



Novec™

Engineered Fluid

HFE-71IPA

Hydrofluoroether Azeotrope

Introduction

3M™ Novec™ Engineered Fluid HFE-71IPA 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 HFE-71IPA fluid has a low toxicological profile, with a time-weighted average exposure guideline of 750 ppm for the 3M™ Novec™ Engineered Fluid HFE-7100 component (eight hour average).

The increased polar soil solvency and low surface tension, nonflammability and constant composition during boiling of HFE-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.

Typical 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

All values determined at 25°C unless otherwise specified

Not for specification purposes

Properties	HFE-71IPA
Methoxy-Nonafluorobutyl Ethers ¹	95.5% by weight
Isopropanol	4.5% by weight
Appearance	Clear, colorless

¹HFE-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).

3M™ Novec™ Engineered Fluid HFE-71IPA Physical Properties – Table 1

Data compiled from published information

Not for specification purposes

Properties	HFE-7100	HFE-71IPA	CFC-113	HCFC-141b	1,1,1-TCA
Formula	C ₄ F ₉ OCH ₃	Azeotrope ¹	C ₂ Cl ₂ F ₄	C ₂ Cl ₃ H ₂ F	C ₂ Cl ₃ H ₃
Boiling Point °C	61	54.8	48	32	74
Freeze Point °C	-135	-42 ²	-35	-103	-39
Flash Point	None	None	None	None	None
Flammability Range in Air	None	4.0 - 16.7%	None	7.6 - 17.7%	6 - 15%
Liquid Density ³	1.52	1.48	1.56	1.23	1.32
Surface Tension ⁴	13.6	14.5	17.3	19.3	25.1
Vapor Pressure ⁵	202	207	331	569	128
Heat of Vaporization ⁶	30	39.5	35	53.3	58

¹95% 3M HFE-7100 (C₄F₉OCH₃), 5% IPA

²Critical Solution Temperature

³ g/ml @ 25°C

⁴ dynes/cm @ 25°C

⁵ mm Hg

⁶ cal/g@bp

Environmental Properties and Exposure Guidelines – Table 2

Data compiled from published information

Not for specification purposes

Properties	HFE-7100	HFE-71IPA	CFC-113	HCFC-141b	1,1,1-TCA
Ozone Depletion Potential ¹ , ODP	0	0	0.8	0.1	0.1
Global Warming Potential ² , GWP	320	310	6000	700	140
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

¹CFC-11=1.0 ²GWP=100 years IHT, CO₂ = 1.0

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

More 3M™ Novec™ Engineered Fluids

Data compiled from published information

Not for specification purposes

Properties	HFE-7100	HFE-7200	HFE-71DE	HFE-71DA
Formulation	Methoxy-nonafluorobutane	Ethoxy-nonafluorobutane	HFE-7100 with Trans-1, 2-dichloroethylene (Azeotrope)	HFE-7100 with Trans-1, 2-dichloroethylene and Ethanol (Azeotrope)
Boiling point °C	61	76	41	40
Typical Application	light cleaning formulations process solvent	cold cleaner film cleaning process solvent	medium weight oil cleaning liquid oxygen cleaning	flux removal vapor degreasing

Materials Compatibility

Testing of 3M™ Novec™ Engineered Fluid HFE-71IPA 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, HFE-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.*

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 national and other official organizations engaged in environmental activities.

Environmental. Health and Safety

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 HFE-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 HFE-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 HFE-71IPA fluid.

3M™ Novec™ Engineered Fluid HFE-71IPA Packaging and Availability

Novec HFE-71IPA fluid may be ordered in the following container sizes:

- 55-gallon drum; 5-gallon pail; 1-gallon pail
- 4-ounce samples for limited or preliminary test work are available

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. and Puerto Rico through Safety-Kleen Corp. The fluid return program is covered by independent third-party financial and environmental audits of treatment, storage and disposal facilities. Necessary documentation is provided.

Safety-Kleen Corp. has a network of 156 branch service centers in the U.S. This large fleet will provide timely, economical fluid disposal service.

For additional information on the 3M Used Fluid Return Program, contact Safety-Kleen at this toll-free line: 1.888.932.2731. Contact your local 3M representative for fluid return programs outside the U.S.

* Must have a 30 or more gallon purchase to participate in the 3M paid program. Used product of 5-30 gallons can be returned through Safety-Kleen at the user's expense.

Resources

3M™ Novec™ Engineered Fluids are supported by global sales, technical and customer service resources, with fully-staffed 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 engineered fluid HFE-71IPA in the United States, call 3M Performance Materials Division, 800.810.8513.

For other 3M global offices, and information on additional 3M fluids, visit our web site at: www.3m.com/fluids.

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