3M™ Novec™ 7300 Engineered Fluid

Introduction

3M™ Novec™ 7300 Engineered Fluid is a clear, colorless, odorless fluid that has utility in a wide variety of applications, including heat transfer, lubricant deposition, electronic testing and cleaning applications.

Novec 7300 fluid, a segregated hydrofluoroether, is non-flammable, thermally stable, non-ozone depleting, and has a very low global warming potential. Novec 7300 fluid does not contribute to the formation of photochemical smog. An exemption from the U.S. EPA definition of a VOC has been requested. The product is recommended for use as a replacement for perfluoropolyethers (PFPEs), perfluorocarbons (PFCs), hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs). On this basis, Novec 7300 fluid provides a useful tool to help meet commitments for greenhouse gas emission reduction.

The boiling point, wide liquid range and low-temperature viscosity of Novec 7300 fluid make it ideal for cooling ion implanters, dry etchers, and CVD machines. Novec 7300 fluid is effective at mitigating the aggressiveness of solvents and is useful in inerting the flammability of blends. The chemical and thermal stability of Novec 7300 fluid lend to its use as a reaction media.

Typical Physical Properties

Table 1

Not for specification purposes. All values @ 25°C unless otherwise specified.

Properties	Novec 7300
Appearance	Clear, colorless
Molecular Weight	350
Boiling Point (°C) @ 760 mmHg	98.0
Freeze Point (°C)	-38
Liquid Density (g/ml)	1.66
Surface Tension (dynes/cm)	15
Solubility of Solvent in Water (ppb)	586
Solubility of Water in Solvent (ppb)	67
Vapor Pressure (mmHg)	44.9
Viscosity (cSt)	0.71
Viscosity @-35°C (cSt)	3.51
Heat of Vaporization @ boiling point (cal/g)	24.3

Environmental and Safety Properties

Table 2

Properties	Novec 7300
Ozone Depletion Potential–ODP[1]	0
Global Warming Potential[2]	200
Atmospheric Lifetime (years)	3.8

[1] CFC-11=1.0
[2] GWP–100 year ITH, CO_2 = 1.0

Vapor Pressure and Density

The variation of vapor pressure and density with temperature of 3M™ Novec™ 7300 Engineered Fluid can be calculated using the following formulas:

Vapor Pressure: $P = \exp(-6504.623709/(t + 350) + 21.151057)$
Density: $D = 1.7162 – 0.0024t$
P = Vapor Pressure in mmHg
t = Temperature in °C
D = Density in g/ml

Heat Transfer

Novec 7300 fluid is ideal as a heat transfer fluid for the demanding requirements of semiconductor processing and electronics equipment. Novec 7300 fluid is designed to balance performance with favorable environmental and worker safety properties. In heat transfer applications, Novec 7300 fluid offers:

- Excellent dielectric properties
- Wide liquid range
- Good materials compatibility
- Low toxicity
- Nonflammability
- Low Global Warming Potential (GWP)
- Zero Ozone Depletion Potential (ODP)

For heat transfer applications, favorable environmental health and safety properties make Novec 7300 fluid a long-term, sustainable solution, helping improve reliability, address environmental concerns and lower overall operating costs.

Solvent Properties

Data compiled from published information.

Not for specification purposes.

Novec 7300 fluid is an excellent replacement for PFCs, HCFCs, and HFCs in many solvent applications. A high purity version of Novec 7300 fluid, marketed as Novec 7300DL Engineered Fluid, is available for applications such as the deposition of lubricants onto hard disk drive media and for high purity cleaning applications in the semiconductor industry. Contact your local 3M representative for more information.

Novec 7300 fluid has shown utility in solvent cleaning applications–both in its neat form, and when blended with organic solvents, and/or other hydrofluoroethers, hydrofluorocarbons and other fluorinated solvents. Azeotropic mixtures of Novec 7300 fluid have been demonstrated with several commonly used cleaning solvents. Novec 7300 fluid can also be used as a medium for quality and reliability testing of integrated circuits.

Materials Compatibility

3M™ Novec™ 7300 Engineered Fluid is compatible with most metals and hard polymers such as:

Metals	Plastics	Elastomers
Stainless Steel	Polycarbonate	EPDM
Nickel	PMMA	Natural Rubber
Copper	ABS	Polyurethane
Aluminum	Polypropylene	
Monel	Polyethylene	

Elastomeric materials should be limited to those compounds that contain the least amount of extractible plasticizer. 3M engineers can suggest appropriate compounds or assist with test procedures for your evaluation.

Safety and Handling

Be sure to read and follow the precautions and directions for use contained in the product label and Material Safety Data Sheet before using this product.

Novec 7300 fluid is nonflammable and is highly resistant to thermal breakdown and hydrolysis in storage and during use. Recommended handling procedures are provided in the Material Safety Data Sheet.

A product Material Safety Data Sheet is available upon request from your local 3M representative, or online at www.3M.com/electronics.

More 3M™ Novec™ Engineered Fluids

Properties	3M™ Novec™ 7000 Engineered Fluid	3M™ Novec™ 7100 Engineered Fluid	3M™ Novec™ 7200 Engineered Fluid	3M™ Novec™ 7500 Engineered Fluid
Formulation	Methoxyheptafluoro-propane	Methoxynonafluoro-butane	Ethoxynonafluoro-butane	2-trifluoromethyl-3-ethoxydodecofluorohexane
Average Molecular Weight	200	250	264	414
Boiling Point, °C	34	61	76	128
Liquid Density, g/ml @ 25°C	1.40	1.52	1.43	1.61
Global Warming Potential[1]	370	320	55	210
Typical Applications	Low temperature thermal management, freeze dryers, process solvent	Vapor degreasing, spray contact cleaner, lubricant carrier, thermal management	Vapor degreasing, movie film cleaning, lubricant carrier, thermal management	Thermal management, reliability testing, temperature calibration

[1] GWP–100 year ITH, CO_2 = 1.0