MATERIAL SAFETY DATA SHEET

01 - IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

PRODUCT NAME ISCEON® MO99 (R438A)

SUPPLIER

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02 - HAZARDS IDENTIFICATION

Potential Health Effects
Gross overexposure by inhalation may cause central nervous system depression with dizziness, confusion, incoordination, drowsiness or unconsciousness, irregular heart beat with a strange sensation in the chest, "heart thumping", apprehension, light headedness, feeling of fainting, dizziness, weakness, sometimes progressing to loss of consciousness and death and suffocation, if air is displaced by vapours.

Skin contact with liquid or escaping vapour may cause frostbite. Significant skin permeation and systemic toxicity after contact appears unlikely. There are no reports of human sensitization.

"Frostbite-like" effects may occur if liquid or escaping vapours contact the eyes.

Increased susceptibility to the effects of overexposure to this product may be observed in persons with pre-existing disease of the central nervous system or cardiovascular system.

Carcinogenicity Information
None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

03 - COMPOSITION/INFORMATION ON INGREDIENTS

Chemical characterization

	CAS Number	%
Difluoromethane (R-32)	75-10-5	8.5
Pentafluoroethane (R-125)	354-33-6	45.0
1,1,1,2-Tetrafluoroethane (R-134a)	811-97-2	44.2
n-Butane	106-97-8	1.7
Isopentane	78-78-4	0.6

04 - FIRST AID MEASURES

INHALATION: If inhaled, immediately remove to fresh air. Keep person calm. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT: Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.

EYE CONTACT: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION: Ingestion is not considered a potential route of exposure.

NOTES TO PHYSICIANS
Because of possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, should only be used with special caution in situations of emergency life support.

05 - FIRE-FIGHTING MEASURES

Flammable Properties :

Flash Point: No Flash Point

Flammable Limits In Air, % by Volume:
LEL: None per ASTM E681-04
UEL: None per ASTM E681-04
Autoignition: Not determined

Fire and Explosion Hazards:
Cylinders may rupture under fire conditions. Decomposition may occur.

Contact of welding or soldering torch flame with high concentrations of refrigerant can result in visible changes in the size and colour of torch flames. This flame effect will only occur in concentrations of product well above the recommended exposure limit, therefore stop all work and ventilate to disperse refrigerant vapours from the work area before using any open flames.

This product is not flammable in air at temperatures up to 100 deg. C (212 deg. F) at atmospheric pressure. However, mixtures of this product with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. This product can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing this product and air, or this product in an oxygen enriched atmosphere becomes 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 product should not be allowed to exist with air above atmospheric pressure or at high temperatures, or in an oxygen-enriched environment. For example: this product should NOT be mixed with air under pressure for leak testing or other purposes.

Experimental data have also been reported which indicate combustibility of HFC-134a a component in this blend, in the presence of chlorine.

Extinguishing Media
Use media appropriate for surrounding material.

Fire Fighting Instructions
Cool cylinders with water spray or fog. Self-contained breathing apparatus (SCBA) is required if cylinders rupture and contents are released under fire conditions. Water runoff should be contained and neutralized prior to release.

06 - ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)
NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Initial Containment
Prevent material from entering sewers, waterways or low areas.

Spill Clean Up
Recover free liquid for reuse or reclamation.

Accidental Release Measures
Ventilate area using forced ventilation, especially in low or enclosed places where heavy vapours might collect. Remove open flames. Use self-contained breathing apparatus (SCBA) for large spills or releases.

07 - HANDLING AND STORAGE

Handling (Personnel)
Avoid breathing vapour. Avoid liquid contact with eyes and skin. Use with sufficient ventilation to keep employee exposure below recommended limits. Contact with chlorine or other strong oxidizing agents should also be avoided. See Fire and Explosion Data section.

Handling (Physical Aspects)
Keep container tightly closed.

Storage
Store in a cool, dry place. Store below 52 C (125 F)

08 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls
Avoid breathing vapours. Avoid contact with skin or eyes. Use with sufficient ventilation to keep employee exposure below the recommended exposure limit. Local exhaust should be used if large amounts are released. Mechanical ventilation should be used in low or enclosed places.

Refrigerant concentration monitors may be necessary to determine vapour concentrations in work areas prior to use of torches or other open flames, or if employees are entering enclosed areas.

Personal Protective Equipment
Impervious gloves should be used to avoid prolonged or repeated exposure. Chemical splash goggles should be available for use as needed to prevent eye contact. Under normal manufacturing conditions, no respiratory protection is required when using this product. Self-contained breathing apparatus (SCBA) is required if a large release occurs.

Exposure Guidelines
Applicable Exposure Limits

Difluoromethane (R-32)

AEL * (DuPont)	:	1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA)	:	1000 ppm, 8 Hr. TWA

Pentafluoroethane (R-125)

PEL (OSHA)	:	None Established
TLV (ACGIH)	:	None Established
AEL* (DuPont)	:	1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA)	:	1000 ppm, 4900 mg/m3, 8 Hr. TWA

1,1,1,2 Tetrafluoroethane (R-134a)

PEL (OSHA)	:	None Established
TLV (ACGIH)	:	None Established
AEL * (DuPont)	:	1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA)	:	1000 ppm, 8 Hr. TWA

n-Butane

PEL (OSHA)	:	None Established
AEL *(DuPont)	:	None Established

Isopentane
PEL (OSHA) : None Established
TLV (ACGIH) : 600 ppm, 8 Hr. TWA

*AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

Exposure Guideline Comments

n-Butane:
TLV (ACGIH) : 1,000 ppm, 8 Hr. TWA

09 - PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point:	-45.4 F (-43 C) @ atmospheric pressure
Vapour Pressure:	161.3 psia @ 77 F (25 C)
Vapour Density:	3.5 (Air = 1) @ 77 F (25 C)
% Volatile:	100%
Solubility in Water:	<0.5 wt% @ 77 F (25 C)
pH:	Neutral
Odour:	Slight Ether-like
Form:	Liquified Gas
Colour:	Colourless
Specific Gravity:	1.14 @ 77 F (25 C)
Density:	Liquid = 71.13 lb/cu ft @ 77 F (25 C)

10 – STABILITY AND REACTIVITY

Chemical stability: Stable.

Incompatibility with Other Materials: Incompatible with alkali or alkaline earth metals – powered A1, Zn, Be, etc.

Decomposition: Decomposes with heat. Potential decomposition products are hydrofluoroic acid and possibly carbonyl fluoride. These materials are toxic and irritating. Contact should be avoided.

Polymerization: Polymerization will not occur.

11 - TOXICOLOGICAL INFORMATION

Animal Data
The blend has not been tested for toxicity.

R-125:
4-hr LC50: rat, > 709,000 ppm, anesthetic effects

Cardiac sensitization: epinephrine challenged dog, NOAEL = 50,000 ppm, LOAEL = 100,000 ppm

Genetic: Not mutagenic or damaging to DNA when tested in cell cultures and laboratory animals.

Repeated inhalation exposure: rat, 90 days, NOAEL = 50,000 ppm

Pre-natal development: rat and rabbit, maternal NOAEL = 15,000 ppm, foetal NOAEL = 50,000 ppm, not uniquely toxic to the foetus.

R-32:
4-hr LC50: rate, >760,000 ppm, anesthetic effects.

Cardiac sensitization: epinephrine challenged dog, threshold = 250,000 ppm

Genetic: not mutagenic or damaging to DNA when tested in cell cultures and laboratory animals.

Repeated inhalation exposure: rat, 90 days, NOAEL = 50,000 ppm

Pre-natal development: rat, maternal LOAEL = 50,000 ppm, foetal LOAEL = 50,000 ppm, rabbit maternal and foetal NOEL = 50,000 ppm, not uniquely toxic to the foetus.

R-134a:
4-hr LC50: rat, 359,300 ppm, anesthetic effects

Cardiac sensitization: epinephrine challenged dog, NOEL = 50,000 ppm, LOAEL = 75,000 ppm

Genetic: Not mutagenic or damaging to DNA when tested in cell cultures and laboratory animals.

Repeated inhalation exposure: rat, 90 days NOAEL = 50,000 ppm, human, 1hr/wk for 8 wks did not result in any adverse effects on pulse, blood pressure, electrocardiogram or lung function, NOAEL = 8000 ppm (highest concentration tested).

Chronic/Carcinogenicity: rat, 2 years, NOAEL = 10,000 ppm, LOAEL = 50,000 ppm, Leydig cell hyperplasia and a significant increase in the incidence of benign Leydig cell tumours in male rats exposed to 50,000 ppm

Pre-natal development: rat, material and foetal NOAEL = 10,000 ppm, LOAEL = 50,000 ppm, Rabbit, maternal NOAEL = 2,500 ppm, foetal NOAEL = 50,000 ppm not uniquely toxic to the foetus.

Reproduction: rat, multi-generation. NOAEL = 50,000 ppm

n-Butane:
Inhalation 4 hour LC50: 658 mg/L in rats.

A single exposure to large amounts of butane produced central nervous system depression, anesthesia, and depression of the heart with lowered blood pressure. Repeated exposure produced lowered respiratory rate and narcosis.

n-Butane does not product genetic damage in bacterial cell cultures but has not be tested in animals.

12 - ECOLOGICAL INFORMATION

Ecotoxicological Information

Aquatic Toxicity: 1,1,1,2 – Tetrafluoroethane: 48 hour LC50 – daphnia magna: 980 mg/L; 96 hour LC50 – rainbow trout: 450 mg/L
n-Butane: 96 hour LC50 - >1,000 mg/L

13 - DISPOSAL CONSIDERATIONS

Waste Disposal:
Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial and Local regulations.

14 - TRANSPORT INFORMATION

Shipping information

DOT/IMO

Proper Shipping Name :	Refrigerant Gas N.O.S. (1,1,1,2 Tetrafluoroethane and Pentafluoroethane)
Hazard Class:	2.2
UN No.:	1078
Reportable Quantity:	No
Marine Pollutant:	No
DOT/IMO Label:	Non Flammable Gas

15 - REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status: Listed.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute:	Yes
Chronic:	Yes
Fire:	No
Reactivity:	No
Pressure:	Yes

16 - OTHER INFORMATION

NFPA, NPCA-HMIS

NPCA-HMIS Rating

Health	: 1
Flammability	: 0
Reactivity	: 1

Personal Protection rating to be supplied by user depending on use conditions.

This data sheet was prepared in accordance with Directive 2001/58/EC.
This information contained within this safety data sheet applies only to the Harp International Limited product to which it relates. The information provided is based upon our best knowledge at the time that this safety data sheet was published.
The information is believed to be accurate and is given in all good faith.
When used in other preparations, in formulations or in mixtures, it is necessary to ascertain if the classification of the hazards have changed.
The attention of users is drawn to the possibility of creating other hazards when the product is used for purposes other than that for which it is recommended. In such cases a complete reassessment should be made by user.
This safety data sheet should only be used and reproduced in order that the necessary measures may be taken relating to the protection of health and safety at work and relating to the protection of environment.
The reference to the legislative, regulatory and codes of practice documents must not be considered as exhaustive.
It is the responsibility of handlers of the product to pass on the totality of the information contained within this document to any subsequent persons who will come into contact with, handle or use the product in any way.
They should check the adequacy of the information contained in the safety data sheet received before passing it onto their customers.

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