

3M Novec™ 72DE

Engineered Fluid

Introduction

3M™ Novec™ 72DE Engineered Fluid is a blend of methyl nonafluorobutyl ether ($C_4F_9OCH_3$), ethyl nonafluorobutyl ether ($C_4F_9OC_2H_5$), and trans-1,2-dichloroethylene (t-DCE). In this mixture of solvents the t-DCE forms azeotropes with each of the hydrofluoroether components. The blend has been analyzed during evaporation and extended use in a vapor degreaser and found to have a consistent composition that is safe and effective for medium- to heavy-duty degreasing applications.

Novec 72DE fluid is ideal for a wide range of cleaning applications. It is intended to replace ozone depleting and chlorinated solvents as well as other solvent systems that do not have as favorable health, safety, or environmental properties. This Novec product has zero ozone depletion potential and other favorable environmental properties (see Table 2). 3M Industrial Hygiene monitoring indicates there is a large margin of safety between the exposure guidelines that have been established for each of the components and exposures anticipated from intended end-use applications.

The high solvency and low surface tension, nonflammability and stability of Novec 72DE fluid make it ideal for immersion and vapor degreasing applications. These properties also make the solvent ideal for certain coating and lubricant deposition applications where increased solvency is desired.

Typical Applications

Cleaning, rinsing and drying agent

- Cleaning of oils, greases, waxes

Specialty solvent applications

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

Material Description

Ingredients

Novec 72DE

Methyl Nonafluorobutyl Ether ($C_4F_9OCH_3$)	10% by weight
Ethyl Nonafluorobutyl Ether ($C_4F_9OC_2H_5$)	20% by weight
Trans-1,2-dichloroethylene (t-DCE)	70% by weight

Typical Physical Properties
- Table 1

Data compiled from published information

Not for specification purposes

Properties	Novac 72DE	CFC-113	HCFC-141b	HCFC-225 ca/cb	TCE	Perc	nPB*
Formulation	Azeotrope ¹	C ₂ Cl ₃ F ₃	CCl ₂ FCH ₃	C ₃ Cl ₂ HF ₅	C ₂ HCl ₃	C ₂ Cl ₄	C ₃ H ₇ Br
Boiling Pt °C	43	48	32	54	87	121	71
Freeze Pt °C	N/A	-35	-103	-131	-86	-23	-110
Liquid Density ²	1.28	1.56	1.23	1.55	1.44	1.62	1.35
Surface Tension ³	19	17.3	19.3	16.2	32.3	29.5	25.9
Kauri-Butanol Value	52	31	56	31	129	90	125
Vapor Pressure ⁴	350 ⁵	331	569	290	74	18	150
Viscosity ⁶	0.45	0.68	0.43	0.59	0.54	0.75	0.49
Heat of Vaporization ⁷	52	35	53.3	34.6	56.4	50.1	58.8

¹ 10% Novac 7100 (C₄F₉CH₃), 20% Novac 7200 (C₄F₉C₅H₅), 70% trans-1,2-dichloroethylene

² g/ml @ 25°C

³ dynes/cm @ 25°C

⁴ mmHg @ 25°C

⁵ Estimated value

⁶ cps @ 25°C

⁷ cal/g @ boiling point

*n-propyl bromide, or 1 bromo propane

Environmental and Safety Properties
- Table 2

Data compiled from published information

Not for specification purposes

Properties	Novac 72DE	CFC-113	HCFC-141b	HCFC-225 ca/cb	TCE	Perc	nPB*
Ozone Depletion Potential-ODP ¹	0.00	0.80	0.10	0.03	0.00	0.00	0.026
Global Warming Potential ²	43	6000	700	180/620	Low	Low	Low
Flash Point	None	None	None	None	None	None	None

¹ CFC-113 = 1.0

² GWP-100 year ITH, CO₂ = 1.0

³ 4.1-Novac 7100 fluid, 0.8-Novac 7200 fluid, 0.01 trans-1,2-dichloroethylene

⁴ Vol% by ASTM E681-94 @ 100°C

*n-propyl bromide, or 1 bromo propane

Regulatory Status

The U.S. Environmental Protection Agency (EPA) has listed all components of 3M™ Novec™ 72DE Engineered Fluid 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	Trichloroethylene	Perchloroethylene	Methylene Chloride
VOC Designation	Yes	Yes	Exempt	Exempt
Reportable Qty. for Accidental Release	1000 lbs. (2240 lbs. in Novec 72DE)	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 subject to less stringent regulations in the areas noted compared to the other chlorinated solvents in Table 3. Regulations affecting Novec 72DE fluid include VOC emissions of t-DCE and reporting requirements if t-DCE is emitted into water or if a spill of 1430 lbs. or more of Novec 72DE fluid occurs. t-DCE is not considered a Hazardous Air Pollutant (HAP).

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 72DE fluid 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 72DE fluid may be ordered in the following container sizes:

- 1-gallon pail
- 55-gallon drum

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 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™ 72DE Engineered Fluid in the United States, call 3M Customer Service, **800 810 8513**.

For information on additional 3M fluids, coatings and other chemical products for the electronics industry, visit our web site at:

www.3M.com/electronics

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