

3M™ Novec™ 71IPA Engineered Fluid

Introduction

3M™ Novec™ 71IPA Engineered Fluid is a hydrofluoroether, methoxy-nonafluorobutane (C₄F₉OCH₃), in an azeotrope-like formulation with isopropanol.

This fluid is ideal for light-duty cleaning and degreasing tasks, and is intended to replace ozone-depleting materials such as CFC-113, HCFC-141b and 1,1,1-trichloroethane in many applications. It has zero ozone depletion potential and other favorable environmental properties (see Table 2). Novec 71IPA fluid has a low toxicological profile, with a time-weighted average exposure guideline of 750 ppm for the 3M™ Novec™ 7100 Engineered Fluid component (eight hour average).

The increased polar soil solvency and low surface tension, nonflammability and constant composition during boiling of Novec 71IPA fluid make it ideal for precision and specialty cleaning and rinsing for removal of particulate, fingerprints and light soils from metal, plastic and glass parts.

All values determined at 25°C unless otherwise specified

Not for specification purposes

Applications

- Precision cleaning, rinsing and drying agent
 - Light-duty cleaning of oils, greases, waxes, fingerprints
- Use in combination with co-solvents for “no-clean flux” residue removal.

Material Description

Ingredients	3M™ Novec™ 71IPA Engineered Fluid
Methyl Nonafluorobutyl Ether (C ₄ F ₉ OCH ₃)	95.5% by weight
Isopropanol	4.5% by weight
Appearance	Clear, colorless

¹Novec 7100 fluid (C₄F₉OCH₃) consists of two inseparable isomers with essentially identical properties. These are (CF₃)₂CF₂OCH₃ (CAS No. 163702-08-7) and CF₃CF₂CF₂OCH₃ (CAS No. 163702-07-6).

Typical Physical Properties

Table 1

Properties	3M™ Novec™ 7100 Engineered Fluid	3M™ Novec™ 71IPA Engineered Fluid	CFC-113	HCFC-141b	1,1,1-TCA
Formulation	C ₄ F ₉ OCH ₃	Azeotrope ¹	C ₂ Cl ₃ F ₃	CCl ₂ FCH ₃	C ₃ Cl ₂ HF ₅
Boiling Point (°C)	61	54.8	48	32	74
Freeze Point (°C)	-135	-42 ²	-35	-103	-39
Liquid Density (g/ml)	1.52	1.48	1.56	1.23	1.32
Surface Tension (dynes/cm)	13.6	14.5	17.3	19.3	25.1
Vapor Pressure (mmHg)	202	207	331	569	128
Heat of Vaporization (cal/g @ boiling point)	30	39.5	35	53.3	58

¹95% 3M™ Novec™ 7100 (C₄F₉OCH₃), 5% IPA

²Critical Solution Temperature

Environmental and Safety Properties

Table 2

Properties	3M™ Novec™ 7100 Engineered Fluid	3M™ Novec™ 71IPA Engineered Fluid	CFC-113	HCFC-141b	1,1,1-TCA
Ozone Depletion Potential—ODP ¹	0.0	0.0	0.80	0.10	0.1
Global Warming Potential ²	320	310	6000	700	140
Flash Point	None	None	None	None	None
Atmospheric Lifetime, Years	4.1	4.1	85	9.2	4.8
Exposure Guidelines, ppm (8 hr. time-weighted average)	750	750/400*	1000	400	350
Flammability Range in Air	None	4.0 - 16.7%	None	7.6 - 17.7%	6 - 15%

¹ CFC-11=1.0

² GWP—100 year ITH, CO₂ = 1.0

*Isopropyl alcohol (IPA) has an 8 hr. TWA exposure guidelines of 400 ppm

Data compiled from published information.

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

More 3M™ Novec™ Engineered Fluids

Properties	3M™ Novec™ 7100 Engineered Fluid	3M™ Novec™ 7200 Engineered Fluid	3M™ Novec™ 71DE Engineered Fluid	3M™ Novec™ 71DA Engineered Fluid
Formulation	Methoxynonafluoro-butane	Ethoxynonafluoro-butane	Novec 7100 with Trans-1, 2-dichloroethylene (Azeotrope)	Novec 7100 with Trans-1, 2-dichloroethylene and Ethanol (Azeotrope)
Boiling Point (°C)	61	76	128	40
Typical Applications	Light cleaning, formulations, process solvent	cold cleaner, movie film cleaning, process solvent	medium weight oil cleaning, liquid oxygen cleaning	flux removal, vapor degreasing

Materials Compatibility

Testing of 3M™ Novec™ 71IPA Engineered Fluid demonstrates compatibility with a wide range of metals, plastics and elastomers, similar to the performance of perfluorinated liquids. Good compatibility with particularly sensitive plastics such as polycarbonate and PMMA indicates utility in cleaning of assemblies containing many composite materials. As with most fluorinated liquids, Novec 71IPA 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	Nitrile Rubber
302 Stainless Steel	Polycarbonate	EPDM
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 >1 month.

Regulations on Chlorine-Containing Solvents

Table 3

Data compiled from published information.

Not for specification purposes.

Regulation	Trans-1,2-dichloroethylene	Trichloroethylene	Perchloroethylene	Methylene Chloride
VOC Designation	Yes	Yes	Yes	No
Reportable Quantity for Accidental Release	1000 lbs. (2240 lbs. in Novec 71IPA)	100 lbs.	100 lbs.	1000 lbs.
Regulated if Emitted into Water	Yes	Yes	Yes	Yes
Hazardous Air Pollutant	No	Yes	Yes	Yes
Annual Reporting (EPCRA 313) (SARA)	No	Yes	Yes	Yes
OSHA List of toxins/carcinogens	No	Yes	Yes	Yes

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.

Safety and Handling

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

Novec 71IPA fluid is characterized as having no closed cup flash point, or open cup flash point and no sustained burning per ASTM D4206-86 (<1 second) and is safe to use under normal operating conditions. The product has flame limits of 4.0% to 16.7% (by volume), similar to materials such as HCFC-141b and 1,1,1-TCA which have been used safely in this application for many years.

This fluid is highly resistant to thermal breakdown and hydrolysis in storage and during use. A flammable mixture can form during co-solvent boil down in a vapor degreaser. Products of thermal decomposition may cause irritation. Recovery of Novec 71IPA fluid from a co-solvent cleaning process by boil down should only be conducted in equipment designed and approved for handling flammable mixtures. Use of a desiccant is recommended in the water separator. Detailed handling procedures are provided in the Material Safety Data Sheet. Consult your 3M representative for additional information on the proper recovery and disposal of Novec 71IPA fluid.

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 3M™ Novec™ 71IPA Engineered 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

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