

Genetron® 410A

Introduction

Genetron® 410A (a near-azeotropic mixture of HFC-32/HFC-125) has been developed by Honeywell to serve as a long-term, non-ozone depleting energy efficient replacement for Genetron® 22 (HCFC-22) in a variety of new-equipment applications.

Genetron® 410A has a significantly higher capacity and pressure than Genetron® 22 and an intrinsically low toxicity. Because it behaves like an azeotrope, Genetron® 410A is easy to service in the field.

Genetron® 410A is patented and has been recognized by underwriters' laboratory as practically non-flammable.



Physical properties

Components:	Chemical name:	Molecular formula:	Weight %:
HFC-32	Difluoromethane	CH ₂ F ₂	50%
HFC-125	Pentafluoroethane	CHF ₂ CF ₃	50%
Molecular weight			72.6
Boiling point ^{iv} (°C)			-52.7
Freezing point (°C)			-155
Critical temperature (°C)			72.5
Critical pressure (kPa)			4950
Critical volume (m ³ /kg)			0.0020
Critical density (kg/m ³)			500.00
Vapour density at boiling point (kg/m ³)			4.19
Liquid density ⁱⁱⁱ (kg/m ³)			1063.38
Liquid heat capacity ⁱⁱⁱ (kJ/kg·°K)			1.67
Vapour heat capacity ⁱⁱⁱ (kJ/kg·°K)			0.84
Heat of vaporization at boiling point (kJ/kg)			256.68
Vapour pressure ⁱⁱⁱ (bar)			16.49
Liquid thermal conductivity ^{i,iii} (W/m·°K)			0.0794
Vapour thermal conductivity ^{i,iii} (W/m·°K)			0.0154
Liquid viscosity ⁱⁱⁱ (μPa·sec)			121.23
Vapour viscosity ^{i,iii} (μPa·sec)			13.85
% Volatiles by volume			99.99
Solubility of water in Genetron® 410A (wt.%)			0.28
Flammability limits in air (vol.%)			None ⁱⁱ
Ozone Depletion Potential (ODP – R11=1)			0.00
ASHRAE Safety Group Classification			A1/A1

ⁱ Information based on estimated properties.

ⁱⁱ Flame limits measured using ASTM E681 with electrically activated kitchen ignition source per ASHRAE Standard 34.

ⁱⁱⁱ All measurements are at 25°C unless otherwise noted.

^{iv} at 101.3 kPa

Pressure/Temperature table

Temperature (°C)	Pressure (kPa)
-50.0	110
-45.0	140
-40.0	176
-35.0	220
-30.0	271
-25.0	331
-20.0	401
-15.0	482
-10.0	574
-5.0	680
0.0	799
5.0	934
10.0	1085
15.0	1254
20.0	1443
25.0	1652
30.0	1883
35.0	2137
40.0	2417
45.0	2724
50.0	3061
55.0	3429
60.0	3833

Compatibility with plastics and elastomers

The table below is a summary of materials compatibility data resulting from tests performed by Honeywell and other worldwide industry organisations.

Since there are many different grades and formulations of these materials, we recommend that compatibility testing be performed on the specific grade of

materials under consideration when designing new systems. This data should be used only as a guide to the compatibility of materials with Genetron® 410A.

The rankings in the table should be used with caution since they are judgements based on limited samplings. Customers should consult with the manufacturer or conduct further independent testing.

Compatibility with plastics and elastomers

Material	Genetron® 410A
Ethylene-Propylene Diene Terpolymer	S
Ethylene-Propylene Copolymer	S
Chlorosulfonated Polyethylene	S
Chlorinated Polyethylene	Su
Neoprene (Chloroprene)	S
Epichlorohydrin	Su
Fluorinated Rubbers	U
Silicone	Su
Polyurethane	Su
Nitriles	Su
H-NBR	Su
Butyl Rubber	Su
Polysulfide	S
Nylon	S
Polytetrafluoroethylene	S
PEEK	S
ABS	U
Polypropylene	Su
Polyphenyl Sulfide	U
Polyethylene Terephthalate	Su
Polysulfone	Su
Polyimide	S
Polyetherimide	S
Polyphthalamide	Su
Polyamideimide	S
Acetal	Su
Phenolic	S

S: Suitable

Su: Suitable with some exceptions

U: Unsuitable

Applications

Air-conditioning

Genetron® 410A is an ideal non-ozone depleting, long-term replacement for Genetron® 22 in new residential and light commercial unitary air conditioning systems. In new systems optimised for its use, with either scroll or reciprocating compressors, Genetron® 410A has shown in tests to have a 5-to-6 percent higher Energy Efficiency Rating (EER) than Genetron® 22. Genetron® 410A also has a higher capacity and pressure than Genetron® 22, enabling the design of smaller, more compact air-conditioning equipment.

Chillers

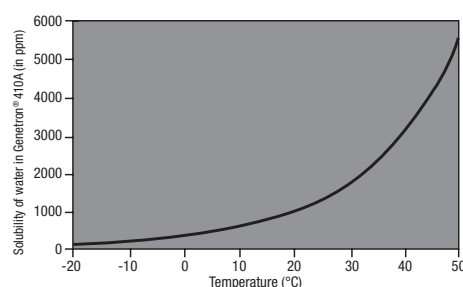
Genetron® 410A serves as an excellent refrigerant in newly designed chillers, particularly positive displacement chillers.

Commercial refrigeration

Genetron® 410A may be used as a replacement for Genetron® 22 in new medium and low temperature commercial refrigeration systems, including supermarket display cases and refrigerated transport. Genetron® 410A can serve as a replacement for refrigerants like R-13B1 in new low-temperature industrial refrigeration systems and can be used as a retrofit gas of existing R-13B1 systems.

Solubility of water

The solubility of water in Genetron® 410A is shown in the graph below.



Safety

Honeywell recommends reading the Material Safety Data sheet (MSDS) before using Genetron® 410A.

Toxicity

Genetron® 410A can be safely used in all of its intended applications, based on data developed by the Program for Alternative Fluorocarbon Toxicity Testing (PAFT 1).

Leaks

If a large release of Genetron® 410A as vapour occurs, the area should be evacuated immediately. Vapour may concentrate near the floor, displacing available oxygen. Once the area is evacuated, it must be ventilated using blowers or fans to circulate the air at floor-level.

Flammability

According to ASHRAE Standard 34, Genetron® 410A is classified in safety group A1/A1, i.e., it is non-flammable at 1 atm. pressure (101.3 kPa) and 18°C.

Leak detection

Use leak detectors for pinpointing leaks or for monitoring an entire room on a continual basis. Leak detectors are important for refrigerant conservation, equipment protection and performance, reduction of emissions and protection of those coming in contact with the system. Leak testing should not be performed with mixtures of air and Genetron® 410A under pressure. Since Genetron® 410A is an HFC mixture, use a leak detector capable of detecting an HFC gas.

Retrofitting existing systems

Genetron® 410A is a leading, long-term non-ozone-depleting candidate to replace Genetron® 22 due to its many favourable performance characteristics. However, the performance properties which make it an attractive candidate to replace Genetron® 22 in new equipment -- higher capacity and higher pressure -- make it difficult to be used in existing systems designed for Genetron® 22. In most cases, mandatory changes would include compressors and thermostatic expansion valves. Condensers and other high-pressure-side components may also require replacing. Depending on the applicable design standard for pressure-containing components and the particular design, even low-pressure-side components may require changing. Provided local building codes permit, and equipment manufacturers approve, it may be possible to retain the indoor coil and inter-connecting lines. Hoses and manifold-sets require the range from 55 bar high side and 35 low side.



Environmental considerations

Genetron® 410A is a halogenated hydrocarbon. Treatment or disposal of wastes generated by use of this product may require special consideration, depending on the nature of the wastes and the means of discharge, treatment or disposal. For more information, refer to the MSDS.

Storage and handling

Genetron® 410A must be only liquid charged into a system to ensure proper refrigerant composition and system performance.

Bulk and cylinder

Genetron® 410A has a higher vapour pressure compared to most of the current refrigerants, particularly Genetron® 22 (HCFC-22). For this reason, Genetron® 410A must be handled with careful attention to the design pressure rating of the handling equipment. All storage shipping containers - cylinders, storage tanks, ISO containers, tank trailers or tank cars -- must be specifically designed to handle Genetron® 410A. Another important handling practice that must be followed for Genetron® 410A is to ensure that all transfers be executed by using liquid charging instead of vapour charging. This practice will help minimise compositional changes. To help facilitate liquid charging, all cylinders are equipped with dip-tubes. Keep cylinders of Genetron® 410A out of direct sunlight, especially in warm weather.

Genetron® 410A expands significantly when heated, reducing the amount of vapour space left in the cylinder. Once the cylinder becomes liquid-full, any further rise in temperature can cause it to burst, potentially resulting in serious personal injury. Never allow a cylinder to get warmer than 52°C.

Available literature

Honeywell has a wide range of literature available on topics including: retrofitting procedures, product specifications and product descriptions.

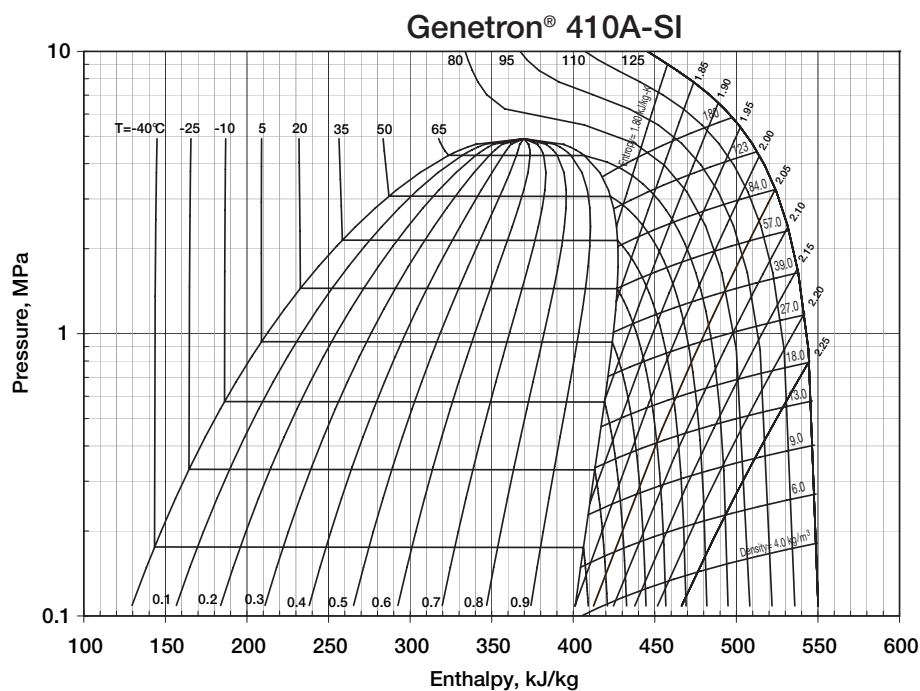
Please ask for Honeywell's software package containing Refrigerant Properties, Cycle Analysis and Pipe Sizing.

All literature and information can be found at:

www.honeywellrefrigerants.com

www.410A.com

Pressure-Enthalpy Diagram



Disclaimer

Although all statements and information contained herein are believed to be accurate and reliable, they are presented without guarantee or warranty of any kind, express or implied. Information provided herein does not relieve the user from the responsibility of carrying out its own tests and experiments, and the user assumes all risks and liability for use of the information and results obtained. Statements or suggestions concerning the use of materials and processes are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe any patent. The user should not assume that all toxicity data and safety measures are indicated herein or that other measures may not be required.

Honeywell Fluorine Products Europe B.V.

Laarderhoogtweg 18
1101 EA Amsterdam
The Netherlands

Honeywell Belgium N.V.

Haasrode Research Park,
Grauwmeer 1
B-3001 Heverlee
Belgium
Tel: +32 16-391 278
Fax: +32 16-391 277

Honeywell