



Fluorinert™ Electronic Liquid FC-770

Introduction

3M™ Fluorinert™ Electronic Liquid FC-770 is a thermally stable, fully-fluorinated liquid that has ideal properties for use as a heat transfer fluid in a variety of industries.

The inertness of Fluorinert liquid FC-770 permits its use as a direct contact single and two-phase coolant in certain supercomputers and sensitive military electronics. Its high dielectric strength and electrical resistivity are ideal for applications in high voltage transformers and power electronics.

In the semiconductor manufacturing industry, its wide liquid range makes Fluorinert liquid FC-770 suited for cooling ion implanters, dry etchers and CVD machines. Its low pour point also permits its use in thermal shock and test equipment.

Physical Properties

**Not for
specification
purposes.**

All values are
determined at
25°C unless
otherwise
specified.

Properties	FC-770
Appearance	Clear, colorless
Average Molecular Weight	399
Boiling Point (1 atm)	95°C
Pour Point	-127°C
Calculated Critical Temperature	511 K
Calculated Critical Pressure	2.47 x 10 ⁶ pascals
Vapor Pressure	6.568 x 10 ³ pascals
Latent Heat of Vaporization (at normal boiling point)	85.9 J/g
Liquid Density	1793 kg/m ³
Kinematic Viscosity	0.79 centistokes
Absolute Viscosity	1.359 centipoise
Liquid Specific Heat	1038 J kg ⁻¹ °C ⁻¹
Liquid Thermal Conductivity	0.063 W m ⁻¹ °C ⁻¹
Coefficient of Expansion	0.00148 °C ⁻¹
Surface Tension	14.8 dynes/cm
Refractive Index	1.27
Water Solubility	14 ppmw
Solubility in Water	1.3 ppmw

3M™ Fluorinert™ Electronic Liquid FC-770 Electrical Properties

Properties	FC-770
Dielectric Strength	>40 kV, 0.1" gap
Dielectric Constant	1.9
Electrical Resistivity (ASTM D-257)	>3 x10 ¹⁴ ohm cm

Heat Transfer Properties

The following formulas can be used to calculate the specific heat, density, viscosity and vapor pressure of 3M™ Fluorinert™ Electronic Liquid FC-770 at various temperatures.

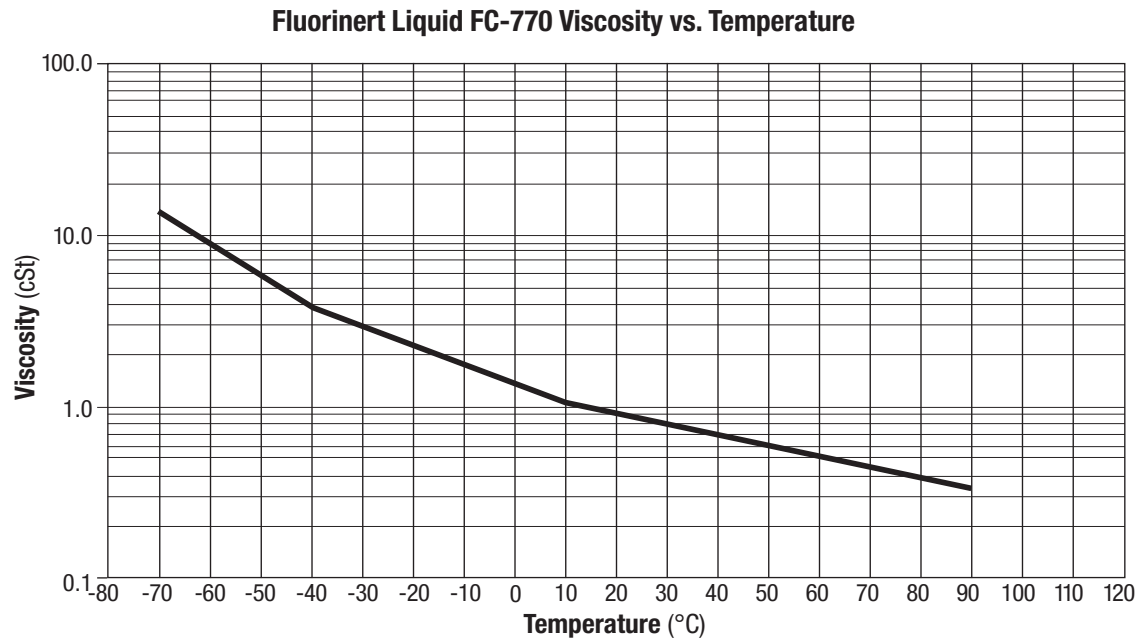
$$\text{Specific Heat (J kg}^{-1} \text{ }^\circ\text{C)} = 997 + 1.615 (T, \text{ }^\circ\text{C)}$$

$$\text{Density (kg/m}^3\text{)} = 1860 - 2.66 (T, \text{ }^\circ\text{C)}$$

$$\text{Vapor Pressure (mm Hg)} = \text{EXP} [16.21 - 3028.88/(T, \text{ }^\circ\text{C} + 221)]$$

$$\text{Kinematic Viscosity cSt} = \text{EXP} [834.8/(T, \text{ }^\circ\text{C} + 196) - 4.0]$$

The following graph can be used to determine the viscosity of Fluorinert liquid FC-770 over the indicated temperature range.



3M™ Fluorinert™ Electronic Liquid FC-770 Materials Compatibility

3M™ Fluorinert™ Electronic Liquid FC-770 is compatible with most metals, plastics and elastomers.

Toxicity Profile

Perfluorocarbons (PFCs) have been thoroughly tested in mammalian toxicity studies. In general, these materials are not irritants, sensitizers or mutagens. PFCs are low in toxicity through normal routes of industrial exposure. A material toxicity summary sheet is available upon request and MSDSs are available upon request or from the 3M website.

Safety and Handling

Before using this product, please read the current product Material Safety Data Sheet and the precautionary statement on the product package. Follow all applicable precautions and directions. Fluorinert liquid FC-770 is nonflammable, and is highly resistant to thermal breakdown and hydrolysis in storage and during use.

Environmental Properties

Fluorinert liquid FC-770 has zero ozone depletion potential. The material is not defined by the U.S. EPA, nor is it regulated, as a volatile organic compound (VOC). FC-770 liquid does not contribute to ground-level smog formation.

Fluorinert liquid FC-770, a perfluorocarbon (PFC), has a high global warming potential and a long atmospheric lifetime. As such, its use should be carefully managed to minimize emissions.

3M recommends that users of Fluorinert liquid FC-770 further limit emissions by employing good conservation practices, and by implementing recovery, recycling and/or proper disposal procedures. 3M offers a program for used fluid return.

Environmental Policy

3M will 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

3M™ Fluorinert™ Electronic Liquid FC-770 Used Fluid Return Program

3M offers a program for free pickup and return of used 3M Specialty Materials in the U.S. through Safety-Kleen Corporation. A pre-negotiated handling agreement between users and this service provider helps protect 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 Materials is required for participation in this free program.

Safety-Kleen Corporation 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 Corporation at this toll-free line: 1.888.932.2731.

Resources

3M™ Fluorinert™ Electronic Liquid FC-770 customers are supported by global sales, technical and customer sales 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 other 3M global offices and additional information on Fluorinert electronic liquid FC-770 in the U.S., call 3M Performance Materials, 800.810.8513, or visit our web site at: www.3M.com/electronics.

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