Dynaflo®

MATERIAL SAFETY DATA SHEET

R-404A

Issue Date: 2nd April 2020

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: R-404A

SUPPLIER: Dynaflo Co. Ltd., Nana Bhai Lane Fort,
Mumbai - 400 001, India

2. COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT NAME	CAS #	WEIGHT %	COMMON NAME
PENTAFLUOROETHANE (HFC-125)	354-33-6	44%	HFC-125
ETHANE, 1,1,1-TRIFLUORO	420-46-2	52%	HFC-143A
ETHANE, 1,1,1,2-TETRAFLUORO	811-97-2	4%	HFC-134A

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death. Intentional misuse or deliberate inhalation may cause death without warning. Vapor reduces oxygen available for breathing and is heavier than air. Liquid contact can cause frostbite.

HUMAN HEALTH EFFECTS:

Overexposure to the vapors by inhalation may include temporary nervous system depression with anesthetic effects such as dizziness, headache, confusion, incoordination, and loss of consciousness. Higher exposures to the vapors may cause temporary alteration of the heart's

electrical activity with irregular pulse, palpitations, or inadequate circulation; or fatality from gross overexposure. Contact with the liquid may cause frostbite. Individuals with preexisting Diseases of the central nervous or cardiovascular system may have increased susceptibility to the toxicity of increased exposures. 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.

4. 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: Not a probable route. However, in case of accidental ingestion, call a physician. Notes to Physicians

THIS MATERIAL MAY MAKE THE HEART MORE SUSCEPTIBLE TO ARRHYTHMIAS:

Catecholamines such as adrenaline, and other compounds having similar effects, should be reserved for emergencies and then used only with special caution.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	No flash point
FLAMMABLE LIMITS IN AIR, % BY VOLUME:	LEL: None per ASTM E681 UEL: None per ASTM E681
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 color 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 vapors from the work area before using any open flames. R-404A is not flammable in air at temperatures up to 100 deg C (212 deg F) at atmospheric pressure. However, mixtures of R-404A with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. R-404A can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing R-404A and air, or R-404A 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, R-404A should not be allowed to exist with air above atmospheric pressure or at high temperatures; or in an oxygen enriched environment. For example: R-404A 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 as appropriate for combustibles in area. Fire Fighting Instructions Cool cylinder 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.

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

7. HANDLING AND STORAGE

Handling (Personnel) Avoid breathing vapor. 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. Storage Clean, dry area. Do not heat above 52 deg C (125 deg F).

ENGINEERING CONTROLS:

Avoid breathing vapors. 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 vapor concentrations in work areas prior to use of torches or other open flames, or if employees are entering enclosed areas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE GUIDELINES:

APPLICABLE EXPOSURE LIMITS

PENTAFLUOROETHANE (HFC-125)

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

ETHANE, 1,1,1-TRIFLUORO- (HFC-143a)

PEL (OSHA):	None Established
TLV (ACGIH):	None Established
WEEL (AIHA):	1000 ppm, 8 Hr. TWA

ETHANE, 1,1,1,2-TETRAFLUORO- (HFC-134a)

PEL (OSHA):	None Established
TLV (ACGIH):	None Established
WEEL (AIHA):	1000 ppm, 8 Hr. TWA

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DATA

BOILING POINT:	-46.7 C (-52.1 F) Average
VAPOR PRESSURE:	182.1 psia at 25 deg C (77 deg F)
% VOLATILES:	100 WT%
EVAPORATION RATE:	(CL4 = 1) Greater than 1
SOLUBILITY IN WATER:	Not determined
ODOR:	Slight ethereal
FORM:	Liquefied gas
COLOR:	Clear, colorless
SPECIFIC GRAVITY:	1.05 @ 25C (77F)

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY:

Material is stable. However, avoid open flames and high temperatures. Incompatibility with Other Materials Incompatible with active metals, alkali or alkaline earth metals--powdered Al, Zn, Be, etc.

DECOMPOSITION:

Decomposition products are hazardous. This material can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrofluoric 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 IS UNTESTED.

HFC-125: Inhalation 4 hour ALC: > 709,000 ppm in rats Single, high inhalation exposures caused lethargy, decreased activity, labored breathing and weight loss. Weak cardiac sensitization effect, a potentially fatal disturbance of heart rhythm caused by a heightened sensitivity to the action of epinephrine. Lowest-Observed-Adverse-Effect-Level for cardiac sensitization: 100,000 ppm. Repeated exposure caused: No significant toxicological effects. No-Observed-Adverse-Effect-Level(NOAEL): 50,000 ppm No animal data are available to define carcinogenic, developmental or reproductive hazards. In animal testing this material has not caused developmental toxicity.

HFC-125 does not produce genetic damage in bacterial or mammalian cell cultures or when tested in animals (not tested for heritable genetic damage).

HFC-134A: Inhalation 4-hour LC50: 567,000 ppm in rats, Single exposure caused: Cardiac sensitization, a potentially fatal disturbance of heart rhythm associated with a heightened sensitivity to the action of epinephrine. Lowest-Observed-Adverse-Effect-Level for cardiac sensitization: 75,000 ppm. Single exposure caused: Lethargy. Narcosis. Increased respiratory rates.

These effects were temporary. Single exposure to near lethal doses caused: Pulmonary edema. Repeated exposure caused: Increased adrenals, liver, spleen weight. Decreased uterine, prostate weight. Repeated dosing of higher concentrations caused: the following temporary effects - Tremors. Incoordination.

CARCINOGENIC, DEVELOPMENTAL, REPRODUCTIVE, MUTAGENIC EFFECTS:

In a two-year inhalation study, HFC-134a, at a concentration of 50,000 ppm, produced an increase in late-occurring benign testicular tumors, testicular hyperplasia and testicular weight. The no-effect-level for this study was 10,000 ppm. Animal data show slight fetotoxicity but only at exposure levels producing other toxic effects in the adult animal. Reproductive data on male mice show: No change in reproductive performance. Tests have shown that this material does not cause genetic damage in bacterial or mammalian cell cultures, or in animals. In animal testing, this material has not caused permanent genetic damage in reproductive cells of mammals (has not produced heritable genetic damage).

HFC-143A: Inhalation 4-hour LC50: >540,000 ppm in rats, Single exposures by inhalation to 500,000 ppm caused anesthesia but no mortality at 540,000 ppm. Cardiac sensitization occurred in dogs at 300,000 ppm following an intravenous challenge with epinephrine. Two, 4-week inhalation have been conducted. In the first study, pathological changes in the testes were observed at all exposure concentrations; no effects were observed in females. The testicular effect was considered related to the method used to expose the rats to HFC-143a. In the second study using the same exposure concentrations, no effects were noted in males at any concentration. Data from a 90-day study revealed no effects in male or female rats at exposures up to 40,000 ppm. Long-term exposure caused significantly decreased body weights in male rats fed 300 mg/kg for 52 weeks, but there was no effect on mortality. Tests in rats demonstrated no carcinogenic activity when administered orally 300 mg/kg/day for 52 weeks and observed for an additional 73 weeks. Tests in bacterial cell cultures demonstrated mutagenic activity, but the compound did not induce transformation of mammalian cells in culture or in the whole animal. Tests in animals demonstrate no developmental toxicity.

AQUATIC TOXICITY

12. ECOLOGICAL INFORMATION

HFC 143A

96-HOUR LC50, RAINBOW TROUT: >40 mg/L

HFC-134A

48-HOUR EC50, DAPHNIA MAGNA: 980 mg/L
96-HOUR LC50, RAINBOW TROUT: 450 mg/L

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL:

Comply with Federal, State, and local regulations. Reclaim by distillation or remove to a permitted waste disposal facility.

14. TRANSPORTATION INFORMATION

SHIPPING INFORMATION

DOT/IMO/IATA

PROPER SHIPPING NAME:	Refrigerant Gas R-404A
HAZARD CLASS:	2.2
UN NO.:	3337
LABEL(S):	Nonflammable Gas
SHIPPING CONTAINERS:	Tank Cars. Cylinders Ton Tanks
SARA EXTREMELY HAZARDOUS SUBSTANCE:	No
CERCLA HAZARDOUS MATERIAL:	No
SARA TOXIC CHEMICALS:	No

15. REGULATORY INFORMATION

R-134A (811-97-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS:

- European Customs Inventory of Chemical Substances ECICS (English)
- European Union - European Inventory of Existing Commercial Chemical Substances (EINECS) (English)
- UK Workplace Exposure Limits (WELs)

R143A (420-46-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS:

- EU REACH Regulation (EC) No 1907/2006 - Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

- European Customs Inventory of Chemical Substances ECICS (English)
- European Union - European Inventory of Existing Commercial Chemical Substances (EINECS) (English)
- International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft

R125 (354-33-6) IS FOUND ON THE FOLLOWING REGULATORY LISTS:

- European Customs Inventory of Chemical Substances ECICS (English)
- European Union - European Inventory of Existing Commercial Chemical Substances (EINECS) (English)

16. OTHER INFORMATION

This safety data sheet is in compliance with the following EU legislation and its adaptations - as far as applicable -: 67/548/EEC, 1999/45/EC, 98/24/EC, 92/85/EC, 94/33/EC, 91/689/EEC, 1999/13/EC, Commission Regulation (EU) 2015/830, Regulation (EC) No 1272/2008 and their amendments as well as the following British legislation: - The Control of Substances Hazardous to Health Regulations (COSHH) 2002 - COSHH Essentials - The Management of Health and Safety at Work Regulations 1999.

FULL TEXT RISK AND HAZARD CODES:

H220:	Extremely flammable gas.
H224:	Extremely flammable liquid and vapour.
H312:	Harmful in contact with skin.
H370:	Causes damage to organs.
H371:	May cause damage to organs.
R12:	Extremely flammable.
R18:	In use, may form flammable/ explosive vapour-air mixture
R4:	Forms very sensitive explosive metallic compounds.

DSD / DPD LABEL ELEMENTS:

Not Applicable

For detailed advice on Personal Protective Equipment, refer to the following EU CEN Standards: EN 166 Personal eye-protection

EN 340:	Protective clothing
EN 374:	Protective gloves against chemicals and micro-organisms EN 13832 Footwear protecting against chemicals
EN 133:	Respiratory protective devices

DEFINITIONS AND ABBREVIATIONS:

PC-TWA:	Permissible Concentration n-Time Weighted Average
PC-STEL:	Permissible Concentration-Short Term Exposure Limit IARC: International Agency for Research on Cancer
ACGIH:	American Conference of Governmental Industrial Hygienists STEL: Short Term Exposure Limit
TEEL:	Temporary Emergency Exposure Limit
IDLH:	Immediately Dangerous to Life or Health Concentrations OSF: Odour Safety Factor
NOAEL:	No Observed Adverse Eff Level LOAEL: Lowest Observed Adverse Effect
LEVEL TLV:	Threshold Limit Value
LOD:	Limit of Detection OTV: Odour Threshold Value
BCF:	Bio Concentration Factors BEI: Biological Exposure Index

The MSDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.