SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Genetron® 410A

MSDS Number : 000000009881

Product Use Description : Refrigerant

Manufacturer or supplier's details : Honeywell International Inc.
115 Tabor Road
Morris Plains, NJ 07950-2546

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

In case of emergency call : Medical: 1-800-498-5701 or +1-303-389-1414
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

Classification of the substance or mixture

Classification of the substance or mixture : Gases under pressure, Liquefied gas
Simple Asphyxiant

GHS Label elements, including precautionary statements
Symbol(s) : ⚠️

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation.

Precautionary statements : Prevention:
Use personal protective equipment as required.

Storage:
Protect from sunlight. Store in a well-ventilated place.

Hazards not otherwise classified : May cause eye and skin irritation. May cause frostbite. May cause cardiac arrhythmia.

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

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentafluoroethane</td>
<td>354-33-6</td>
<td>50.00 %</td>
</tr>
<tr>
<td>Difluoromethane</td>
<td>75-10-5</td>
<td>50.00 %</td>
</tr>
</tbody>
</table>

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. Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. 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 halides
- 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 >= 19.5%.

**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.
- Use only in well-ventilated areas.
- 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.
- Store away from incompatible substances.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective measures:
- Do not breathe vapour.
Avoid contact with skin, eyes and 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.
Avoid contact with skin, eyes and clothing.
Remove and wash contaminated clothing before re-use.
Keep working clothes separately.

Hygiene measures:
Handle in accordance with good industrial hygiene and safety practice.
Ensure adequate ventilation, especially in confined areas.
When using do not eat, drink or smoke.
Remove and wash contaminated clothing before re-use.
Keep working clothes separately.
Do not breathe vapour.
Avoid contact with skin, eyes and clothing.
### Exposure Guidelines

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Update</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difluoromethane</td>
<td>75-10-5</td>
<td>TWA : time weighted average</td>
<td>2,200 mg/m³ (1,000 ppm)</td>
<td>2007</td>
<td>WEEL: US. AIHA Workplace Environmental Exposure Level (WEEL) Guides</td>
</tr>
<tr>
<td>Difluoromethane</td>
<td>75-10-5</td>
<td>TWA : time weighted average</td>
<td>(1,000 ppm)</td>
<td>1994</td>
<td>Honeywell: Limit established by Honeywell International Inc.</td>
</tr>
<tr>
<td>Pentafluoroethane</td>
<td>354-33-6</td>
<td>TWA : time weighted average</td>
<td>4,900 mg/m³ (1,000 ppm)</td>
<td>2007</td>
<td>WEEL: US. AIHA Workplace Environmental Exposure Level (WEEL) Guides</td>
</tr>
<tr>
<td>Pentafluoroethane</td>
<td>354-33-6</td>
<td>TWA : time weighted average</td>
<td>(1,000 ppm)</td>
<td></td>
<td>Honeywell: Limit established by Honeywell International Inc.</td>
</tr>
</tbody>
</table>

### SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

- **Physical state**: Liquefied gas
- **Color**: Colourless
- **Odor**: Weak
- **pH**: Note: Neutral
- **Melting point/freezing point**: Note: Not determined
Boiling point/boiling range: -48.5 °C

Flash point: Note: not applicable

Evaporation rate: > 1
Method: Compared to CCl4.

lower flammability limit: Note: None
upper flammability limit: Note: None

Vapor pressure: 14,844 hPa
at 21.1 °C (70.0 °F)
33,798 hPa
at 54.4 °C (129.9 °F)

Vapor density: 3 Note: (Air = 1.0)

Density: 1.08 g/cm³ at 21.1 °C

Water solubility: Note: no data available

Partition coefficient: n-octanol/water
log Pow: 1.48
Test substance: Ethane, pentafluoro- (HFC-125)

log Pow: 0.21
Test substance: Difluoromethane (HFC-32)

Ignition temperature: > 750 °C

Decomposition temperature: > 250 °C
Global warming potential (GWP) : 1,975
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: Hydrogen fluoride, Carbonyl halides, Carbon monoxide, Carbon dioxide (CO2)

SECTION 11. TOXICOLOGICAL INFORMATION

Acute inhalation toxicity Pentfluoroethane : > 769000 ppm
Exposure time: 4 h
Species: rat

Difluoromethane:
- LC50: > 520000 ppm
- Exposure time: 4 h

Species: rats

Sensitisation
Pentafluoroethane:
- Cardiac sensitization
  - Species: dogs
  - Note: No-observed-effect level 75000 ppm
  - Lowest observable effect level 100000 ppm

Difluoromethane:
- Cardiac sensitization
  - Species: dogs
  - Note: No-observed-effect level >350000 ppm

Repeated dose toxicity
Pentafluoroethane:
- Species: rat
  - Application Route: Inhalation
  - Exposure time: (4 Weeks)
  - NOEL: 50000 ppm
  - Subchronic toxicity

Difluoromethane:
- Species: rat
  - Application Route: Inhalation
  - Exposure time: (90 d)
  - NOEL: 50000 ppm
  - Subchronic toxicity

Genotoxicity in vitro
Pentafluoroethane:
- Test Method: Ames test
  - Result: negative

Difluoromethane:
- Test Method: Ames test
  - Result: negative
  - Cell type: Human lymphocytes
  - Result: negative
Cell type: Chinese Hamster Ovary Cells
   Result: negative

Cell type: Human lymphocytes
   Result: negative
   Method: Mutagenicity (in vitro mammalian cytogenetic test)

Test Method: Chromosome aberration test in vitro
   Result: negative

Genotoxicity in vivo
Difluoromethane
   Species: mouse
   Cell type: Bone marrow
   Method: Mutagenicity (micronucleus test)
   Result: negative

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

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

Difluoromethane
   Species: rat
   Dose: NOEL - 50,000 ppm
   Note: Did not show teratogenic effects in animal experiments.

   Species: rabbit
   Dose: NOEL - 50,000 ppm
   Note: Did not show teratogenic effects in animal experiments.

Further information
   Acute toxicity Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Rapid evaporation of the liquid may cause frostbite. May cause
cardiac arrhythmia.

SECTION 12. ECOLOGICAL INFORMATION

Biodegradability
Pentafluoroethane : Result: Not readily biodegradable.
Value: 5 %
Method: OECD 301 D

Difluoromethane : Note: Minimal

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 3163
Proper shipping name : LIQUEFIED GAS, N.O.S.
(Pentafluoroethane, Difluoromethane)
### SECTION 15. REGULATORY INFORMATION

**Inventories**

<table>
<thead>
<tr>
<th>Country</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>US. Toxic Substances Control Act</td>
<td>On TSCA Inventory</td>
</tr>
<tr>
<td>Australia. Industrial Chemical (Notification and Assessment) Act</td>
<td>On the inventory, or in compliance with the inventory</td>
</tr>
<tr>
<td>Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL)</td>
<td>All components of this product are on the Canadian DSL.</td>
</tr>
<tr>
<td>Japan. Kashin-Hou Law List</td>
<td>On the inventory, or in compliance with the inventory</td>
</tr>
<tr>
<td>Korea. Toxic Chemical</td>
<td>On the inventory, or in compliance with the inventory</td>
</tr>
</tbody>
</table>
Control Law (TCCL) List

Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act

China. Inventory of Existing Chemical Substances

NZIOC - New Zealand

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 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

WARNING! This product contains a chemical known to the State of California to cause cancer.
Dichloromethane 75-09-2

Massachusetts RTK

Dichloromethane 75-09-2

New Jersey RTK

Difluoromethane 75-10-5

Pennsylvania RTK

Difluoromethane 75-10-5

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**: 1,975

**Ozone depletion potential (ODP)**: 0

### SECTION 16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>Hazard</th>
<th>HMIS III</th>
<th>NFPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health hazard</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Flammability</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Physical Hazard</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Instability</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

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.

**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**: 09/11/2013

**Prepared by**: Honeywell Performance Materials and Technologies Product Stewardship Group