June 10, 2015 (rev. 1)

SAFETY DATA SHEET R-404A

1. IDENTIFICATION

PRODUCT NAME: Refrigerant 404A

SYNONYMS: R-404A, REFRIGERANT 404A

RECOMMENDED USE: Refrigerant

DISTRIBUTOR: Hudson Technologies Company
ADDRESS: PO Box 1541
One Blue Hill Plaza
Pearl River, NY 10965

EMERGENCY PHONE: 1- 800-501-4376
CHEMTREC PHONE: 1-800-424-9300
INFORMATION PHONE: 1-800-953-2244

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Colorless, volatile liquid with ethereal and faint sweetish odor. Non-flammable material. Contact with the liquid may cause frostbite. Overexposure to vapors by inhalation may cause dizziness and loss of concentration. At higher levels, central nervous system depression and cardiac arrhythmia may result from exposure. Vapors displace air and can cause asphyxiation in confined spaces. At higher temperatures, (>250°C), decomposition products may include Hydrochloric Acid (HCL), Hydrofluoric Acid (HF) and carbonyl halides.

HAZARD CLASSIFICATION: Gases Under Pressure
USDOT Hazard Class 2.2, Non-Flammable Gas

SIGNAL WORD: **WARNING**

HAZARD STATEMENTS: Gas under pressure; may explode if heated
Harmful in contact with skin - may cause frostbite
May displace oxygen and cause rapid suffocation. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness, or death.

PRECAUTIONARY STATEMENTS

PREVENTION: Do not breathe vapors. Use only with adequate ventilation - never in a closed space. Wear protective gloves. Wear eye protection.

RESPONSE: If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a physician. If not breathing, give artificial respiration, preferably mouth to mouth.
If breathing is difficult, give oxygen. Avoid stimulants. Do not give adrenalin
If on skin: Wash with plenty of water (not hot water) or use other means to warm skin slowly.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician.

STORAGE: Protect from sunlight. Store in well-ventilated place.
Do not heat above 120°F (50°C). Do not store in damp areas.

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

CARCINOGENICITY: Ingredients found on one of the OSHA designated carcinogen lists are listed below.

INGREDIENT NAME	NTP STATUS	IARC STATUS	OSHA LIST
No ingredients listed in this section			

3. COMPOSITION / INFORMATION ON INGREDIENTS

PRODUCT NAME: Refrigerant 404A

SYNONYMS: R-404A, REFRIGERANT 404A

INGREDIENT NAME CAS NUMBER WEIGHT %

Ingredient Name	CAS Number	%
1,1,1-Trifluoroethane (HFC-143a)	420-46-2	52
Pentafluoroethane (HFC-125)	354-33-6	44
1,1,1,2-Tetrafluoroethane (HFC-134a)	811-97-2	4

Trace impurities and additional material names not listed above may also appear in Section 15 toward the end of this Safety Data Sheet.

4. FIRST AID MEASURES

SKIN: Promptly flush skin with water until all chemical is removed. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with a clean, soft cloth or similar covering. Get medical attention if symptoms persist.

EYES: Immediately flush eyes with large amounts of water for at least 15 minutes (in case of frostbite water should be lukewarm, not hot) lifting eyelids occasionally to facilitate irrigation. Get medical attention if symptoms persist.

INHALATION: Immediately remove to fresh air. If breathing has stopped, give artificial respiration. Use oxygen as required, provided a qualified operator is available. Get medical attention. Do not give epinephrine (adrenaline).

INGESTION: Ingestion is unlikely because of the physical properties and is not expected to be hazardous. In case of accidental ingestion, get medical attention. Do not induce vomiting unless instructed to do so by a physician.

ADVICE TO PHYSICIAN: Because of the possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, should be used with special caution and only in situations of emergency life support. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

FLASH POINT:	No flash point
FLASH POINT METHOD:	Not applicable
AUTOIGNITION TEMPERATURE:	not determined
UPPER FLAME LIMIT (volume % in air):	None*
LOWER FLAME LIMIT (volume % in air):	None*
FLAME PROPAGATION RATE (solids):	Not applicable
OSHA FLAMMABILITY CLASS:	Not applicable

*Based on ASHRAE Standard 34 with match ignition

EXTINGUISHING MEDIA:
Use any standard agent – choose the one most appropriate for type of surrounding fire (material itself is not flammable)

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Cylinders may rupture under fire conditions. Decomposition may occur.
R-404A is not flammable in air at temperatures up to 100° C (212° F) at atmospheric pressure. However, this material will become combustible when mixed with air at elevated pressure and/or temperature in the presence of an ignition sources. R-404A can also become combustible in an oxygen enriched environment. Contact with certain reactive metals may result in formation of explosive or exothermic reactions under specific conditions (e.g. very high temperatures and/or appropriate pressures.

SPECIAL FIRE FIGHTING PRECAUTIONS/INSTRUCTIONS:
In the event of fire, firefighters should wear self-contained, NIOSH-approved breathing apparatus for protection against possible toxic decomposition products. Proper eye and skin protection should be provided. Use water spray to keep fire-exposed cylinders/tanks cool.

6. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE:
(Always wear recommended personal protective equipment.)
Evacuate unprotected personnel. Protected personnel should remove ignition sources and shut off leak, if without risk, and provide ventilation. Use self-contained breathing apparatus (SCBA) for large spills or releases. Unprotected personnel should not return until air has been tested and determined safe, including low- lying areas.

Spills and releases may have to be reported to Federal and/or local authorities. See Section 15 regarding reporting requirements.

7. HANDLING AND STORAGE

NORMAL HANDLING: Always wear recommended personal protective equipment.
Avoid breathing vapors and liquid contact with eyes, skin or clothing. Do not puncture or drop cylinders, expose them to open flame or excessive heat. Use authorized cylinders only. Follow standard safety precautions for handling and use of compressed gas cylinders. R-404A should not be mixed with air above atmospheric pressure for leak testing or any other purpose.

STORAGE RECOMMENDATIONS:
Store in a cool, well-ventilated area of low fire risk and keep out of direct sunlight. Protect cylinder and its fittings from physical damage. Storage in subsurface locations should be avoided. Close valve tightly after use and when empty. Cylinder temperatures should not exceed 52° C (125° F).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide local ventilation at filling zones and areas where leakage is probable. Mechanical (general) ventilation may be adequate for other operating and storage areas.

PERSONAL PROTECTIVE EQUIPMENT

SKIN PROTECTION: Skin contact with refrigerant may cause frostbite. General work clothing and gloves (leather) should provide adequate protection. If prolonged contact with the liquid or gas is anticipated, insulated gloves constructed of PVA, neoprene or butyl rubber should be used. Any contaminated clothing should be promptly removed and washed before reuse.

EYE PROTECTION: For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear chemical safety goggles.

RESPIRATORY PROTECTION: None generally required for adequately ventilated work situations. For accidental release or non-ventilated situations, or release into confined space, where the concentration may be above the PEL of 1,000 ppm, use a self-contained, NIOSH- approved breathing apparatus or supplied air respirator. For escape: use the former or a NIOSH-approved gas mask with organic vapor canister.

ADDITIONAL RECOMMENDATIONS: Where contact with liquid is likely, such as in a spill or leak, impervious boots and clothing should be worn. High dose-level warning signs are recommended for areas of principle exposure. Provide eyewash stations and quick-drench shower facilities at convenient locations. For tank cleaning operations, see OSHA regulations, 29 CFR 1910.132 and 29 CFR 1910.133.

EXPOSURE GUIDELINES

INGREDIENT NAME	ACGIH TLV	OSHA PEL	OTHER LIMIT
Pentafluoroethane	None	None	*1000 ppm TWA (8hr)
1,1,1-Trifluoroethane	None	None	*1000 ppm TWA (8hr)
1,1,1,2-Tetrafluoroethane	None	None	*1000 ppm TWA (8hr)

* = Workplace Environmental Exposure Level (AIHA)

OTHER EXPOSURE LIMITS FOR POTENTIAL DECOMPOSITION PRODUCTS:

Hydrogen Fluoride: ACGIH TLV: 3 ppm ceiling

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Clear, colorless liquid and vapor
PHYSICAL STATE:	Liquefied gas - gas at ambient temperatures
MOLECULAR WEIGHT:	97.6
ODOR:	Faint ethereal odor
SPECIFIC GRAVITY (water = 1.0):	1.05 @ 25°C (77°F)
SOLUBILITY IN WATER (weight %):	Unknown
pH:	Neutral
BOILING POINT:	-46.7°C (-52.1°F)
FREEZING POINT:	Not determined
VAPOR PRESSURE:	182.1 psia @ 25°C (77°F)
VAPOR DENSITY (air = 1.0):	3.43 25°C (77°F)
EVAPORATION RATE:	>1
COMPARED TO:	$CC1_4$ = 1
% VOLATILES:	100
FLASH POINT:	Not applicable

(Flash point method and additional flammability data are found in Section 5.)

10. STABILITY AND REACTIVITY

NORMALLY STABLE (CONDITIONS TO AVOID):
The product is stable.
Do not mix with oxygen or air above atmospheric pressure. Any source of high temperature, such as lighted cigarettes, flames, hot spots or welding may yield toxic and/or corrosive decomposition products.

INCOMPATIBILITIES:
Under specific conditions: e.g. very high temperatures and/or appropriate pressures – Freshly abraded aluminum surfaces may cause strong exothermic reaction. Chemically active metals: potassium, calcium, powdered aluminum, magnesium and zinc.

HAZARDOUS DECOMPOSITION PRODUCTS:
Halogens, halogen acids and possibly carbonyl halides. These materials are toxic and irritating.

HAZARDOUS POLYMERIZATION:
Will not occur.

11. TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS:

HFC-134a: LC_{50} : 4 hr. (rat) - > 500,000 ppm / Cardiac Sensitization threshold (dog) > 80,000 ppm
HFC-143a: LC_{50} : 4 hr. (rat) - > 540,000 ppm / Cardiac Sensitization threshold (dog) > 250,000 ppm
HFC-125: LC_{50}: 4 hr. (rat) - > 800,000 ppm / Cardiac Sensitization threshold (dog) 75,000 ppm

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS:

HFC-134a:	Teratogenic NOEL(rate and rabbit) – 40,000 ppm
	Subchronic inhalation NOEL (rat) - 50,000 ppm / Chronic NOEL – 10,000 ppm
HFC-125:	Teratogenic NOEL (rat and rabbit) – 50,000 ppm
	Subchronic inhalation (rat) NOEL - >50,000 ppm / Chronic NOEL – 10,000 ppm
HFC-143a:	Teratogenic NOEL (rat and rabbit) – 50,000 ppm
	Subchronic inhalation NOEL (rat) - >_50,000 ppm

OTHER DATA:

HFC-125, HFC-134a: Not active in four genetic studies
HFC-143a: Not active in two genetic studies
Toxicity to reproduction: Did not show mutagenic or teratogenic effects in animal experiments

12. ECOLOGICAL INFORMATION

Aquatic Toxicity:

HFC 143a	96-hour LC50. Rainbow trout: >40mg/L
HFC 134a	48-hour EC50, Daphnia magna: 980 mg/L
	96-hour LC50. Rainbow trout: >450mg/L

Degradability (BOD): R-404A is a gas at room temperature; therefore, it is unlikely to remain in water.
Octanol Water Partition Coefficient: Unknown for mixture

13. DISPOSAL CONSIDERATIONS

RCRA - Not a hazardous waste.

OTHER DISPOSAL CONSIDERATIONS:
Disposal must comply with federal, state, and local disposal or discharge laws. R-404A is subject to U.S. Environmental Protection Agency Clean Air Act Regulations Section 608 in 40 CFR Part 82 regarding refrigerant recycling.

The information offered here is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.

14. TRANSPORT INFORMATION

US DOT PROPER SHIPPING NAME: Refrigerant Gas R-404A
US DOT HAZARD CLASS: 2.2
US DOT ID NUMBER: UN3337
PRIMARY LABEL: Nonflammable gas
SHIPPING CONTAINERS: Tank Cars, cylinders, ton tanks

For additional information on shipping regulations affecting this material, contact the information number found in Section 1.

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA)

TSCA INVENTORY STATUS: Components listed on the TSCA inventory
OTHER TSCA ISSUES: None

SARA TITLE III / CERCLA

"Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

INGREDIENT NAME	SARA / CERCLA RQ (lb.)	SARA EHS TPQ (lb.)
No ingredients listed in this section		

Spills or releases resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center [(800) 424-8802] and to your Local Emergency Planning Committee.

SECTION 311 HAZARD CLASS: IMMEDIATE PRESSURE

SARA 313 TOXIC CHEMICALS:

The following ingredients are SARA 313 "Toxic Chemicals". CAS numbers and weight percents are found in Section 3.

INGREDIENT NAME	COMMENT
No ingredients listed in this section	

STATE RIGHT-TO-KNOW

In addition to the ingredients found in Section 3, the following are listed for state right-to-know purposes.

INGREDIENT NAME	WEIGHT %	COMMENT
No ingredients listed in this section		

ADDITIONAL REGULATORY INFORMATION:
R-404A is subject to U.S. Environmental Protection Agency Clean Air Act Regulations at 40 CFR Part 82.

WARNING:
Do not vent to the atmosphere. To comply with provisions of the U.S. Clean Air Act, any residual must be recovered.

Contains Pentafluoroethane (HFC-125), 1,1,1-Trifluoroethane (HFC-143a) and 1,1,1,2-Tetrafluoroethane (HFC-134a), greenhouse gases which may contribute to global warming.

16. OTHER INFORMATION

DISCLAIMER: The above information is based upon technical information believed to be accurate but does not purport to all-inclusive and should be used only as a guide. Hudson Technologies Company shall not be held liable for any damage from handling or from contact with this product. No warranty of merchantability or any warranty, express or implied is made with respect to such information