



Standard Methods of Testing Synthetic Dielectric Fluids For Capacitors¹

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1. Scope

1.1 These methods cover testing synthetic dielectric fluids currently in use for capacitors. The methods are generally suitable for specification acceptance, factory control, referee testing, and research. Their applicability to future fluids has not been determined.

1.2 The scope of some of the methods listed here apply to petroleum oils, but have been found suitable for synthetic fluids.

1.3 For polybutene fluids refer to Specification D 2296.

1.4 For silicone fluids refer to Methods D 2225.

1.5 A list of properties and standards are as follows:

Property Measured	Section	ASTM Test Method
<i>Physical:</i>		
Coefficient of thermal expansion	6	D 1903
Flash point	7	D 92
Pour point	8	D 97
Refractive index	9	D 1218
Specific gravity	10	D 1298
Viscosity	11	D 445
<i>Chemical:</i>		
Acid number	12	D 664
Water content	13	D 1533
<i>Electrical:</i>		
Relative permittivity	14	D 924
Dielectric strength	15	D 877
Dissipation factor	16	D 924

1.6 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 92 Test Method for Flash and Fire Points by Cleveland Open Cup²

D 97 Test Method for Pour Point of Petroleum Products²

D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)²

D 664 Test Method for Acid Number of Petroleum Products by Potentiometric Titration²

¹ These methods are under the jurisdiction of ASTM Committee D-27 on Electrical Insulating Liquids and Gases and are the direct responsibility of Subcommittee D27.02 on Gases and Synthetic Liquids.

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² Annual Book of ASTM Standards, Vol 05.01.

D 877 Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes³

D 923 Test Method for Sampling Electrical Insulating Liquids³

D 924 Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids³

D 1218 Test Method for Refractive Index and Refractive Dispersion of Hydrocarbon Liquids²

D 1298 Practice for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method²

D 1533 Test Methods for Water in Insulating Liquids (Karl Fischer Reaction Method)³

D 1807 Test Methods for Refractive Index and Specific Optical Dispersion of Electrical Insulating Liquids³

D 1903 Test Method for Coefficient of Thermal Expansion of Electrical Insulating Liquids of Petroleum Origin, and Askarels³

D 2225 Test Methods for Silicone Fluids Used for Electrical Insulation³

D 2296 Specification for Continuity of Quality of Electrical Insulating Polybutene Oil for Capacitors³

D 2864 Terminology Relating to Electrical Insulating Liquids and Gases³

3. Terminology Definitions

3.1 *coefficient of thermal expansion*—the increase in volume per unit volume per degree change in temperature. It is commonly stated as the average coefficient over a given temperature range.

3.2 *flash point*—the temperature at which vapors above the oil surface first ignite when a small test flame is passed across the surface under specific conditions.

3.3 *pour point*—the lowest temperature expressed as a multiple of 5°F (or 3°C), at which the oil is observed to flow when cooled, and examined under prescribed conditions.

3.4 *refractive index*—the ratio of the velocity of light (of a specified wave length) in air at 25°C to its velocity in the substance under test.

3.5 *specific gravity*—the ratio of weight of a given volume of liquid to the weight of an equal volume of water. In this method, both weights are corrected to weight in vacuum, and the material is at 25°C using hydrometers calibrated at 60/60°F.

³ Annual Book of ASTM Standards, Vol 10.03.