

TMC-49

TMC-49 is a fluorinated liquid aimed at data mining center and electronic products for immersion cooling because of its prominent thermal stability and great efficacy of heat radiation. It is non-flammable, insoluble in water and not hazardous to human health.

TMC-49 can also be used as a cleaning agent for electronic products or electric parts accredited to its high dielectric strength.

Applications

- Heat transfer agent for companies like data mining
- Fluorinated surfactant
- Cleaning agent for electronic products or electric parts
- 2-Phase Cooling

Packaging Information

Sold in:

- 1 gal. Bottle - 12 lbs. (5 kg)
- 5 gal. Pail - 40 lbs. (18 kg)
- 55 gal. Drum - 550 lbs. (250 kg)

Properties

Appearance	Colorless transparent liquid
Purity	≥99.0%
Water Content	≤100ppm
Molecular Weight	300.05
Boiling Point	49°C
Flash Point	None
Pour Point	115°C
Dielectric Constant	1.88
Dielectric Strength	43.4 kV
Freezing Point	-80°C
Latent Heat of Vaporization	93.22 kJ kg ⁻¹
Vapor Pressure (20°C)	36kPa
Kinetic Viscosity (25°C)	0.373 cst
Critical Temperataure	443.3K
Critical Pressure	2.205kPa
Liquid Density (25°C)	1.6 g/cm ³
Liquid Viscosity (25°C)	0.3562 mm ² /s
Surface Tension (25°C)	11.44 mN/m
Liquid Thermal Conductivity at (25°C)	0.0609 W·m ⁻¹ .K ⁻¹
Volume Resistivity	3.070x10 ¹⁵ Ω.mm
Auto Ignition Temp	N/A (not flammable)
Ozone Depletion (ODP)	0
Global Warming Potential (GWP)	20

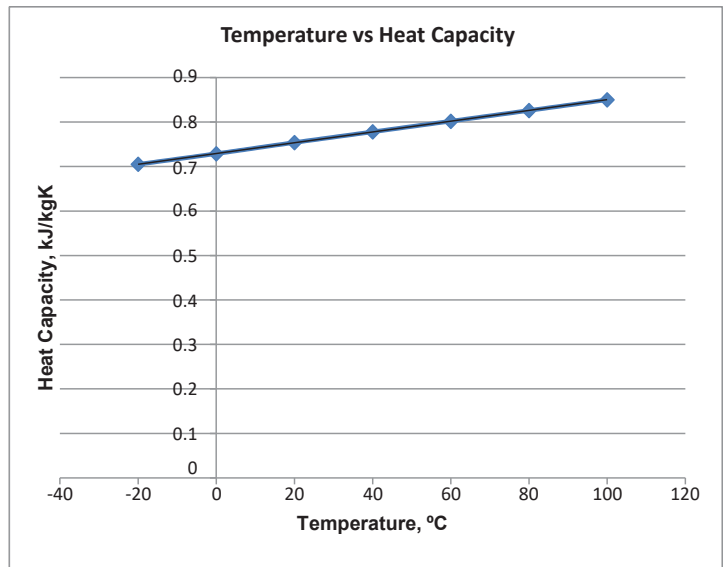
Two-Phase Cooling

In a two-phase immersion cooling system, servers are sealed inside a bath of specially engineered fluorocarbon-based liquid. Because the fluid has a low boiling point (often below 50°C vs. 100°C for water), heat from the servers easily boils the surrounding fluid. The boiling of the liquid causes a phase change (from liquid to gas), which gives two-phase immersion cooling its name.

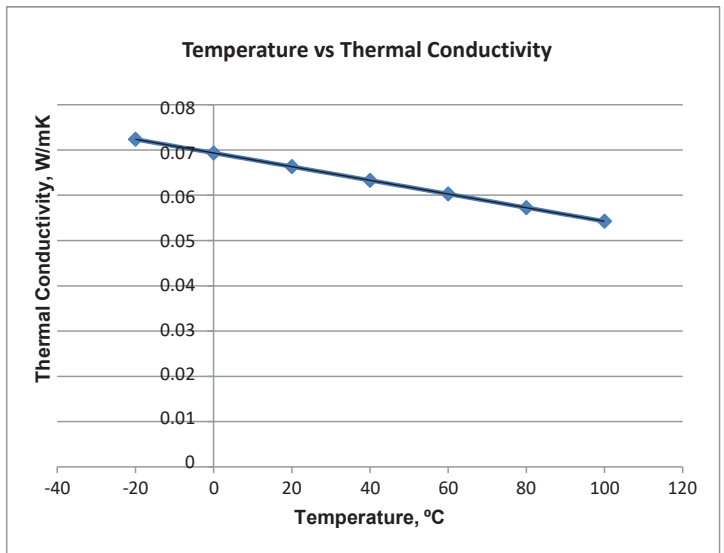
The vapor is then condensed back to the liquid form via water-cooled condenser coils, which are integrated into the top of the sealed racks. The condensed liquid drips back into the bath of fluid to be recycled through the system.

Parameter	Results
Vapor Pressure at Saturation Temperature, ASTM E 1719, psia	14.73
Viscosity, Kinematic, at 16°C, ASTM D 445.a, cSt	0.395
Viscosity, Kinematic, at 18°C, ASTM D 445.a, cSt	0.387
Viscosity, Kinematic, at 21°C, ASTM D 445.a, cSt	0.376
Viscosity, Kinematic, at 24°C, ASTM D 445.a, cSt	0.365
Viscosity, Kinematic, at 27°C, ASTM D 445.a, cSt	0.354
Viscosity, Kinematic, at 29°C, ASTM D 445.a, cSt	0.348
Viscosity, Kinematic, at 32°C, ASTM D 445.a, cSt	0.338
Viscosity, Kinematic, at 35°C, ASTM D 445.a, cSt	0.328
Viscosity, Kinematic, at 40°C, ASTM D 445.a, cSt	0.312
Viscosity, Kinematic, at 45°C, ASTM D 445.a, cSt	0.297
Density of Liquids by Digital Density Meter @ 16°C, Density, ASTM D 4052, g/cm ³	1.6313
Density of Liquids by Digital Density Meter @ 21°C, Density, ASTM D 4052, g/cm ³	1.6142
Density of Liquids by Digital Density Meter @ 27°C, Density, ASTM D 4052, g/cm ³	1.5969
Density of Liquids by Digital Density Meter @ 32°C, Density, ASTM D 4052, g/cm ³	1.5790
Density of Liquids by Digital Density Meter @ 35°C, Density, ASTM D 4052, g/cm ³	1.5702
Density of Liquids by Digital Density Meter @ 38°C, Density, ASTM D 4052, g/cm ³	1.5610
Density of Liquids by Digital Density Meter @ 40°C, Density, ASTM D 4052, g/cm ³	1.5515
Density of Liquids by Digital Density Meter @ 43°C, Density, ASTM D 4052, g/cm ³	1.5427
Density of Liquids by Digital Density Meter @ 46°C, Density, ASTM D 4052, g/cm ³	1.5336
Density of Liquids by Digital Density Meter @ 49°C, Density, ASTM D 4052, g/cm ³	1.5241

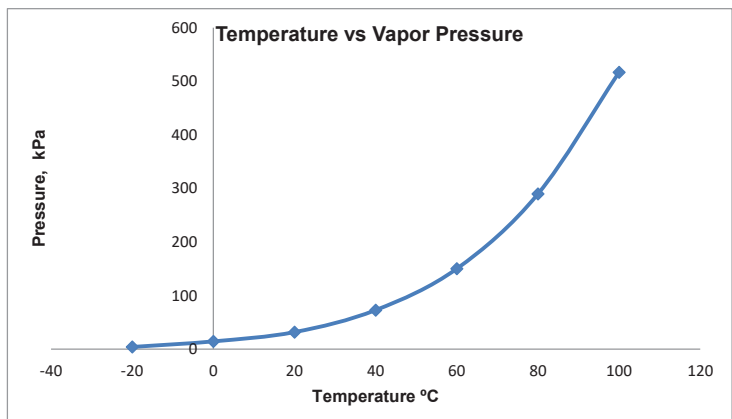
Heat Capacity, ASTM D 7896	
Temperatures °C	Results, KJ/kgK
-20	0.705
0	0.729
20	0.754
40	0.778
60	0.802
80	0.826
100	0.850



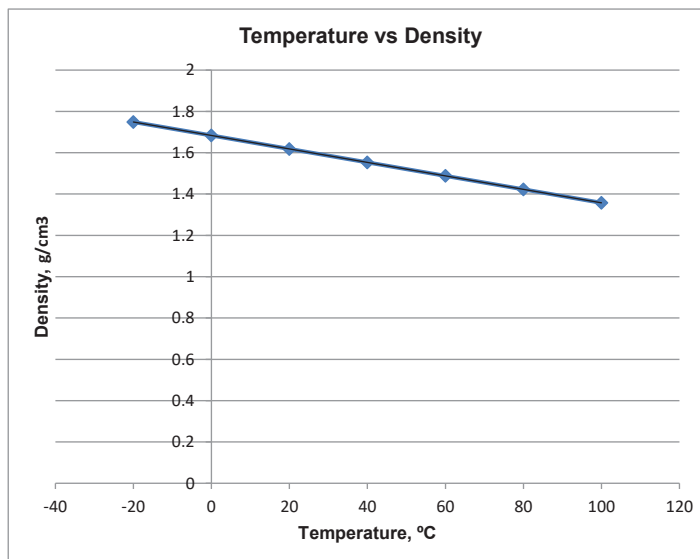
Thermal Conductivity, ASTM D 7896	
Temperatures °C	Results, W/mK
-20	0.072
0	0.069
20	0.066
40	0.063
60	0.060
80	0.057
100	0.054



Vapor Pressure of Liquids by Ebulliometry, ASTM E 1719	
Temperatures °C	Results, W/mK
-20	4.069
0	12.26
20	31.78
40	72.94
60	151.5
80	289.7
100	516.8



Density of Liquids by Digital Density Meter, ASTM D 4052	
Temperatures °C	Results, g/cm ³
-20	1.7488
0	1.6836
20	1.6184
40	1.5532
60	1.4880
80	1.4227
100	1.3575



Boiling Range Distribution @Atmospheric Pressure ASTM D 86

	Results, °F
Initial Boiling Point	116
5% Recovered	118
10% Recovered	118
15% Recovered	118
20% Recovered	118
25% Recovered	118
30% Recovered	118
35% Recovered	118
40% Recovered	118
45% Recovered	118
50% Recovered	118
55% Recovered	118
60% Recovered	118
65% Recovered	118
70% Recovered	118
75% Recovered	118
80% Recovered	118
85% Recovered	118
90% Recovered	118
99% Recovered	120

Environmental Properties

TMC-49 ingredients are listed acceptable by the U.S. EPA under the SNAP program as a substitute for ozone depleting substances, are not subject to SARA title III (EPCRA) reporting regulation. It is not considered a Hazardous Air Pollutant (HAP) and therefore is not regulated under NESHAP. TMC-49 is not considered hazardous waste in the U.S. as long as a hazardous material is not deposited into the solvent during the cleaning process.

Materials Compatibility

TMC-49 is compatible with most materials used in modern industrial facilities. TMC-49 is also compatible with stainless steel, aluminum, iron and every other metal commonly used in precision parts manufacturing.

TMC-49 is compatible with all metals and most plastic and elastomers. Testing should be done on parts to be cleaned in a particular process prior to implementing TMC-49 into the process. Gaskets and O-rings should be made of chemical resistant elastomers such as, nitrile, EPDM, silicone and butyl. Fluoroelastomers and heavily plasticized rubbers should be avoided.

Flammability

TMC-49 is not classified as flammable by OSHA. TMC-49 is not classified as flammable or hazardous for transport by DOT.

Safety & Handling

TMC-49 is not a flammable or toxic liquid. It requires few conditions during application. For more information, please refer to the Safety Data Sheet (SDS).

Keep dry and in room temperature with good ventilation. Keep the container sealed when not in use.

Shelf Life

The shelf life is 36 months under recommended storage conditions. The product stored past expiration may still be used if the analysis results so indicate.



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