

Genetron® 404A**00000009893**

Version 2.5

Revision Date 08/16/2012

Print Date 07/01/2013

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : **Genetron® 404A**

MSDS Number : 00000009893

Product Use Description : Refrigerant

Company : Honeywell International, Inc.
101 Columbia Road
Morristown, NJ 07962-1057

For more information call : 800-522-8001
+1-973-455-6300
(Monday-Friday, 9:00am-5:00pm)

In case of emergency call : Medical (PROSAR): 1-800-498-5701 or +1-651-523-0309
: **Transportation (CHEMTREC): 1-800-424-9300 or +1-703-527-3887**
:
: (24 hours/day, 7 days/week)

SECTION 2. HAZARDS IDENTIFICATION**Emergency Overview**

Form : Liquefied gas

Color : colourless

Odor : weak

Hazard Summary : Warning! Container under pressure. This product is not flammable at ambient temperatures and atmospheric pressure. Gas reduces oxygen available for breathing. Causes asphyxiation in high concentrations. The victim will not realize that he/she is suffocating. Inhalation may cause central nervous system effects. May cause cardiac arrhythmia. May cause drowsiness and dizziness. Do not breathe vapour. Irritating to eyes and skin. Avoid contact with skin, eyes and clothing. At higher temperatures, (>250 C),

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decomposition products may include hydrofluoric acid (HF) and carbonyl halides. The ACGIH Threshold Limit Values (2007) for Hydrogen Fluoride are TLV-TWA 0.5 ppm and Ceiling Exposure Limit 2 ppm.

Potential Health Effects

- Skin** : Avoid skin contact with leaking liquid (danger of frostbite).
May cause frostbite.
Irritating to skin.
- Eyes** : Causes serious eye irritation.
May cause frostbite.
- Ingestion** : Unlikely route of exposure.
Effects due to ingestion may include:
Gastrointestinal discomfort
- Inhalation** : Gas reduces oxygen available for breathing.
Causes asphyxiation in high concentrations. The victim will not realize that he/she is suffocating.
Inhalation may cause central nervous system effects.
May cause cardiac arrhythmia.
Vapours may cause drowsiness and dizziness.
- Chronic Exposure** : None known.

Carcinogenicity

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP, IARC, or OSHA.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Mixture

Chemical Name	CAS-No.	Concentration
1,1,1-Trifluoroethane	420-46-2	52.00%

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Pentafluoroethane	354-33-6	44.00%
1,1,1,2-Tetrafluoroethane	811-97-2	4.00%

SECTION 4. FIRST AID MEASURES

- Inhalation : Move to fresh air. If breathing is irregular or stopped, administer artificial respiration. Use oxygen as required, provided a qualified operator is present. Call a physician. Do not give drugs from adrenaline-ephedrine group.
- Skin contact : After contact with skin, wash immediately with plenty of water. 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. If symptoms persist, call a physician.
- Eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In case of frostbite water should be lukewarm, not hot. If symptoms persist, call a physician.
- Ingestion : Unlikely route of exposure. As this product is a gas, refer to the inhalation section. Do not induce vomiting without medical advice. Call a physician immediately.

Notes to physician

- Treatment : 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. Treat frost-bitten areas as needed.

SECTION 5. FIREFIGHTING MEASURES

- Suitable extinguishing media : The product is not flammable.
ASHRAE 34
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

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- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
- Specific hazards during firefighting : Contents under pressure.
This product is not flammable at ambient temperatures and atmospheric pressure.
However, this material can ignite when mixed with air under pressure and exposed to strong ignition sources.
Container may rupture on heating.
Cool closed containers exposed to fire with water spray.
Do not allow run-off from fire fighting to enter drains or water courses.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
In case of fire hazardous decomposition products may be produced such as:
Hydrogen fluoride
Carbon monoxide
Carbon dioxide (CO₂)
Carbonyl halides
- Special protective equipment for firefighters : In the event of fire and/or explosion do not breathe fumes.
Wear self-contained breathing apparatus and protective suit.
No unprotected exposed skin areas.

SECTION 6. ACCIDENTAL RELEASE MEASURES

- Personal precautions : Immediately evacuate personnel to safe areas.
Keep people away from and upwind of spill/leak.
Wear personal protective equipment. Unprotected persons must be kept away.
Remove all sources of ignition.
Avoid skin contact with leaking liquid (danger of frostbite).
Ventilate the area.
After release, disperses into the air.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Avoid accumulation of vapours in low areas.
Unprotected personnel should not return until air has been tested and determined safe.
Ensure that the oxygen content is $\geq 19.5\%$.

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Environmental precautions : Prevent further leakage or spillage if safe to do so.
The product evaporates readily.

Methods for cleaning up : Ventilate the area.

SECTION 7. HANDLING AND STORAGE**Handling**

Handling : Handle with care.
Avoid inhalation of vapour or mist.
Do not get in eyes, on skin, or on clothing.
Wear personal protective equipment.
Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C.
Follow all standard safety precautions for handling and use of compressed gas cylinders.
Use authorized cylinders only.
Protect cylinders from physical damage.
Do not puncture or drop cylinders, expose them to open flame or excessive heat.
Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.
Do not remove screw cap until immediately ready for use.
Always replace cap after use.

Advice on protection against fire and explosion : The product is not flammable.
Can form a combustible mixture with air at pressures above atmospheric pressure.

Storage

Requirements for storage areas and containers : Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use.
Keep containers tightly closed in a dry, cool and well-ventilated place.
Storage rooms must be properly ventilated.
Ensure adequate ventilation, especially in confined areas.
Protect cylinders from physical damage.

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SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

- Protective measures : Do not breathe vapour.
Do not get in eyes, on skin, or on clothing.
Ensure that eyewash stations and safety showers are close to the workstation location.
- Engineering measures : General room ventilation is adequate for storage and handling.
Perform filling operations only at stations with exhaust ventilation facilities.
- Eye protection : Wear as appropriate:
Safety glasses with side-shields
If splashes are likely to occur, wear:
Goggles or face shield, giving complete protection to eyes
- Hand protection : Leather gloves
In case of contact through splashing:
Protective gloves
Neoprene gloves
Polyvinyl alcohol or nitrile- butyl-rubber gloves
- Skin and body protection : Avoid skin contact with leaking liquid (danger of frostbite).
Wear cold insulating gloves/ face shield/ eye protection.
- Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment.
Wear a positive-pressure supplied-air respirator.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
For rescue and maintenance work in storage tanks use self-contained breathing apparatus.
- Hygiene measures : Handle in accordance with good industrial hygiene and safety practice.
Ensure adequate ventilation, especially in confined areas.
Do not get in eyes, on skin, or on clothing.
Remove and wash contaminated clothing before re-use.
Keep working clothes separately.

Exposure Guidelines

Components	CAS-No.	Value	Control parameters	Update	Basis

SAFETY DATA SHEET

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1,1,1-Trifluoroethane	420-46-2	TWA : time weighted average	(1,000 ppm)		Honeywell:Limit established by Honeywell International Inc.
1,1,1-Trifluoroethane	420-46-2	TWA : time weighted average	3,400 mg/m3 (1,000 ppm)	2007	WEEL:US. Workplace Environmental Exposure Level (WEEL) Guides
Pentafluoroethane	354-33-6	TWA : time weighted average	4,900 mg/m3 (1,000 ppm)	2007	WEEL:US. Workplace Environmental Exposure Level (WEEL) Guides
Pentafluoroethane	354-33-6	TWA : time weighted average	(1,000 ppm)		Honeywell:Limit established by Honeywell International Inc.
1,1,1,2-Tetrafluoroethane	811-97-2	TWA : time weighted average	(1,000 ppm)		Honeywell:Limit established by Honeywell International Inc.
1,1,1,2-Tetrafluoroethane	811-97-2	TWA : time weighted average	4,240 mg/m3 (1,000 ppm)	2007	WEEL:US. Workplace Environmental Exposure Level (WEEL) Guides

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state : Liquefied gas

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Color : colourless

Odor : weak

pH : Note: neutral

Melting point/freezing point : Note: no data available

Boiling point/boiling range : -47.8 °C

Flash point : Note: not applicable

Evaporation rate : > 1
Method: Compared to CCl4.

Lower explosion limit : Note: None

Upper explosion limit : Note: None

Vapor pressure : 12,610 hPa
at 21.1 °C(70.0 °F)
25,572 hPa
at 54.4 °C(129.9 °F)

Vapor density : 3.43 Note: (Air = 1.0)

Density : 1.08 g/cm³ at 21.1 °C

Water solubility : Note: Very slightly soluble in cold water, hot water.

Partition coefficient: n-
octanol/water : log Pow: 1.06
Test substance: 1,1,1,2-tetrafluoroethane (HFC-134a)

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Ignition temperature : < 750 °C

Decomposition temperature : > 250 °C

Global warming potential (GWP) : 3,784

Ozone depletion potential (ODP) : 0

SECTION 10. STABILITY AND REACTIVITY

Chemical stability : Stable under normal conditions.

Possibility of hazardous reactions : Hazardous polymerisation does not occur.

Conditions to avoid : Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Decomposes under high temperature. Some risk may be expected of corrosive and toxic decomposition products. Can form a combustible mixture with air at pressures above atmospheric pressure. Do not mix with oxygen or air above atmospheric pressure.

Incompatible materials to avoid : Finely divided aluminium
Potassium
Calcium
Powdered metals
Aluminium
Magnesium
Zinc

Hazardous decomposition products : In case of fire hazardous decomposition products may be produced such as:
Gaseous hydrogen fluoride (HF).
Carbonyl halides
Carbon monoxide
Carbon dioxide (CO₂)

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SECTION 11. TOXICOLOGICAL INFORMATION

Acute inhalation toxicity

1,1,1-Trifluoroethane : LC50: > 540000 ppm
Exposure time: 4 h
Species: rat

LC50: > 106 mg/l
Exposure time: 4 h
Species: rat

Pentafluoroethane : > 769000 ppm
Exposure time: 4 h
Species: rat

1,1,1,2-Tetrafluoroethane : LC50: > 500000 ppm
Exposure time: 4 h
Species: rat

Sensitisation

1,1,1-Trifluoroethane : Cardiac sensitization
Species: dogs
Note: 1,1,1,2-tetrafluoroethane (HFC-134a): Cardiac sensitisation threshold (dog): 80000 ppm.

Pentafluoroethane : Cardiac sensitization
Species: dogs
Note: No-observed-effect level
75 000 ppm
Lowest observable effect level
100 000 ppm

1,1,1,2-Tetrafluoroethane : Cardiac sensitization
Species: dogs
Note: No-observed-effect level
50 000 ppm
Lowest observable effect level
75 000 ppm

Repeated dose toxicity

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- 1,1,1-Trifluoroethane : Species: rat
Application Route: Inhalation
Exposure time: (90 d)
NOEL: 40000 ppm
Subchronic toxicity
- Pentafluoroethane : Species: rat
Application Route: Inhalation
Exposure time: (4 Weeks)
NOEL: 50000 ppm
Subchronic toxicity
- 1,1,1,2-Tetrafluoroethane : Species: rat
NOEL: 40000 ppm
- Genotoxicity in vitro
1,1,1-Trifluoroethane : Test Method: Ames test
Result: negative
- Pentafluoroethane : Test Method: Ames test
Result: negative
- 1,1,1,2-Tetrafluoroethane : Note: In vitro tests did not show mutagenic effects
- : Cell type: Human lymphocytes
Result: negative
- : Cell type: Human lymphocytes
Result: negative
- : Cell type: Chinese Hamster Ovary Cells
Result: negative
- Genotoxicity in vivo
1,1,1-Trifluoroethane : Species: mouse
Cell type: Bone marrow
Application Route: Inhalation
Result: negative

Teratogenicity

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1,1,1-Trifluoroethane : Species: rat
Application Route: Inhalation exposure
NOAEL, Teratog: 40,000 ppm
NOAEL, Maternal: 40,000 ppm
Note: Did not show teratogenic effects in animal experiments.

Species: rabbit
Application Route: Inhalation exposure
NOAEL, Teratog: 40,000 ppm
NOAEL, Maternal: 40,000 ppm
Note: Did not show teratogenic effects in animal experiments.

Pentafluoroethane : Species: rabbit
Application Route: Inhalation exposure
NOAEL, Teratog: 50,000 ppm
NOAEL, Maternal: 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.

Species: rat
Application Route: Inhalation exposure
NOAEL, Teratog: 50,000 ppm
NOAEL, Maternal: 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.

Further information : Note: Acute Health Hazard Ethane, pentafluoro- (HFC-125): Cardiac sensitisation threshold (dog): 75000 ppm. 1,1,1-trifluoroethane (HFC-143a): Cardiac sensitisation threshold (dog): >250000 ppm. 1,1,1,2-tetrafluoroethane (HFC-134a): Cardiac sensitisation threshold (dog): 80000 ppm. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Irritating to eyes and skin. Rapid evaporation of the liquid may cause frostbite. Avoid skin contact with leaking liquid (danger of frostbite). May cause cardiac arrhythmia. Chronic Health Hazard 1,1,1-trifluoroethane (HFC-143a): Not mutagenic in AMES Test.

SECTION 12. ECOLOGICAL INFORMATION

Biodegradability
Pentafluoroethane : Result: Not readily biodegradable.
Value: 5 %

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Method: OECD 301 D

Further information on ecology

Additional ecological information : This product is subject to U.S. Environmental Protection Agency Clean Air Act Regulations at 40 CFR Part 82. This product contains greenhouse gases which may contribute to global warming. Do NOT vent to the atmosphere. To comply with provisions of the U.S. Clean Air Act, any residual must be recovered.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods : Observe all Federal, State, and Local Environmental regulations.

Note : This product is subject to U.S. Environmental Protection Agency Clean Air Act Regulations Section 608 in 40 CFR Part 82 regarding refrigerant recycling.

SECTION 14. TRANSPORT INFORMATION

DOT UN/ID No. : UN 3337
 Proper shipping name : REFRIGERANT GAS R 404A
 Class : 2.2
 Packing group
 Hazard Labels : 2.2

IATA UN/ID No. : UN 3337
 Description of the goods : REFRIGERANT GAS R 404A
 Class : 2.2
 Hazard Labels : 2.2
 Packing instruction (cargo aircraft) : 200
 Packing instruction (passenger aircraft) : 200

IMDG UN/ID No. : UN 3337
 Description of the goods : REFRIGERANT GAS R 404A
 Class : 2.2

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Hazard Labels : 2.2
EmS Number : F-C, S-V
Marine pollutant : no

SECTION 15. REGULATORY INFORMATION**Inventories**

US. Toxic Substances Control Act : On TSCA Inventory

Australia. Industrial Chemical (Notification and Assessment) Act : On the inventory, or in compliance with the inventory

Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL) : All components of this product are on the Canadian DSL list.

Japan. Kashin-Hou Law List : On the inventory, or in compliance with the inventory

Korea. Existing Chemicals Inventory (KECI) : On the inventory, or in compliance with the inventory

Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act : On the inventory, or in compliance with the inventory

China. Inventory of Existing Chemical Substances : On the inventory, or in compliance with the inventory

NZIOC - New Zealand : On the inventory, or in compliance with the inventory

National regulatory information

SARA 302 Components : SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components : SARA 313: This material does not contain any chemical

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components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards : Acute Health Hazard
Sudden Release of Pressure Hazard

California Prop. 65 : This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

New Jersey RTK : 1,1,1-Trifluoroethane 420-46-2

WHMIS Classification : A: Compressed Gas
This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

Global warming potential : 3,784

Ozone depletion potential (ODP) : 0

SECTION 16. OTHER INFORMATION

	HMIS III	NFPA
Health hazard	: 1	2
Flammability	: 1	1
Physical Hazard	: 0	
Instability	:	0

Hazard rating and rating systems (e.g. HMIS® III, NFPA): This information is intended solely for the use of individuals trained in the particular system.

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Further information

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 given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. Final determination of suitability of any material is the sole responsibility of the user. This information should not constitute a guarantee for any specific product properties.

Changes since the last version are highlighted in the margin. This version replaces all previous versions.

Previous Issue Date: 08/24/2009

Prepared by: Honeywell Performance Materials and Technologies Product Stewardship Group