Designation: D3612 – 02 (Reapproved 2009)

Standard Test Method for Analysis of Gases Dissolved in Electrical Insulating Oil by Gas Chromatography[1]

This standard is issued under the fixed designation D3612; 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 test method covers three procedures for extraction and measurement of gases dissolved in electrical insulating oil having a viscosity of 20 cSt (100 SUS) or less at 40°C (104°F), and the identification and determination of the individual component gases extracted. Other methods have been used to perform this analysis.

1.2 The individual component gases that may be identified and determined include:

Hydrogen—H_2
Oxygen—O_2
Nitrogen—N_2
Carbon monoxide—CO
Carbon dioxide—CO_2
Methane—CH_4
Ethane—C_2H_6
Ethylene—C_2H_4
Acetylene—C_2H_2
Propane—C_3H_8
Propylene—C_3H_6

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.* For specific warning statements see 6.1.8, 30.2.2 and 30.3.1.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2140 Practice for Calculating Carbon-Type Composition of Insulating Oils of Petroleum Origin

D2300 Test Method for Gassing of Electrical Insulating Liquids Under Electrical Stress and Ionization (Modified Pirelli Method)

D2779 Test Method for Estimation of Solubility of Gases in Petroleum Liquids

D2780 Test Method for Solubility of Fixed Gases in Liquids (Withdrawn 2010)[3]

D3613 Practice for Sampling Insulating Liquids for Gas Analysis and Determination of Water Content (Withdrawn 2007)[3]

D4051 Practice for Preparation of Low-Pressure Gas Blends

E260 Practice for Packed Column Gas Chromatography

2.2 *IEEE Standard:*

C 57.104 Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers[4]

2.3 *IEC Standard:*

Publication No. 567 Guide for the Sampling of Gases and of Oil from Oil-Filled Electrical Equipment and for the Analysis of Free and Dissolved Gases[5]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *gas content of oil by volume—in Method A*, the total volume of gases, corrected to 760 torr (101.325 kPa) and 0°C, contained in a given volume of oil, expressed as a percentage. In Methods B and C, the sum of the individual gas concentrations corrected to 760 torr (101.325 kPa) and 0°C, expressed in percent or parts per million.

3.1.2 *headspace*—a volume of gas phase in contact with a volume of oil in a closed vessel. The vessel is a headspace vial of 20-mL nominal capacity.

3.1.2.1 *Discussion*—Other vessel volumes may also be used, but the analytical performance may be somewhat different than that specified in Method C.

3.1.3 *parts per million (ppm) by volume of (specific gas) in oil*—the volume of that gas corrected to 760 torr (101.325 kPa) and 0°C, contained in 10^6 volume of oil.

3.1.4 *sparging, v*—agitating the liquid sample using a gas to strip other gases free.

[1] This test method is under the jurisdiction of ASTM Committee D27 on Electrical Insulating Liquids and Gasesand is the direct responsibility of Subcommittee D27.03 on Analytical Tests.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from IEEE, 345 E. 47th St., New York, NY 10017.

[5] Available from International Electrotechnical Commission (IEC), 3 rue de Varembé, Case postale 131, CH-1211, Geneva 20, Switzerland, http://www.iec.ch..

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