Honeywell

Genetron® 404A

Genetron® 404A (HFC-404A) is a non-ozone depleting compound designed to serve as a long-term alternative to Genetron® 502 (CFC-502) and Genetron® 22 (HCFC-22) in low- and medium-temperature commercial refrigeration applications. Applications where Genetron® 404A is a suitable retrofit refrigerant include supermarket freezer cases, reach-in coolers, display cases, transport refrigeration and ice machines.

Genetron® 404A has been designed as a substitute for Genetron® 502, but it is not a drop-in replacement. Mineral oils and alkylbenzene lubricants, which have been used traditionally with Genetron® 502, are immiscible with Genetron® 404A. Service technicians should consult the original equipment manufacturer for the recommended lubricants.

Physical properties

Components:	Chemical name:	Molecular formula:	Weight %:
HFC-125	Pentafluoroethane	CHF_2CF_3	44%
HFC-143a	1,1,1 Trifluoroethane	CH_3CF_3	52%
HFC-134a	1,1,1,2 Tetrafluorethane	CH_2FCF_3	4%
Molecular weight			97.6
Boiling point (Bubble point) [IV] (°C)			-46.2
Critical temperature (°C)			72.2
Critical pressure (kPa)			3668.6
Critical density (kg/m^3)			483.7
Saturated liquid density [V] (kg/m^3)			1034.7
Heat of vaporization at boiling point [I] (kJ/kg)			35.8
Specific heat of vapour [I, VI] (kJ/kg·°C)			0.09
Flammability limits in air (vol.%)			None [II]
Ozone Depletion Potential (ODP-R11=1)			0
ASHRAE/ANSI Standard 34-1992 Safety Group Classification			A1/A1

[I] Refprop v 4.0 (NIST)
[II] Flame limits measured using ASTM E681 with electrically activated kitchen ignition source per ASHRAE Standard 34.
[IV] at 101.3 kPa
[V] at 26.7 °C
[VI] Cp at 101.3 kPa and 26.7°C

Pressure/Temperature table

Temperature (°C)	Bubble pressure (liquid) (kPa)	Dew pressure (vapour) (kPa)
-60	51	48
-56	63	60
-52	78	74
-48	95	91
-44	114	110
-40	137	133
-36	164	159
-32	194	188
-28	228	222
-24	267	260
-20	310	303
-16	359	351
-12	414	405
-8	474	465
-4	541	531
0	615	604
4	696	685
8	785	773
12	882	869
16	987	974
20	1102	1089
24	1227	1213

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® 404A.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® 404A	Genetron® 404A Polyol Ester
Ethylene-Propylene Diene Terpolymer	S	S
Ethylene-Propylene copolymer	S	S
Chlorosulfonated Polyethylene	S	U
Polyisoprene	Su	U
Chlorinated Polyethylene	S	Us
Neoprene (Chloroprene)	S	Su
Epichlorohydrin	Su	Us
Polyvinylidene Fluoride and copolymer of Vinylidene Fluoride and Hexafluoropropylene	U	Us
Silicone	Us	Su
Polyurethane	Su	Su
Nitriles	Su	Su
H-NBR	Su	S
Butyl rubber	Su	S
Polysulfide	S	U
Nylon	S	Su
Polytetrafluoroethylene	S	S
PEEK	S	S
ABS	Su	U
Polypropylene	Su	Su
Polyphenylene Sulfide	Su	Su
Polyethylene Terephthalate	S	S
Polysulfone	S	S
Polyimide	S	Su
Polyetherimide	S	S
Polyphthalamide	Su	U
Polyamideimide	Su	S
Acetal	S	U
Phenolic	S	Su
Epoxy Laminate	S	S

U: Unsuitable
Us: Unsuitable with some exceptions
S: Suitable
Su: Suitable with some exceptions

Retrofitting

Handling

Genetron® 404A is a blend. For this reason it is essential that systems be charged only with liquid from the cylinder, not vapour. Vapour-charging Genetron® 404A may result in the wrong refrigerant composition and could damage the system. Technicians should use a throttling device to avoid slugging the compressor with liquid and causing damage to the compressor.

Lubricant

A lubricant miscible with HFC refrigerants must be used with Genetron® 404A. Honeywell recommends using a lubricant such as polyol ester (POE) that has been approved by the compressor manufacturer. Differences among polyol ester-based lubricants make it difficult to assume that they are interchangeable. Check with the compressor manufacturer for the correct viscosity grade and brand for the compressor in the system being retrofitted.

Expansion device

Most Genetron® 502 systems with any common expansion device will operate satisfactorily with Genetron® 404A, however, it may be necessary to adjust the superheat. For Genetron® 502 equipped with a capillary tube, in most cases the unit can be operated satisfactorily with the original capillary tube by undercharging the unit (as long as ambient conditions are relatively constant).

Leak detection

Use leak detectors for pinpointing leaks or for monitoring an entire room on a continual basis. Leak detection is important for refrigerant conservation, equipment protection and performance, reduction of emission and protection of those coming in contact with the system. Never use air to perform leak detection.

Storage and handling

Genetron® 404A must be only liquid charged into a system to ensure proper refrigerant composition and system performance.

Bulk and cylinder

Genetron® 404A cylinders must be clearly marked and kept in a cool, dry and properly ventilated storage area away from heat, flames, corrosive chemicals, fumes, explosives -- and be otherwise protected from damage. Under no circumstances should an empty cylinder be refilled with anything other than virgin product. Once empty, properly close the cylinder valve and replace the valve cap. Return empty cylinders to your Honeywell distributor. Cylinders of Genetron® 404A should be kept out of direct sunlight, especially in warm weather. Liquid Genetron® 404A 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 severe personal injury. Never allow a cylinder to get warmer than 52°C. Vessels, containers, transfer lines, pumps and other equipment used with Genetron® 404A should not be exposed to high-temperature sources (such as welding, brazing and open flames) until they have been thoroughly cleaned and found free of vapours or liquid. Cylinders must never be exposed to welding, brazing or open flames. Exposure to high temperatures can cause fire, explosion and decomposition of Genetron® 404A. This may result in the formation of toxic or corrosive compounds.

When possible, maintenance or cleaning of equipment should be performed without entering the vessel. If a tank or any confined space must be entered, then formal confined space entry procedures must be followed. These procedures require that a fully qualified work team be used and a confined space entry form be completed and placed at the job site.

Available literature

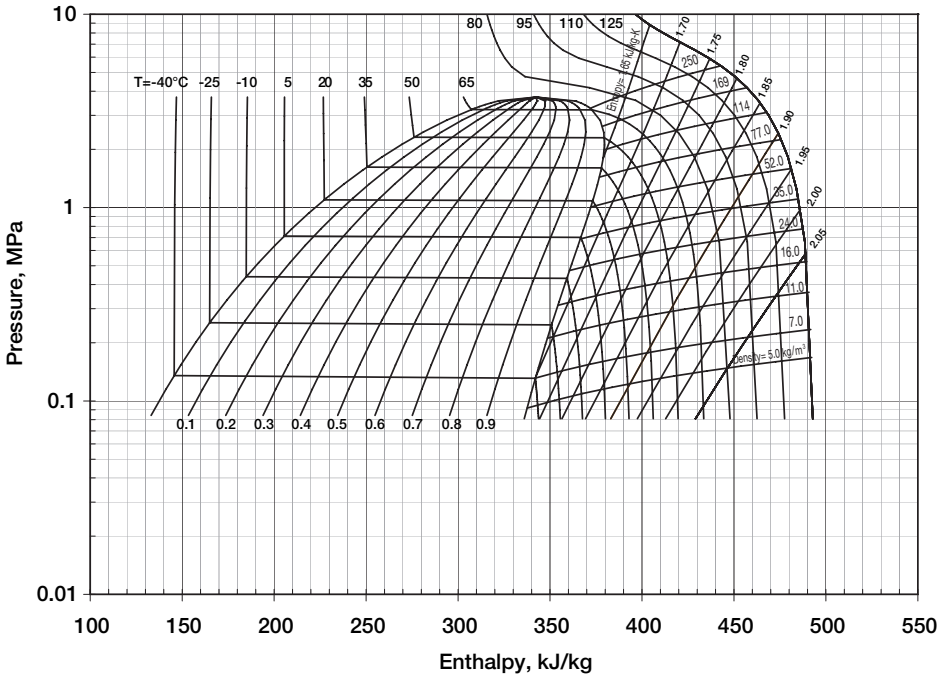
Honeywell has a wide range of literature available on topics including: retrofitting procedures, product specifications and product descriptions.

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

Pressure-Enthalpy Diagram

Genetron® 404A-SI



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