



Designation: D 2233 – 86 (Reapproved 1997)

Standard Specification for Chlorinated Aromatic Hydrocarbons (Askarels) for Capacitors¹

This standard is issued under the fixed designation D 2233; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers synthetic nonflammable electrical insulating liquids of the chlorinated aromatic hydrocarbon type known as askarels, which are used as an electrical insulating and cooling medium in capacitors. This specification includes liquids that were previously available and are still in use in apparatus.

1.2 Insulation systems incorporating these askarels and cellulosic or other organic materials may, when arced, produce gaseous mixtures that are moderately flammable.

1.3 Askarels covered by this specification are of four types as follows:

1.3.1 *Type A*—Biphenyl that has been chlorinated to a content of 42 weight %.

1.3.2 *Type B*—Biphenyl that has been chlorinated to a chlorine content of 54 weight %.

1.3.3 *Type C*—A mixture of approximately 75 % Type D 2233 B and 25 % trichlorobenzene.

1.3.4 *Type D*—The same as Type A, except that the higher boiling homologs have been removed to a maximum level of 0.4 %.

NOTE 1—These statements are merely descriptions of the materials currently in common use and are not intended as part of this specification, which is based on the physical and chemical properties prescribed in Table 1.

NOTE 2—Current governmental regulations prohibit the manufacture and sale of polychlorinated biphenyls (askarels). This method is being maintained for reference of those units that are still in service.

NOTE 3—For information on PCB's in mineral oils, refer to Method D 4059.

2. Referenced Documents

2.1 ASTM Standards:

D 88 Test Method for Saybolt Viscosity²

D 92 Test Method for Flash and Fire Points by Cleveland Open Cup³

D 97 Test Method for Pour Point of Petroleum Products³

D 664 Test Method for Acid Number of Petroleum Products

¹ This specification is under the jurisdiction of ASTM Committee D-27 on Electrical Insulating Liquids and Gases and is the direct responsibility of Subcommittee D27.02 on Gases and Synthetic Liquids.

Current edition approved Jan. 31, 1986. Published March 1986. Originally published as D 2233 – 63 T. Last previous edition D 2233 – 85.

² Annual Book of ASTM Standards, Vol 04.04.

³ Annual Book of ASTM Standards, Vol 05.01.

by Potentiometric Titration³

D 877 Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes⁴

D 923 Test Method for Sampling Electrical Insulating Liquids⁴

D 924 Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids⁴

D 974 Test Method for Acid and Base Number by Color-Indicator Titration³

D 1169 Test Method for Specific Resistance (Resistivity) of Electrical Insulating Liquids⁴

D 1218 Test Method for Refractive Index and Refractive Dispersion of Hydrocarbon Liquids³

D 1533 Test Methods for Water in Insulating Liquids (Karl Fischer Reaction Method)⁴

D 1810 Test Method for Specific Gravity of Askarels⁴

D 1820 Test Method for Hydrolyzable Chlorine Compounds in Chlorinated Aromatic Hydrocarbons (Askarels)⁴

D 1821 Test Method for Inorganic Chlorides in Askarels⁴

D 1903 Test Method for Coefficient of Thermal Expansion of Electrical Insulating Liquids of Petroleum Origin, and Askarels⁴

D 1936 Test Method for Thermal Stability of Chlorinated Aromatic Hydrocarbons (Askarels)⁵

D 2129 Test Method for Color of Water White Electrical Insulating Liquids⁴

D 4059 Test Method for Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography⁴

3. Terminology

3.1 Definitions:

3.1.1 *askarel*—a generic term for a group of synthetic, fire-resistant, chlorinated aromatic hydrocarbons used as electrical insulating liquids. They have a property under arcing conditions such that any gases produced will consist predominantly of noncombustible hydrogen chloride with lesser amounts of combustible gases.

4. Detail Requirements

4.1 Askarels for use in capacitors shall conform to the

⁴ Annual Book of ASTM Standards, Vol 10.03.

⁵ Discontinued; see 1986 Annual Book of ASTM Standards, Vol 10.03.



TABLE 1 Detail Requirements for Askarels for Capacitors

Property	Type A	Type B	Type C	Type D ^A	ASTM Test Method ^B
Acidity, max, mg KOH/g	0.01	0.01	0.01	0.01	D 974, D644
Color, APHA, max	50	50	150	40	D 2129
Condition	clear	clear	clear	clear	(visual)
Chlorides, inorganic, max, ppm	0.05	0.05	0.05	0.05	D 1821
Relative permittivity at 100°C and 1 kHz	4.7 to 4.9	4.15 to 4.35	4.1 to 4.6	4.80 to 4.95	D 924
Dielectric breakdown voltage, min, kV	35	35	35	35	D877
Fire point ^C	none to boiling	none to boiling	none to boiling	none to boiling	D 92
Hydrolyzable chlorine compounds, max, ppm	0.5	1.0		0.5	D 1820
Pour point, °C	−14 max	7 to 12	−15 max	−14 max	D 97
Refractive index, 25°C	1.6240 to 1.6260	1.6370 to 1.6390	1.6205 to 1.6215	1.6215 to 1.6235	D 1218
Resistivity at 100°C, 5V/mil, d-c, min Ω·cm	500×10^9	500×10^9	100×10^9	500×10^9	D 1169
Specific gravity	1.381 to 1.392 at 25/15.5°C	1.495 to 1.505 at 65/15.5°C	1.525 to 1.535 at 15.5/15.5°C	1.362 to 1.372 at 25/15.5°C	D 1810
Coefficient of thermal expansion, ^D cm ³ /cm ³ ·°C	0.00068	0.00066	0.00070	0.00068	D 1903
Thermal stability, max, ppm	0.4	0.5		0.4	D 1936
Viscosity, Saybolt Universal, s	82 to 92 at 37.8°C	44 to 48 at 98.9°C	70 to 82 at 37.8°C	71 to 81 at 37.8°C	D 88
Water content, max, ppm	35	35	35	35	D 1533

^A Askarel produced in the United States for use in capacitors after October 1971.

^B These designations refer to the test methods referenced in Section 2.

^C When testing for fire point, pseudo-flash may be observed; it differs noticeably from the flash obtained on combustible materials and is not indicative of a fire hazard.

^D These are approximate values included for information only.

requirements prescribed in Table 1.

NOTE 4—Since October 1971 askarel produced in the United States for use in capacitors has conformed to Type D as shown in Table 1. Materials previously available are still in use in the field.

NOTE 5—These materials sometimes contain additives whose presence may interfere with the chemical tests prescribed in Table 1. Unless it is known that no additives are present, results of the chemical tests may be misleading.

5. Sampling and Test Methods

5.1 The material shall be sampled in accordance with Test Method D 923 and tests shall be conducted in accordance with the test methods listed in Table 1.

6. Keywords

6.1 askarels; capacitors; chlorinated aromatic hydrocarbons

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

This standard is copyrighted by ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (http://www.astm.org).