

3M™ Novec™ 72DA Engineered Fluid

Introduction

3M™ Novec™ 72DA Engineered Fluid is a blend of hydrofluoroether methyl nonafluorobutyl ether (C₄F₉OCH₃), ethyl nonafluorobutyl ether (C₄F₉OC₂H₅), trans-1,2-dichloroethylene (t-DCE) and isopropanol. This mixture of solvents is a blend of azeotropes. The blend has been analyzed during evaporation and extended use in a vapor degreaser and found to have a consistent composition that is effective for medium- to heavy-duty degreasing and defluxing applications.

Novec 72DA fluid is ideal for a wide range of electronics and other precision cleaning applications. It is intended to replace CFCs, HCFCs, HFCs, nPB and chlorinated solvents. This Novec product has zero ozone depletion potential and other favorable environmental, health and safety properties (see Table 2).

The high solvency, low surface tension, nonflammability and stability of Novec 72DA fluid make it ideal for immersion and vapor degreasing applications. The isopropanol in Novec 72DA fluid provides enhanced removal of ionic contaminants.

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

Applications

- Cleaning, rinsing and drying agent
 - Cleaning of rosin solder flux residues, oils, greases and waxes

Material Description

| Ingredients | 3M™ Novec™ 72DA Engineered Fluid |
|---|----------------------------------|
| Methyl Nonafluorobutyl Ether (C ₄ F ₉ OCH ₃) | 10% by weight |
| Ethyl Nonafluorobutyl Ether (C ₄ F ₉ OC ₂ H ₅) | 20% by weight |
| Trans-1,2-dichloroethylene (t-DCE) | 68% by weight |
| Isopropanol | 2% by weight |

Typical Physical Properties

Table 1

| Properties | 3M™ Novec™ 72DA Engineered Fluid | Freon® TE | Gensolv® 2004 | AK-225 AES | 4310-SMT |
|---|-------------------------------------|--|---|---|------------------------|
| Formulation | Azeotrope ¹ | Azeotrope 96% C ₂ Cl ₃ F ₃ 4% Ethanol | Azeotrope 96% CCl ₂ FCH ₃ 4% Methanol | Azeotrope 96% C ₃ Cl ₂ HF ₅ 4.5% Ethanol | Azeotrope ² |
| Boiling Point (°C) | 44 | 45 | 29.4 | 52 | 37 |
| Freeze Point (°C) | -38 ³ | -42 | N/A | -138 | -10 ³ |
| Liquid Density (g/ml) | 1.27 | 1.50 | 1.22 | 1.49 | 1.37 |
| Surface Tension (dynes/cm) | 18 | 17.7 | 18.5 | 16.8 | 15.5 |
| Kauri-Butanol Value | 58 | 40 | 76 | 41 | N/A |
| Vapor Pressure (mmHg) | 360 | 362 | 527 | 414 | 471 |
| Viscosity (cps) | 0.40 | 0.65 | 0.45 | 0.61 | 0.47 |
| Heat of Vaporization (cal/g @ boiling point) | 60 | 43 | 62 | 41 | 53 |

¹ 10% 3M™ Novec™ 7100 (C₄F₈OCH₃), 20% 3M™ Novec™ 7200 (C₄F₈OC₃H₇), 68% trans-1,2-dichloroethylene, 2% isopropanol

² 52.9% HFC-4310mee (C₅H₂F₁₀), 43% trans-1,2-dichloroethylene, 4% methanol, 0.1% stabilizer

³ Critical solution temperature

N/A-Not available

Data compiled from published information.

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

Environmental and Safety Properties

Table 2

| Properties | 3M™ Novec™ 72DA Engineered Fluid | Freon® TE | Gensolv® 2004 | AK-225 AES | 4310-SMT |
|--|-------------------------------------|-----------|---------------|------------|------------------|
| Ozone Depletion Potential—ODP ¹ | 0.00 | 0.77 | 0.11 | 0.03 | 0.00 |
| Global Warming Potential ² | 43 | 5800 | 670 | 400 | 758 ³ |
| Flash Point | None | None | None | None | None |

¹ CFC-11=1.0

² IPCC Report, 2001

³ GWP—100 year ITH, CO₂ = 1.0

Regulatory Status

The U.S. Environmental Protection Agency (EPA) has listed all components of 3M™ Novec™ 72DA Engineered Fluid as “acceptable,” without restrictions, under the EPA’s Significant New Alternatives Policy (SNAP) program.

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. (1430 lbs. in Novec 72DA) | 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. The t-DCE content of Novec 72DA may be subject to VOC regulations. 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 72DA 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 72DA 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. 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™ 72DA 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

| 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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