

3M™ Novec™ 7100DL Engineered Fluid

Introduction

3M™ Novec™ 7100DL Engineered Fluid is a high purity version of 3M™ Novec™ 7100 Engineered Fluid introduced to meet the demanding needs of the electronics industry. Product specifications are tightly controlled for the following contaminants:

- ions
- metals
- particulate
- non-volatile residue

Novec 7100DL fluid is used by the disk drive industry for the deposition of lubricants and lubricant additives onto hard disk media as well as for cleaning during the processing of head gimbal assemblies. It is used as the diluent for 3M's fluorochemical acrylate polymer coatings such as 3M™ Novec™ Electronic Coating EGC-1700 and can be used in other electronics and medical industry applications that require a high purity and consistent product.

Material Description

Data compiled from published information.

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

Ingredients	3M™ Novec™ 7100DL Engineered Fluid
Methoxy-nonafluorobutane	99.5% minimum
Non-volatile residue (NVR)	1.0 ppm maximum
Appearance	Clear, colorless

Typical Physical Properties

Properties	3M™ Novec™ 7100DL Engineered Fluid
Molecular Weight	250
Boiling Point (°C)	61
Freeze Point (°C)	-135
Liquid Density (g/ml)	1.52
Surface Tension (dynes/cm)	13.6
Solubility of Solvent in Water (ppmw)	12
Solubility of Water in Solvent (ppmw)	95
Vapor Pressure (mmHg)	200
Viscosity (cps)	0.58
Heat of Vaporization (cal/g @ boiling point)	27
Specific Heat (cal/g °C)	0.28

Environmental and Safety Properties

Properties	3M™ Novec™ 7100DL Engineered Fluid
Ozone Depletion Potential-ODP ¹	0.00
Global Warming Potential ²	320
Atmospheric Lifetime (years)	4.1
Flash Point	None
Flammability Range in Air	None

¹ CFC-11=1.0

² GWP-100 year ITH, CO₂ = 1.0

Typical Purity Specifications

Purity Specifications
(properties controlled and monitored for 3M™ Novec™ 7100DL Engineered Fluid, which are not controlled and monitored for 3M™ Novec™ 7100 Engineered Fluid)

Properties	Units	3M™ Novec™ 7100DL Engineered Fluid	
Particulate Levels*	#/ml	>0.3 micron	Monitor**
		>0.5 micron	Monitor
		>1.0 micron	Monitor
		>5.0 micron	< 3.0***
Ion Concentration*	ppb	F ⁻	<10.0
		Cl ⁻	<10.0
		NO ₂ ⁻	<10.0
		Br ⁻	<10.0
		NO ₃ ⁻	<10.0
		PO ₄ ³⁻	<10.0
		SO ₄ ²⁻	<10.0
		HCOO ⁻	<10.0
		CH ₃ COO ⁻	Monitor
(C ₂ O ₄) ²⁻	Monitor		
Water*	ppm	< 30+ ***	
Non-Volatile Analysis*	ppb	Hydrocarbons	< 200
		Silicones	None Detected
		Esters	< 80
Metals****	ppb	< 5 Each	
		Ag, Al, Ba, Ca, Cd, Co, Cr Cu, Fe, K, Li, Mg, Mn, Na Ni, Pb, Sr, Ti, Zn	

* Certificate of Analysis specifications

**Monitor—The values of these qualities are included with the Certificate of Analysis, but do not have specified values by the C of A specifications.

*** As filled

****Certificate of Conformance specifications

Materials Compatibility

Testing of 3M™ Novec™ 7100DL Engineered Fluid demonstrates compatibility with a wide range of metals, plastics and elastomers—most materials used in electronics manufacturing.

As with most fluorinated liquids, Novec 7100DL fluid will absorb into fluorinated plastics and elastomers over longer exposures.

Metals	Plastics	Elastomers
Aluminum	Acrylic (PMMA)	Butyl Rubber*
Copper	Polyethylene	Natural Rubber
Carbon Steel	Polypropylene	EPDM
302 Stainless Steel	Polycarbonate	EPR
Brass	Polyester	
Molybdenum	Epoxy	
Tantalum	PET	
Tungsten	Phenolic	
Cu/Be Alloy C172	ABS	
Mg Alloy AZ32B		

Compatible after one hour exposure at boiling temperature. Exceptions: Some swelling of PTFE and silicone rubber. Some surface oxidation of copper during heat aging.

* Butyl Rubber best for extended exposure > one month.

Environmental Policy

3M will continue to recognize and exercise its responsibility to prevent pollution at the source wherever and whenever possible; develop products that will have a minimal effect on the environment; conserve natural resources through the use of reclamation and other appropriate methods; assure that its facilities and products meet and sustain the regulations of all federal, state and local environmental agencies; assist, wherever possible, governmental agencies and other official organizations engaged in environmental activities.

Packaging and Availability

3M™ Novec™ 7100DL Engineered Fluid may be ordered in the following container sizes:

- 1-gallon glass container
- 3.5-gallon pail
- 55-gallon drum

Toxicity Profile

The toxicological testing completed on Novec 7100DL fluid shows the overall toxicity is low. The material is practically non-irritating to the eyes, minimally irritating to the skin and is not a mutagen. It is rated “practically non-toxic” through inhalation. A 90-day inhalation study has helped establish a recommended exposure guideline of 750 ppm for an eight-hour average worker exposure per day. This exposure guideline was established by the American Industrial Hygiene Association.

Properties	3M™ Novec™ 7100DL Engineered Fluid
Acute Lethal Inhalation Concentration	>100,000 ppm (4 hour)
Oral	Practically non-toxic (>5g/kg)
Eye Irritation	Practically non-irritating
Skin Irritation	Minimally irritating
Skin Sensitization	Not a skin sensitizer
Inhalation (90 day study)	750 ppm exposure guideline Detailed results are available.
Developmental Toxicity	Detailed results are available
Mutagenicity	Negative in the three assays conducted
Cardiac Sensitization	No signs at exposure up to 100,000 ppm
Ecotoxicity Testing	Very low aquatic toxicity

Environmental, Health and Safety

Before using Novec 7100DL fluid, please read the current product Material Safety Data Sheet (available through your 3M sales or technical service representative) and the precautionary statement on the product package. Follow all applicable precautions and directions.

Handling and Shelf Life

Novec 7100DL fluid is nonflammable and does not exhibit flammability characteristics under normal operation and storage conditions. The fluid is resistant to thermal breakdown and hydrolysis during storage and use. Recommended handling procedures are provided in the Material Safety Data Sheet, which is available from your local 3M representative upon request or at www.3m.com/electronicmaterials

When stored at room temperature (20°C) in the original unopened containers, this product has a shelf life of one year from date of shipment. After one year, the product should be retested to verify that it will meet the purity specifications as listed in this document.

Regulatory Status

3M™ Novec™ 7100DL Engineered Fluid has been accepted for commercial use by regulatory agencies in the United States, Canada, Japan, Korea, Australia and Europe (under the European List of Notified New Chemical Substances).

Novec 7100DL fluid has been approved under the Significant New Alternatives Policy (SNAP) of the U.S. EPA. In addition, Novec 7100DL fluid has been excluded by the U.S. EPA from the definition of a VOC on the basis that this compound has negligible contribution to tropospheric ozone formation.

Contact your local 3M representative regarding the regulatory status of Novec 7100DL fluid in other countries.

Recycle and Disposal Options

Used Fluid Return Program

3M offers a program for free pickup and return of used 3M specialty fluids in the U.S. A pre-negotiated handling agreement between users and our authorized service provider offers users broad protection against future liability for used 3M product. The fluid return program is covered by independent third-party financial and environmental audits of treatment, storage and disposal facilities. Necessary documentation is provided. A minimum of 30 gallons of used 3M specialty fluid is required for participation in this free program.

For additional information on the 3M Used Fluid Return Program, contact your local 3M representative or call 3M Customer Service at 800.810.8513.

Resources

3M™ Novec™ Engineered Fluids are supported by global sales, technical and customer service resources, with technical service laboratories in the U.S., Europe, Japan, Latin America and Southeast Asia. Users benefit from 3M's broad technology base and continuing attention to product development, performance, safety and environmental issues. For additional technical information on Novec 7100DL fluid in the United States or for the name of a local authorized distributor, call 3M Electronics Markets Materials Division: **800 810 8513**.

The 3M™ Novec™ Brand Family

The Novec brand is the hallmark for a variety of patented 3M products. Although each has its own unique formula and performance properties, all Novec products are designed in common to address the need for safe, effective, sustainable solutions in industry-specific applications. These include precision and electronics cleaning, heat transfer, fire protection, lubricant deposition and several specialty chemical applications.

3M™ Novec™ Engineered Fluids • 3M™ Novec™ Aerosol Cleaners • 3M™ Novec™ 1230 Fire Protection Fluid • 3M™ Novec™ Electronic Coatings • 3M™ Novec™ Electronic Surfactants

United States	China	Europe	Japan	Korea	Singapore	Taiwan
3M Electronics Markets Materials Division 800 810 8513	3M China Ltd. 86 21 6275 3535	3M Belgium N.V. 32 3 250 7521	Sumitomo 3M Limited 813 3709 8250	3M Korea Limited 82 2 3771 4114	3M Singapore Pte. Ltd. 65 64508888	3M Taiwan Limited 886 2 2704 9011

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Electronics Markets Materials Division

3M Center, Building 224-3N-11
St. Paul, MN 55144-1000
www.3M.com/novec
1-800-810-8513

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