrecht Netherlands
Telephone	:	+31-78-630.1011
E-mail address	:	sds-support@che.dupont.com

1.4. Emergency telephone number

Emergency telephone number	:	+44-(0)8456-006.640

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Not a hazardous substance or mixture according to EC-directives 67/548/EEC or 1999/45/EC.

2.2. Label elements

Special labelling of certain substances and mixtures	Safety data sheet available for professional user on request. Contains: 1,1,1,2-Tetrafluoroethane, Pentafluoroethane / Contains fluorinated greenhouse gas covered by the Kyoto Protocol., HFC-134a, HFC-125

Not a hazardous substance or mixture according to EC-directives 67/548/EEC or 1999/45/EC.

2.3. Other hazards

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

SECTION 3: Composition/information on ingredients

3.1. Substances

not applicable

3.2. Mixtures

Registration number	Classification according Directive 67/548/EEC	Classification according Regulation 1272/2008 (CLP)	Concentration
1,1,1,2-Tetrafluoroethane (CAS-No.811-97-2) (EC-No.212-377-0)			
01-2119459374-33		Press. Gas H280	>= 75 - <= 85 %
Pentafluoroethane (CAS-No.354-33-6) (EC-No.206-557-8)			
01-2119485636-25		Press. Gas H280	>= 15 - <= 25 %
Butane (<0.1% butadiene) (CAS-No.106-97-8) (EC-No.203-448-7)			
	F+;R12	Flam. Gas 1; H220 Press. Gas	>= 1 - <= 2 %
Pentane (CAS-No.109-66-0) (EC-No.203-692-4)			
	F+;R12 Xn;R65 R66 R67 N;R51/53	Flam. Liq. 2; H225 Asp. Tox. 1; H304 STOT SE 3; H336 Aquatic Chronic 2; H411	>= 0 - <= 1 %

The above products are REACH compliant; Registration number(s) may not be provided because substance(s) are exempted, not yet registered under REACH or are registered under another regulatory process (biocide uses, plant protection products), etc.

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

SECTION 4: First aid measures

4.1. Description of first aid measures

General advice : If unconscious place in recovery position and seek medical advice. Never give anything by mouth to an unconscious person. If breathing is irregular or stopped, administer artificial respiration.

	:	First aider needs to protect himself.
	:	If symptoms persist, call a physician.
Inhalation	:	Remove from exposure, lie down. Move to fresh air. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Consult a physician.
Skin contact	:	Take off contaminated clothing and shoes immediately. Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.
Eye contact	:	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention.
Ingestion	:	Is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms	:	Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects., Other symptoms potentially related to misuse or inhalation abuse are:, Anaesthetic effects, Light-headedness, dizziness, confusion, incoordination, drowsiness, or unconsciousness, irregular heartbeat with a strange sensation in the chest, heart thumping, apprehension, feeling of fainting, dizziness or weakness, Drowsiness, narcosis
	:	Irritating to respiratory system., Cough, sneezing, runny nose, sore throat, or shortness of breath.
	:	Skin contact may provoke the following symptoms:, Frostbite, Irritation, Discomfort, Itching, Redness, Swelling of tissue
	:	Eye contact may provoke the following symptoms:, Frostbite, Irritation, Tearing, redness, or discomfort.

4.3. Indication of any immediate medical attention and special treatment needed

Treatment	:	Do not give adrenaline or similar drugs.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
	:	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2. Special hazards arising from the substance or mixture

Specific hazards during firefighting	:	Pressure build-up. Fire or intense heat may cause violent rupture of packages.
	:	Hazardous thermal decomposition products:

: Carbon oxides
: Hydrogen fluoride
: Fluorinated compounds
: Exposure to decomposition products may be a hazard to health.

5.3. Advice for firefighters

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment. Wear neoprene gloves during cleaning up work after a fire.

Further information : Cool containers / tanks with water spray.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions : Evacuate personnel to safe areas. Ventilate area, especially low or enclosed places where heavy vapours might collect. Refer to protective measures listed in sections 7 and 8.

6.2. Environmental precautions

Environmental precautions : Should not be released into the environment.

In accordance with local and national regulations.

6.3. Methods and materials for containment and cleaning up

Methods for cleaning up : Evaporates.

6.4. Reference to other sections

For disposal instructions see section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling : Avoid breathing vapours or mist. Avoid contact with skin, eyes and clothing. Provide sufficient air exchange and/or exhaust in work rooms. For personal protection see section 8.

Vapours are heavier than air and may spread along floors.

Advice on protection against fire and explosion : The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air or oxygen, the mixture may become flammable. Certain mixtures of HCFCs or HFCs with chlorine may become flammable or reactive under certain conditions.

7.2. Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Do not drag, slide or roll cylinders. Never attempt to lift cylinder by its cap. Use a check valve or trap in the discharge line to prevent hazardous back flow into

the cylinder. Keep at temperature not exceeding 52°C. Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from contamination. Protect cylinders from damage. Keep away from direct sunlight. Store only in approved containers.

Advice on common storage : No materials to be especially mentioned.

For further information see Section 10 of the safety data sheet.

Storage temperature : < 52 °C

7.3. Specific end use(s)

no data available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

If sub-section is empty then no values are applicable.

Components with workplace control parameters

Type Form of exposure	Control parameters	Update	Basis	Remarks
1,1,1,2-Tetrafluoroethane (CAS-No. 811-97-2)				
TWA	4,240 mg/m3 1,000 ppm	2007	EH40 WEL	
Butane (<0.1% butadiene) (CAS-No. 106-97-8)				
TWA	1,450 mg/m3 600 ppm	2007	EH40 WEL	
STEL	1,810 mg/m3 750 ppm	2007	EH40 WEL	
Pentane (CAS-No. 109-66-0)				
TWA	1,800 mg/m3 600 ppm	2007	EH40 WEL	
TWA	3,000 mg/m3 1,000 ppm	12 2009	EU ELV	Indicative

Derived No Effect Level (DNEL)

- 1,1,1,2-Tetrafluoroethane : Type of Application (Use): Workers
  Exposure routes: Inhalation
  Health Effect: Chronic effects, Systemic toxicity

Value: 13936 mg/m3

: Type of Application (Use): Consumers
Exposure routes: Inhalation
Health Effect: Chronic effects, Systemic toxicity
Value: 2476 mg/m3

- Pentafluoroethane : Type of Application (Use): Workers
Exposure routes: Inhalation
Health Effect: Chronic effects, Systemic toxicity
Value: 16444 mg/m3

: Type of Application (Use): Consumers
Exposure routes: Inhalation
Health Effect: Chronic effects, Systemic toxicity
Value: 1753 mg/m3

Predicted No Effect Concentration (PNEC)

- 1,1,1,2-Tetrafluoroethane : Value: 0.1 mg/l
Compartment: Fresh water

: Value: 0.01 mg/l
Compartment: Marine water

: Value: 1 mg/l
Compartment: Water
Remarks: Intermittent use/release

: Value: 0.75 mg/kg dry weight (d.w.)
Compartment: Fresh water sediment

: Value: 73 mg/l
Compartment: Water
Remarks: Sewage treatment plants

- Pentafluoroethane : Value: 0.1 mg/l
Compartment: Fresh water

: Value: 1 mg/l
Compartment: Water
Remarks: Intermittent use/release

: Value: 0.6 mg/kg
Compartment: Fresh water sediment

8.2. Exposure controls

Engineering measures : Ensure adequate ventilation, especially in confined areas. Local exhaust should be used when large amounts are released.

Eye protection : Wear safety glasses or coverall chemical splash goggles.
Eye protection complying with EN 166.
or
ANSI Z87.1

		Additionally wear a face shield where the possibility exists for face contact due to splashing, spraying or airborne contact with this material.
Hand protection	:	Material: Leather gloves The suitability for a specific workplace should be discussed with the producers of the protective gloves.
	:	Material: Low temperature resistant gloves
	:	Protective gloves complying with EN 374. or US OSHA guidelines
	:	The choice of an appropriate glove does not only depend on its material but also on other quality features and is different from one producer to the other. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time.
Skin and body protection	:	Wear suitable protective equipment. Wear as appropriate: impervious clothing
Protective measures	:	Self-contained breathing apparatus (SCBA) is required if a large release occurs. The type of protective equipment must be selected according to the concentration and amount of the substance at the specific workplace.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety practice.
Respiratory protection	:	For rescue and maintenance work in storage tanks use self-contained breathing apparatus. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Respiratory protection complying with EN 137.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Form	: compressed liquefied gas
Colour	: colourless, clear
Odour	: slight, ether-like
pH	: neutral
Melting point/range	: Not available for this mixture.
Boiling point/boiling range	: -32 - -29 °C
Flash point	: does not flash
Density	: 1.192 g/cm3 at 21 °C, (as liquid)
Relative vapor density	: 3.7 at 25 °C

9.2. Other information
no data available

SECTION 10: Stability and reactivity

10.1. Reactivity : Decomposes on heating.

10.2. Chemical stability : The product is chemically stable.

10.3. Possibility of hazardous reactions : Polymerization will not occur. Stable under recommended storage conditions.

10.4. Conditions to avoid : Avoid open flames and high temperatures. The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air or oxygen, the mixture may become flammable. Certain mixtures of HCFCs or HFCs with chlorine may become flammable or reactive under certain conditions. Pressurized container: Do not pierce or burn, even after use. Keep at temperature not exceeding 52°C.

10.5. Incompatible materials : Alkali metals
Alkaline earth metals
Powdered metals
Powdered metal salts

10.6. Hazardous decomposition products : Hazardous thermal decomposition products may include:
Hydrogen fluoride
Carbon oxides
Fluorocarbons
Carbonyl fluoride

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute oral toxicity

- Pentafluoroethane
  not applicable
- Butane (<0.1% butadiene)
  not applicable
- Pentane
  LD50 / rat : > 2,000 mg/kg
  not applicable

Acute inhalation toxicity

- 1,1,1,2-Tetrafluoroethane
  LC50 / 4 h rat :567000 ppm

  Low Observed Adverse Effect Concentration (LOAEC) / dog :75000 ppm
  Cardiac sensitization

No Observed Adverse Effect Concentration (NOAEC) / dog :50000 ppm
Cardiac sensitization

- Pentafluoroethane
  LC50 / 4 h rat :> 800000 ppm

  Low Observed Adverse Effect Concentration (LOAEC) / dog :100000 ppm
  Cardiac sensitization

- Butane (<0.1% butadiene)
  LC50 / 4 h rat :277018 ppm
  Irritating to respiratory system. Central nervous system depression narcosis

  Low Observed Adverse Effect Concentration (LOAEC) / dog :150000 ppm
  Cardiac sensitization

- Pentane
  LC50 / 4 h mouse :70000 ppm
  Irritating to respiratory system. narcosis

  LC50 / 4 h rat : > 20 mg/l

Acute dermal toxicity

- Pentafluoroethane
  not applicable

- Butane (<0.1% butadiene)
  not applicable

- Pentane
  not applicable

Skin irritation

- 1,1,1,2-Tetrafluoroethane
  rabbit
  Classification: Not classified as irritant
  Result: slight irritation
  Not expected to cause skin irritation based on expert review of the properties of the substance.

  human
  Classification: Not classified as irritant
  Result: No skin irritation

- Pentafluoroethane
  Not tested on animals
  Classification: Not classified as irritant
  Result: No skin irritation
  Not expected to cause skin irritation based on expert review of the properties of the substance.

- Butane (<0.1% butadiene)
  Not tested on animals

Classification: Not classified as irritant
Result: No skin irritation
Not expected to cause skin irritation based on expert review of the properties of the substance.

- Pentane
  rabbit
  Classification: Not classified as irritant
  Result: slight irritation

Eye irritation

- 1,1,1,2-Tetrafluoroethane
  rabbit
  Classification: Not classified as irritant
  Result: slight irritation
  Not expected to cause eye irritation based on expert review of the properties of the substance.

  human
  Classification: Not classified as irritant
  Result: No eye irritation

- Pentafluoroethane
  Not tested on animals
  Classification: Not classified as irritant
  Result: No eye irritation
  Not expected to cause eye irritation based on expert review of the properties of the substance.

- Butane (<0.1% butadiene)
  Not tested on animals
  Classification: Not classified as irritant
  Result: No eye irritation
  Not expected to cause eye irritation based on expert review of the properties of the substance.

- Pentane
  rabbit
  Classification: Not classified as irritant
  Result: No eye irritation

Sensitisation

- 1,1,1,2-Tetrafluoroethane
  guinea pig
  Classification: Not a skin sensitizer.
  Result: Did not cause sensitization on laboratory animals.
  Not expected to cause sensitization based on expert review of the properties of the substance.

  Did not cause sensitization on laboratory animals. There are no reports of human respiratory sensitization.

- Pentafluoroethane
  Not tested on animals
  Classification: Not a skin sensitizer.
  Result: Does not cause skin sensitization.
  Not expected to cause sensitization based on expert review of the properties of the substance.

There are no reports of human respiratory sensitization.

- Butane (<0.1% butadiene)
  Not tested on animals
  Classification: Not a skin sensitizer.
  There are no reports of human skin sensitization. Not expected to cause sensitization based on expert review of the properties of the substance.

- Pentane
  guinea pig
  Classification: Not a skin sensitizer.
  Result: Animal test did not cause sensitization by skin contact.

Repeated dose toxicity

- 1,1,1,2-Tetrafluoroethane
  Inhalation rat
  No toxicologically significant effects were found.

- Pentafluoroethane
  Inhalation rat
  No toxicologically significant effects were found.

- Butane (<0.1% butadiene)
  Inhalation multiple species
  No toxicologically significant effects were found.

- Pentane
  Oral rat
  No toxicologically significant effects were found.

  Inhalation rat
  No toxicologically significant effects were found.

Mutagenicity assessment

- 1,1,1,2-Tetrafluoroethane
  Animal testing did not show any mutagenic effects. Tests on bacterial or mammalian cell cultures did not show mutagenic effects.

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

- Butane (<0.1% butadiene)
  Animal testing did not show any mutagenic effects.

- Pentane
  Animal testing did not show any mutagenic effects.

Carcinogenicity assessment

- 1,1,1,2-Tetrafluoroethane
  Not classifiable as a human carcinogen.

- Pentafluoroethane
  Not classifiable as a human carcinogen.

- Butane (<0.1% butadiene)
  no data available

- Pentane
  no data available

Toxicity to reproduction assessment

- 1,1,1,2-Tetrafluoroethane
  No toxicity to reproduction

- Pentafluoroethane
  No toxicity to reproduction

- Butane (<0.1% butadiene)
  no data available

- Pentane
  No toxicity to reproduction

Assessment teratogenicity

- Pentafluoroethane
  Did not show teratogenic effects in animal experiments.

- Butane (<0.1% butadiene)
  no data available

- Pentane
  No toxicity to reproduction

Further information

Avoid skin contact with leaking liquid (danger of frostbite).

SECTION 12: Ecological information

12.1. Toxicity

Toxicity to fish

- 1,1,1,2-Tetrafluoroethane
  LC50 / 96 h / Oncorhynchus mykiss (rainbow trout): 450 mg/l

- Pentafluoroethane
  LC50 / 96 h / Danio rerio (zebra fish): > 200 mg/l
  Information given is based on data obtained from similar substances.

  LC50 / 96 h / Oncorhynchus mykiss (rainbow trout): 450 mg/l

Information given is based on data obtained from similar substances.

- Butane (<0.1% butadiene)
  LC50 / 96 h / Fish (unspecified species): > 1,000 mg/l

- Pentane
  LC50 / 96 h / Oncorhynchus mykiss (rainbow trout): 4.26 mg/l

Toxicity to aquatic plants

- 1,1,1,2-Tetrafluoroethane
  EC50 / 72 h / Algae: > 118 mg/l
  Information given is based on data obtained from similar substances.

- Pentafluoroethane
  EC50 / 96 h / Algae: 142 mg/l
  Information given is based on data obtained from similar substances.

- Pentane
  ErC50 / 72 h / Scenedesmus capricornutum (fresh water algae): 10.7 mg/l

  EbC50 / 72 h / Scenedesmus capricornutum (fresh water algae): 7.51 mg/l

Toxicity to aquatic invertebrates

- 1,1,1,2-Tetrafluoroethane
  EC50 / 48 h / Daphnia magna (Water flea): 980 mg/l

- Pentafluoroethane
  EC50 / 48 h / Daphnia magna (Water flea): > 200 mg/l
  Information given is based on data obtained from similar substances.

- Pentane
  EC50 / 48 h / Daphnia magna (Water flea): 2.7 mg/l

Chronic toxicity to fish

- Pentane
  NOEC / 28 d / Oncorhynchus mykiss (rainbow trout): 6.165 mg/l

Chronic toxicity to aquatic Invertebrates

- Pentane
  NOEC / 21 d / Daphnia magna (Water flea): 10.76 mg/l

12.2. Persistence and degradability

Biodegradability

- 1,1,1,2-Tetrafluoroethane
  / 28 d
  Biodegradation: 3 %
  Not readily biodegradable.

- Butane (<0.1% butadiene)
  / 34 d
  Biodegradation: 100 %
  Readily biodegradable.

- Pentane
  / 28 d
  Biodegradation: 71 %
  Readily biodegradable.

12.3. Bioaccumulative potential

Bioaccumulation

- 1,1,1,2-Tetrafluoroethane
  Bioaccumulation is unlikely.

- Pentane
  Bioconcentration factor (BCF): 171
  Bioaccumulation is unlikely.

12.4. Mobility in soil

no data available

12.5. Results of PBT and vPvB assessment

no data available

12.6. Other adverse effects

Ozone depletion potential

0

Global warming potential (GWP)

1741 - 1948

Additional ecological information

IPCC - AR4 (Fourth Assessment Report of the Intergovernmental Panel on Climate Change) - 2007

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product	:	Can be used after re-conditioning. If re-conditioning is not practicable, dispose of in compliance with local regulations.
Contaminated packaging	:	Empty pressure vessels should be returned to the supplier.
		If recycling is not practicable, dispose of in compliance with local regulations.

SECTION 14: Transport information

ADR

14.1. UN number:	1078
14.2. UN proper shipping name:	Refrigerant gas, n.o.s. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)
14.3. Transport hazard class(es):	2
14.4. Packing group:	not applicable
14.5. Environmental hazards:	For further information see Section 12.
14.6. Special precautions for user:	
Tunnel restriction code:	(C/E)

IATA_C

14.1. UN number:	1078
14.2. UN proper shipping name:	Refrigerant gas, n.o.s. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)
14.3. Transport hazard class(es):	2.2
14.4. Packing group:	not applicable
14.5. Environmental hazards :	For further information see Section 12.
14.6. Special precautions for user:	
no data available	

IMDG

14.1. UN number:	1078
14.2. UN proper shipping name:	Refrigerant gas, n.o.s. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)
14.3. Transport hazard class(es):	2.2
14.4. Packing group:	not applicable
14.5. Environmental hazards :	For further information see Section 12.
14.6. Special precautions for user:	
no data available	

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
not applicable

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Other regulations : Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work.

15.2. Chemical Safety Assessment

No Chemical Safety Assessment has been carried out for this mixture.

SECTION 16: Other information

Text of R-phrases mentioned in Section 3

R12	Extremely flammable.
R51/53	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R65	Harmful: may cause lung damage if swallowed.
R66	Repeated exposure may cause skin dryness or cracking.

R67	Vapours may cause drowsiness and dizziness.

Full text of H-Statements referred to under section 3.

H220	Extremely flammable gas.
H225	Highly flammable liquid and vapour.
H280	Contains gas under pressure; may explode if heated.
H304	May be fatal if swallowed and enters airways.
H336	May cause drowsiness or dizziness.
H411	Toxic to aquatic life with long lasting effects.

Further information

® DuPont's registered trademark, Before use read DuPont's safety information., For further information contact the local DuPont office or DuPont's nominated distributors.

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