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Standard Guide for Sampling, Test Methods, and Specifications for Electrical Insulating Liquids¹

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1. Scope

1.1 This guide describes methods of testing and specifications for electrical insulating liquids intended for use in electrical cables, transformers, liquid-filled circuit breakers, and other electrical apparatus where the liquids are used as insulating, or heat transfer media, or both.

1.2 The purpose of this guide is to outline the applicability of the available test methods. Where more than one is available for measuring a given property, their relative advantages are described, along with an indication of laboratory convenience, precision, (95 % confidence limits), and applicability to specific types of electrical insulating liquids.

1.3 This guide is classified into the following categories: Sampling Practices, Physical Tests, Electrical Tests, Chemical Tests, and Specifications. Within each test category, the test methods are listed alphabetically by property measured. A list of standards follows:

Category	Section	ASTM Standard
<i>Sampling:</i>	3	D923
<i>Physical Tests:</i>		
Aniline Point	4	D611
Coefficient of Thermal Expansion	5	D1903
Color	6	D1500
Examination: Visual Infrared	7	D1524, D2144, D2129
Flash and Fire Point	8	D92
Interfacial Tension	9	D971
Pour Point of Petroleum Products	10	D97, D5949, D5950
Particle Count in Mineral Insulating Oil	11	D6786
Refractive Index and Specific Optical Dispersion	12	D1218
Relative Density (Specific Gravity)	13	D287, D1217, D1298, D1481, D4052
Specific Heat	14	D2766
Thermal Conductivity	15	D2717
Viscosity	16	D445, D2161, D7042
<i>Electrical Tests:</i>		

Category	Section	ASTM Standard
Dielectric Breakdown Voltage	17	D877, D1816, D3300
Dissipation Factor and Relative Permittivity (Dielectric Constant)	18	D924
Gassing Characteristic Under Thermal Stress	19	D7150
Gassing Tendency	20	D2300
Resistivity	21	D1169
<i>Chemical Tests:</i>		
Acidity, Approximate	22	D1534
Carbon-Type Composition	23	D2140
Compatibility with Construction Material	24	D3455
Copper Content	25	D3635
Elements by Inductively Coupled Plasma (ICP-AES)	26	D7151
Furanic Compounds in Electrical Insulating Liquids	27	D5837
Dissolved Gas Analysis	28	D3612
Gas Content of Cable and Capacitor Liquids	29	D831, D1827, D2945
Neutralization (Acid and Base) Numbers	30	D664, D974
Oxidation Inhibitor Content	31	D2668, D4768
Oxidation Stability	32	D1934, D2112, D2440
Polychlorinated Biphenyl Content (PCB)	33	D4059
Sulfur, Corrosive	34	D1275
Water Content	35	D1533
<i>Specification:</i>		
Mineral Insulating Liquid for Electrical Apparatus	36	D3487
Less Flammable Electrical Insulating Liquids	37	D5222
Silicone Fluid used for Electrical Insulation	38	D4652
Natural (Vegetable Oil) Ester Fluids used in Electrical Apparatus	39	D6871

1.4 The values stated in SI units are to be regarded as standard. The values stated in parentheses are provided for information only.

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

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

¹ This guide is under the jurisdiction of ASTM Committee D27 on Electrical Insulating Liquids and Gases and is the direct responsibility of Subcommittee D27.01 on Mineral.

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