Information About 561® Transformer Fluid

561 Transformer Fluid is a silicone liquid engineered to meet the demands of a dielectric coolant for transformers.

Type
Dimethylsiloxane polymer

Physical Form
Low-viscosity liquid

Special Properties
Non-sludging; good high-temperature capabilities and dielectric properties; low toxicity; low flammability

Primary Use
Dielectric coolant for small- and medium-size power transformers

DESCRIPTION

561® Transformer Fluid is a dimethyl silicone insulating material for power transformers. It provides a unique combination of dependable safety features and high-performance characteristics.

561 Transformer Fluid allows use of the proven, reliable and dependable liquid transformer design indoors or close to buildings where hydrocarbon fluids may present a fire hazard.

Specifically engineered and thoroughly tested for use in electrical power apparatus, **561** Transformer Fluid is among the least hazardous of all known engineering materials, making it an excellent replacement for transformer askarels. **561** Transformer Fluid is a heat-stable dielectric coolant featuring much greater thermal stability and oxidation resistance than mineral oils, without the environmental concerns of PCB-based askarels.[1]

CURRENT APPLICATIONS

More than 100,000 transformers worldwide now use silicone transformer liquid as the dielectric coolant.

561 Transformer Fluid should be considered for all types of transformer locations where fire, health and environmental hazards preclude the use of hydrocarbon oils or chlorinated fluids.

[1]"Service and Safety Experience with Silicone Liquid-Filled Small Power Transformers," T. Orbeck, B. McClintick, IEEE Montech Conference, September 1986.

HOW TO USE

General Considerations

As with other dielectric liquids, **561** Transformer Fluid should be used in electrical apparatus only under strictly controlled conditions. This is because many factors other than the fluid itself affect the success of its use. Dow Corning has technical data and literature available on many different types of suggested applications, and on handling and maintenance procedures.

CHARACTERISTICS

Environmental Information

Extensive testing has shown **561** Transformer Fluid and similar silicone fluids to be non-harmful to the environment. The following information may be useful for health and environmental professionals.

- **561** Transformer Fluid is 100% trimethyl/end-blocked polydimethylsiloxane.
- The CAS number for **561** Fluid is 63148-62-9.
- **561** Fluid is **not** classified as hazardous under RCRA (40 CFR 261).
- **561** Fluid is halogen free (no chlorine or bromine).
- **561** Fluid contains **no** additives such as pour point depressants, flow modifiers, antioxidants, or thermal stabilizers.
- **561** Fluid contains **no** hazardous ingredients as defined in OSHA regulations 29 CFR 1910, Hazard Communication Standard.
- **561** Fluid is **not** affected by SARA Title III (40 CFR 117) that requires the CAS number and concentration of each extremely hazardous or toxic component.

TYPICAL PROPERTIES

These values are not intended for use in preparing specifications.

CTM[1] 0176	ASTM D 2129	Appearance	Crystal clear liquid
CTM 0001A	ASTM D 1481	Specific Gravity, at 25°C (77°F)	0.960
CTM 0002	ASTM D 1807	Refractive Index, at 25°C (77°F)	1.402
CTM 0114	ASTM D 877[2]	Dielectric Strength[3], volts per mil	>350
CTM 0210	ASTM D 924	Dielectric Constant, at 25°C (77°F), 100 Hz	2.71
CTM 0210	ASTM D 924	Dissipation Factor[3], at 25°C (77°F), 100 Hz	<0.0001
CTM 0272	ASTM D 1169	Volume Resistivity[3], at 25°C (77°F), ohm-cm	>1 x 10^{14}
CTM 0004	ASTM D 445, ASTM D 2161	Viscosity, at	
		0°C (32°F) cSt	85
		25°C (77°F) cSt	50
		100°C (212°F) cSt	15
CTM 0006	ASTM D 92	Flash Point, °C (°F)	>300 (572)
CTM 0052	ASTM D 92	Fire Point, °C (°F)	>340 (644)
CTM 0911	ASTM D 1533[2]	Water Content, ppm	<50
CTM 0208	ASTM D 4559[3]	Volatility, 24 hours at 150°C (302°F), g/g	<0.005

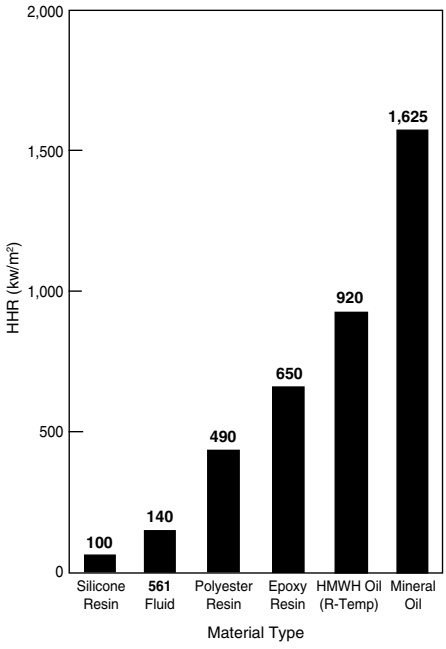
[1]CTMs (Corporate Test Methods) correspond to standard ASTM tests in most instances. Copies of CTMs are available upon request.

[2]Method must be modified as described in ASTM D 2225.

[3]As with other dielectric liquids, these values vary with water content.

Specification Writers: Please obtain a copy of the Dow Corning Sales Specification for this product and use it as a basis for your specifications. It may be obtained from any Dow Corning Sales Office, or from Dow Corning Customer Service in Midland, MI. Call (517) 496-6000.

Figure 1: Total Heat Release Rates of Common Transformer Materials per ASTM E 1354-90



Fire Safety

561 Transformer Fluid is much less flammable than mineral oils and has a higher flash point than many PCB-based askarels. Although this fluid will burn, it has a low heat release rate, high flash and fire points, and is self-extinguishing in burn tests.

Data concerning fire hazard assessment, which includes quantity of smoke produced, toxicity of decomposition products, burning temperatures and convective and radiative heat release rates, have shown that **561** Transformer Fluid is the best askarel substitute from a fire safety standpoint when all aspects are weighed.[2]

Loadbreak Switching

561 Fluid is an excellent fluid in transformers where certain loadbreak devices are used. Testing has proved the suitability of **561** Fluid in applications such as disconnect switches and fuses commonly applied in padmount transformers. Details of these evaluations are available upon request.[3]

HEAT RELEASE RATE

Figure 1 illustrates total heat release rates of several dielectric materials.

UL CLASSIFICATION

561 Transformer Fluid is also classified as a "Dielectric Medium" and "Less-Flammable Fluid" by Underwriters Laboratories. Refer to the "UL Classification Marking" section on the following page for UL's "Use Restrictions."

LIMITATIONS

Not intended for medical use.
Not for human injection.

SHIPPING LIMITATIONS

None.

STORAGE AND SHELF LIFE

561 Transformer Fluid has a three-year shelf life from date of manufacture when stored under normal conditions. The material typically per-forms longer but should be retested after extended storage. Containers must be kept sealed to prevent water contamination.

PACKAGING

561 Transformer Fluid is supplied in 440-lb (199.6-kg) containers, net weight. Smaller quantities are available through distributors. Intermediate bulk containers and bulk tanker quantities are also available.

TRANSFORMER RETROFILLING

Extensive experience has shown that existing askarel-filled transformers can be retrofilled with **561** Transformer Fluid without sacrifice of reliability or performance.

Most mineral oil transformers can also be retrofilled; however, the fire safety of such units depends on the residual oil content in the silicone fluid. Transformer retrofills with **561** Transformer Fluid should only be undertaken by service companies or utilities familiar with the apparatus and product.[4]

[2]"New Principles of Fire Hazard Assessment for Fluid-Filled Electrical Equipment," T. Orbeck, 9th International Conference of Fire Safety, January 16, 1984.

[3]"The Effect of Loadbreak Switching in Silicone," S.K. Mort, EEIC/ICWA Conference, October 4-7, 1993.

[4]"Combustion Properties of Contaminated Dielectric Fluids as Determined in the Cone Calorimeter," J.L. Goudie, R.R. Buch, Dow Corning, IEEE Dielectrics and Electrical Insulation International Conference Proceedings, June 1992.

UL CLASSIFICATION MARKING — 561 TRANSFORMER FLUID

561 Transformer Fluid is classed 4 to 5 less hazardous than paraffin oil in respect to fire hazard. May evolve flammable gases when decomposed by an electric arc.

561 Transformer Fluid is also classified as a "less-flammable liquid" in compliance with the National Electrical Code, when used in 3-phase transformers, 45 through 10,000 kVA, with the following three "use restrictions":

A. For use only in 3-phase transformers having tanks capable of withstanding an internal pressure of 12 psig without rupture.

B. Required use of pressure-relief devices on transformer tank in accordance with the following tabulation to limit internal pressure buildup and prevent tank rupture due to gas generation under low current arcing faults.

C. Required use of over current protection in the transformer primary circuit having I^2t characteristics not exceeding the values in the following tabulation to limit possible high-current arcing faults.

If the fuse is designed to vent during operation (such as an expulsion fuse) it shall be located external to the transformer tank.

3-Phase Transformer Rating, kVA	Required Over Current Protection[1] Maximum I^2t (A^2s)	Minimum Required Pressure Relief Capacity[2] SCFM at 15 psi
45	700,000	35
75	800,000	35
112.5	900,000	35
150	1,000,000	50
225	1,200,000	100
300	1,400,000	100
500	1,900,000	350
750	2,200,000	350
1,000	3,400,000	350
1,500	4,500,000	700
2,000	6,000,000	700
2,500	7,500,000	5,000
3,000	9,000,000	5,000
3,750	11,000,000	5,000
5,000	14,000,000	5,000
7,500	14,000,000	5,000
10,000	14,000,000	5,000

[1]This is an additional requirement to the over current protection required in accordance with Section 450-3 of the 1993 National Electrical Code.

[2]Opening pressure, 10 psig, maximum.

SAFE HANDLING INFORMATION
PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED. BEFORE HANDLING, READ PRODUCT AND MATERIAL SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE MATERIAL SAFETY DATA SHEET IS AVAILABLE FROM YOUR DOW CORNING REPRESENTATIVE, OR DISTRIBUTOR, OR BY WRITING TO DOW CORNING CUSTOMER SERVICE, OR BY CALLING (517) 496-6000.

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