



Standard Guide for Sampling, Test Methods, and Specifications for Electrical Insulating Oils of Petroleum Origin¹

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1. Scope

1.1 This guide describes methods of testing and specifications for electrical insulating oils of petroleum origin intended for use in electrical cables, transformers, oil circuit breakers, and other electrical apparatus where the oils 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 oils.

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 Method
<i>Sampling:</i>	3	D923, D2759, D3305
<i>Physical Tests:</i>		
Aniline Point	4	D611
Coefficient of Thermal Expansion	5	D1903
Color	6	D1500
Examination: Visual Infrared	7	D1524, D2144
Flash and Fire Point	8	D92
Interfacial Tension	9	D971, D2285
Pour Point of Petroleum Products	10	D97
Particle Count in Mineral Insulating Oil	11	D6786
Refractive Index	12	D1218, D1807
Relative Density (Specific Gravity)	13	D287, D1217, D1298, D1481
Specific Heat	14	D2766

Category	Section	ASTM Method
Thermal Conductivity	15	D2717
Turbidity	16	D6181
Viscosity	17	D88, D445, D2161
<i>Electrical Tests:</i>		
Dielectric Breakdown Voltage	18	D877, D1816, D3300
Dissipation Factor and Relative Permittivity (Dielectric Constant)	19	D924
Gassing Characteristic Under Thermal Stress	20	D7150
Gassing Tendency	21	D2300
Resistivity	22	D1169
Stability Under Electrical Discharge	23	D6180
<i>Chemical Tests:</i>		
Acidity, Approximate	24	D1534
Carbon-Type Composition	25	D2140
Compatibility with Construction Material	26	D3455
Copper Content	27	D3635
Elements by Inductively Coupled Plasma (ICP-AES)	28	D7151
Furanic Compounds in Electrical Insulating Liquids	29	D5837
Gas Analysis	30	D3612
Gas Content	31	D831, D1827, D2945
Inorganic Chlorides and Sulfates	32	D878
Neutralization (Acid and Base) Numbers	33	D664, D974
Oxidation Inhibitor Content	34	D2668, D4768
Oxidation Stability	35	D1934, D2112, D2440
Polychlorinated Biphenyl Content	36	D4059
Relative Content of Dissolved Decay	37	D6802
Sediment and Soluble Sludge	38	D1698
Sulfur, Corrosive	39	D1275
Water Content	40	D1533
<i>Specification:</i>		
Mineral Insulating Oil for Electrical Apparatus	41	D3487
High Firepoint Electrical Insulating Oils	42	D5222

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