3M™ FLUORINERT™ ELECTRONIC LIQUIDS

PRODUCT OVERVIEW

BOEING

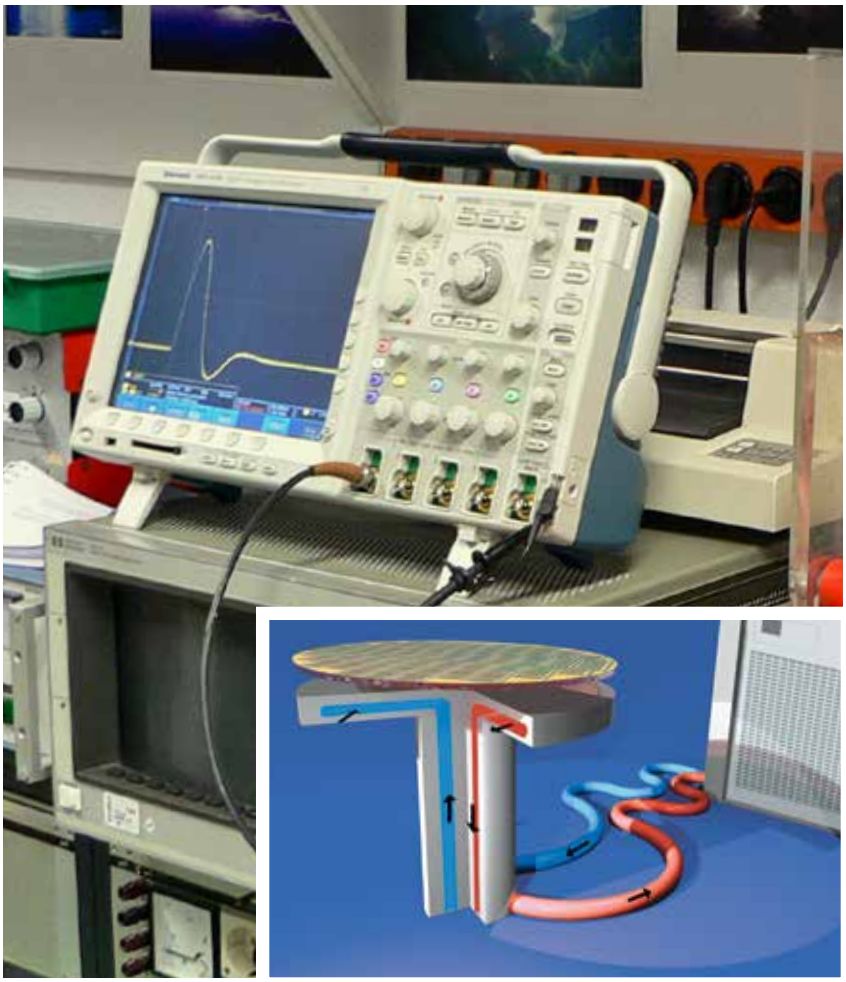
BOEING DISTRIBUTION SERVICES INC.

3M™ FLUORINERT™ ELECTRONIC LIQUIDS

Temperature management and quality control

Boeing Distribution Services Inc. has partnereed with 3M to offer you 3M™ Fluorinert™ Electronic Liquids, a portfolio of products to be used as heat transfer and electronic testing media. With their high density and low surface tension, they are also suitable for leak testing.

Fluorinert Electronic Liquids ensure a high margin of worker safety. They are non-flammable, electrically non-conductive and not classified as hazardous. These properties eliminate the need for installing explosion protection facilities in the work area.



Characteristics

3M™ Fluorinert™ Electronic Liquids are clear, colourless, thermally stable and fully fluorinated liquids. Due to their inert nature, they do not chemically bond with other substances, making them compatible with sensitive materials.

Fluorinert Electronic Liquids are thermally and chemically very stable, which means that their composition will not shift or fractionate over time. This ensures that their thermal transport properties remain unchanged.

Material Compatibility

3M™ Fluorinert™ Electronic Liquids are compatible with most metals, plastics and elastomers.

Like most fluorinated liquids, they penetrate plastics and elastomers containing plasticisers upon prolonged contact.

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Applications

- Heat/cold carrier
- Dielectric test media
- Thermal shock testing
- Sensor testing
- Burn-in testing
- Hermetic seal/ gross leak testing

Fields of use

Measuring and testing

- High-voltage testing
- Thermal shock testing
- Leak testing

Electronics cooling

- Thermosyphon
- 2-phase pumping systems
- High-voltage transformers

Properties:

- Electrically non-conductive
- Excellent thermal conductivity
- Wide range of boiling points from 50°C to 174°C
- Very high dielectric strength
- Dielectric strength >= 16 kV/mm
- Very low viscosity and low surface tension (excellent wetting properties)
- Non-flammable and non-combustible
- No ozone depletion potential
- Excellent material compatibility
- Residue-free evaporation (spot free drying)
- No hazardous goods classification

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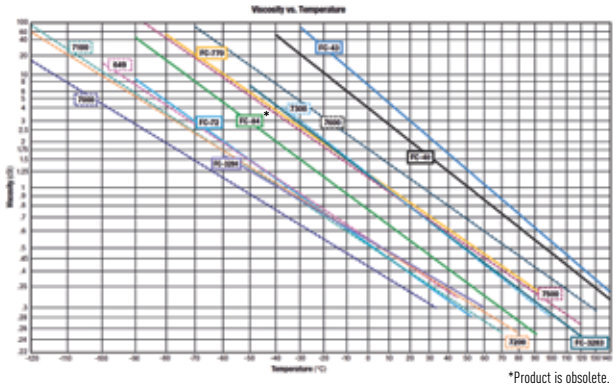
3M™ FLUORINERT™ ELECTRONIC LIQUIDS

Product Overview/Selection Criteria

Key Properties	FC-3284	FC-72	FC-770	FC-3283	FC-40	FC-43
Boiling Point @ 1 Atmosphere, °C	50	56	95	128	155	174
Pour Point, °C	-73	-90	-127	-50	-57	-50
Flash Point, °C	None	None	None	None	None	None
Vapour Pressure, Pa	35.7 x 10^3	30.9 x 10^3	6.658 x 10^3	1.44 x 10^3	432	192
Density, kg/m3	1710	1680	1793	1820	1850	1860
Coefficient of Expansion, °C	0.0016	0.0016	0.0015	0.0014	0.0012	0.0012
Kinematic Viscosity, (cSt) mm^2/s	0.42	0.38	0.79	0.75	1.8	2,5
Dynamic Viscosity, (cP) mPa*s	0.68	0.64	1.36	1.40	3.40	4.70
Specific Heat, J kg-1, °C	1100	1100	1038	1100	1100	1100
Latent Heat of Vapourisation (at normal boiling point), J/g	105	88	85.9	78	68	70
Electric Resistivity, Ω * cm	7 x 10^{15}	1.0 x 10^{15}	3 x 10^{14}	5 x 10^{15}	4 x 10^{15}	3.4 x 10^{15}
Thermal Conductivity, W*m-1 *K-1	0.062	0.057	0.063	0.066	0.065	0.065
Dielectric Strength, kV, 0.1" gap	40	38	>40	43	46	42
Dielectric Constant	1.86	1.75	1.9	1.89	1.9	1.9
Molar Mass Distribution, g/mol	299	338	399	521	650	670
Solubility of Water in Fluid, ppmw	14	10	14	7	7	<7
Solubility of Fluid in Water, ppmw	<5	<5	1.3	<5	<5	<5
Solubility of Air, cm^3/100ml	54	48	ca. 40	30	27	26
ODP	0	0	0	0	0	0
Temperature resistance, °C	200	300	300	200	300	300

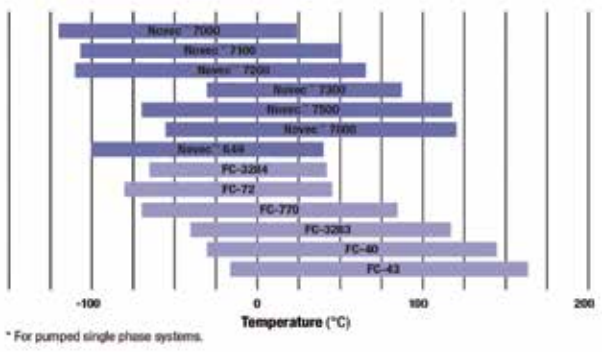
All values determined at 25 °C unless otherwise specified.
Technical data should not be used for specification purposes.

3M™ Thermal Management Fluids Kinematic Viscosity

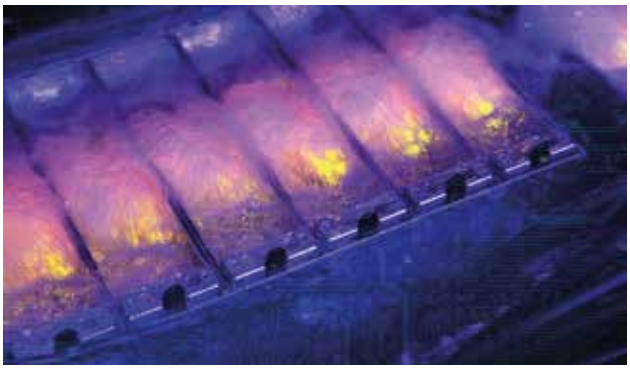


*Product is obsolete.

Recommended Operating Temperature Range*



* For pumped single phase systems.



Example: Two-Phase Immersion Cooling of Server with 3M™ Novec™ Engineered Fluid

Contact Boeing Distribution Services for help with all of your engineered fluid needs, or go to **BoeingDistribution.com**

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