3M

Product Information

Novec™ Engineered Fluid HFE-71DE

Introduction

3M™ Novec™ Engineered Fluid HFE-71DE is a hydrofluoroether, Methyl Nonafluorobutyl Ether ($C_4F_9OCH_3$), in an azeotrope formulation with trans-1,2-dichloroethylene (*t*-DCE). This mixture is a true azeotrope, with constant vapor and liquid composition at its boiling point.

This fluid is ideal for medium-duty cleaning and degreasing tasks, as well as specialty solvent applications, and is intended to replace ozone-depleting materials in many applications. It has zero ozone depletion potential and other favorable environmental properties (see Table 2). Novec fluid HFE-71DE has a time-weighted average exposure guideline of 750 ppm (eight hour average) for the 3M™ Novec™ Engineered Fluid HFE-7100 component, and 200 ppm (eight hour average) for trans-1,2-dichloroethylene (*t*-DCE). These exposure guidelines suggest there is a large margin of safety for use of HFE-71DE fluid in its intended cleaning applications.

The increased solvency and low surface tension, nonflammability and constant composition during boiling of HFE-71DE fluid make it ideal for immersion and vapor degreasing applications. These properties also may make the azeotrope ideal for certain coating and lubricant deposition applications where increased solvency is required.

Typical Applications

Cleaning, rinsing and drying agent

- Cleaning of oils, greases, waxes

Specialty solvent applications, including coatings

For information on other applications, contact your 3M representative or 3M authorized distributor.

Material Description

Ingredients	Novec Fluid HFE-71DE
Methyl Nonafluorobutyl Ethers[1]	50% by weight
Trans-1,2-dichloroethylene	50% by weight
Appearance	Clear, colorless

[1]HFE-7100 fluid ($C_4F_9OCH_3$) consists of two inseparable isomers with essentially identical properties. These are $(CF_3)_2CFCF_2OCH_3$ (CAS No. 163702-08-7) and $CF_3CF_2CF_2CF_2OCH_3$ (CAS No. 163702-07-6).

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

Data compiled from published information

Not for specification purposes

Properties	HFE-71DE	CFC-113	HCFC-141b	HCFC-225 ca/cb	HFC-4310
Formulation	**Azeotrope**[1]	$C_2Cl_3F_3$	CCl_2FCH_3	$C_3Cl_2HF_5$	Azeotrope[2]
Boiling Pt °C	**41 (106°F)**	48 (118°F)	32 (90°F)	54 (129°F)	39 (102°F)
Freeze Pt °C	**-24**[3] **(-11°F)**	-35 (-31°F)	-103 (-153°F)	-131 (-204°F)	N/A (N/A°F)
Liquid Density[4]	**1.37**	1.56	1.23	1.55	1.41
Surface Tension[5]	**16.6**	17.3	19.3	16.2	15.2
Kauri-Butanol Value	**27**	31	56	31	N/A
Vapor Pressure[6]	**383**	331	569	290	464
Viscosity[7]	**0.45**	0.68	0.43	0.59	0.49
Heat of Vaporization[8]	**48**	35	53.3	34.6	43.3

[1] 50% 3M™ Novec™ Engineered Fluid HFE-7100 ($C_4F_9OCH_3$), 50% trans-1,2-dichloroethylene
[2] 62% HFC-4310 ($C_5H_2F_{10}$), 38% trans-1,2-dichloroethylene
[3] Critical Solution Temperature
[4] g/ml @ 25°C
[5] dynes/cm @ 25°C
[6] mmHg @ 25°C
[7] cps @ 25°C
[8] cal/g @ boiling point
N/A-Not Available

Environmental and Safety Properties – Table 2

Data compiled from published information

Not for specification purposes

Properties	HFE-71DE	CFC-113	HCFC-141b	HCFC-225 ca/cb	HFC-4310[1]
Ozone Depletion Potential-ODP[2]	**0.00**	0.80	0.10	0.03	0.00
Global Warming Potential[3]	**160**	6000	700	180/620	1050
Flash Point	**None**	None	None	None	None

[1] 62% HFC-4310 ($C_5H_2F_{10}$), 38% trans-1,2-dichloroethylene
[2] CFC-113 = 1.0
[3] GWP–100 year ITH, CO_2 = 1.0

3M™ Novec™ Engineered Fluid HFE-71DE Regulatory Status

The U.S. Environmental Protection Agency (EPA) has listed all components of 3M™ Novec™ Engineered Fluid HFE-71DE as "acceptable," without restrictions, under the EPA's Significant New Alternatives Policy (SNAP) program.

Regulations on Chlorine-Containing Solvents – Table 3

Regulation	Trans-1,2-dichloroethylene	Trichloro-ethylene	Perchloro-ethylene	Methylene Chloride
VOC Designation	Yes	Yes	Yes	No
Reportable Qty for Accidental Release	1000 lbs. (2000 lbs. in HFE-71DE)	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

Regulations and Reporting
Because of its favorable health and environmental properties, trans-1,2-dichloroethylene (*t*-DCE) is less regulated in the areas noted compared to the other chlorinated solvents in Table 3. Regulations affecting HFE-71DE fluid include VOC emissions of *t*-DCE and ethanol and reporting requirements if trans is emitted into water or if a spill of 2000 lbs. or more of HFE-71DE fluid occurs. *t*-DCE is not considered a Hazardous Air Pollutant (HAP) and is not subject to annual reporting requirements.

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

Novec fluid HFE-71DE is nonflammable and does not exhibit flammability characteristics under normal operating and storage conditions. This fluid is highly resistant to thermal breakdown and hydrolysis in storage and during use. Before using this product, please read the current 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.

Packaging and Availability

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

- 1-gallon pail
- 5-gallon pail
- 55-gallon drum

3M™ Novec™ Engineered Fluid HFE-71DE 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. through Safety-Kleen Corp. A pre-negotiated handling agreement between users and this 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.*

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 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 fluid HFE-71DE in the United States, call 3M Performance Materials Division, 800.833.8513.

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

United States
3M Specialty Materials
3M Center, Building 223-6S-04
St. Paul, MN 55144-1000
800 810 8513
800 810 8514 (Fax)

Europe
3M Specialty Materials
3M Belgium N. V.
Haven 1005, Canadastraat 11
B-2070 Zwijndrecht
32 3 250 7511

3M Canada Company
Specialty Materials
P.O. Box 5757
London, Ontario
N6A 4T1
800 364 3577

Sumitomo 3M Limited
33-1, Tamagawadai 2-chome
Setagaya-ku, Tokyo
158-8583 Japan
813 3709 8250

Asia Pacific and Latin America
Call (U.S.) **651 736 7123**

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3M Specialty Materials

3M Center, Building 223-6S-04
St. Paul, MN 55144-1000

www.3m.com/electronicmaterials

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