

Specification Guideline: Envirotemp® FR3™ Natural Ester Less-Flammable Transformer Insulating Fluid

1. SCOPE

1.1 This specification describes a non-toxic, fire resistant, bio-based natural ester dielectric fluid. It is intended for use in electrical equipment as a less-flammable, high fire point insulating and cooling medium.

2. REQUIREMENTS

2.1 Materials

The fluid shall be a bio-based biodegradable electrical insulating and cooling liquid. The base fluid shall be 100% derived from edible seed oils. The performance enhancing additives shall be food grade. The fluid shall be Factory Mutual Approved, UL Classified, Envirotemp FR3 fluid or equal, with properties as listed in 2.2. Fluid compatibility with transformer components shall be verified. The fluid shall be certified to comply with the US EPA Environmental Technology Verification (ETV) requirements.

2.2 Recommended As-Received Acceptance Value Limits

Dielectric Strength	ASTM D-1816 ≥40 kV
Dissipation Factor (25°C)	ASTM D-924 ≤ 0.20%
Neutralization Number	ASTM D-664 ≤ 0.06 mg KOH/g
Flash Point	ASTM D-92 ≥ 300°C
Fire Point	ASTM D-92 ≥ 340°C
Viscosity	ASTM D-445	40°C ≤ 40 cSt
		100°C ≤10 cSt
Pour Point	ASTM D-97 ≤ -18°C
Moisture Content	ASTM D-1533B ≤ 200 ppm
Color	ASTM D-1500 L 0.5
Appearance	ASTM D-1524 transparent, light green
DC Volume Resistivity	ASTM D-1169 ≥ 5x10 ¹² Ω-cm
Trout Toxicity	OECD 203 zero mortality
BOD/COD Ratio	 ≥ 0.40

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3. QUALITY ASSURANCE

3.1 Inspection

Each lot received shall be visibly inspected for container leaks.

3.2 Receiving Tests

Samples shall be taken from containers per ASTM D-923 Section 2.2, as follows:

<u>Lot Size (gallons)</u>	<u>Number of Containers Sampled</u>
600 or less	1
601 to 3000	2-6
3001 or more	6 minimum (10% of quantity of containers recommended.)

When material will be combined for production, samples may be mixed together in equal proportions to create a composite sample for testing. Minimum tests required are dielectric strength and visual inspection. Dissipation factor test is recommended, although not essential.

4. PACKAGING

4.1 The electrical insulating fluid shall be furnished in sealed 5 gallon containers, 55 gallon drums, 330 gallon totes, or in bulk.

5. NOTES

5.1 Intended Use

The use of electrical insulating and cooling fluid is generally dictated by the engineering design of the electrical apparatus. The electrical insulating fluid covered by this specification is intended for use as an insulating and cooling medium in electrical equipment.

5.2 Fluid Transfer

When transferring electrical insulating fluid from its original container, take care to prevent contamination with moisture, dust, and foreign matter. These impurities can cause deterioration of the dielectric strength and electrical performance.

5.3 Partial Containers

Properly seal partially filled containers to prevent contamination. Avoid storing drums outdoors. Extreme temperature variations can stress the integrity of container protective seals.