Designation: D892 – 23

British Standard 5092

Standard Test Method for Foaming Characteristics of Lubricating Oils[1]

This standard is issued under the fixed designation D892; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This test method covers the determination of the foaming characteristics of lubricating oils at 24 °C and 93.5 °C. Means of empirically rating the foaming tendency and the stability of the foam are described.

1.2 **WARNING**—Mercury has been designated by many regulatory agencies as a hazardous substance that can cause serious medical issues. Mercury, or its vapor, has been demonstrated to be hazardous to health and corrosive to materials. Use caution when handling mercury and mercury-containing products. See the applicable product Safety Data Sheet (SDS) for additional information. The potential exists that selling mercury or mercury-containing products, or both, is prohibited by local or national law. Users must determine legality of sales in their location.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.4 *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.* For specific warning statements, see Sections 7, 8, and 9.1.1.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

D6082 Test Method for High Temperature Foaming Characteristics of Lubricating Oils

E1 Specification for ASTM Liquid-in-Glass Thermometers

E128 Test Method for Maximum Pore Diameter and Permeability of Rigid Porous Filters for Laboratory Use

E1272 Specification for Laboratory Glass Graduated Cylinders

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology D4175.

3.1.2 *diffuser, n—for gas*, a device for dispersing gas into a fluid.

3.1.2.1 *Discussion*—In this test method the diffuser may be made of either metallic or non-metallic materials.

3.1.3 *entrained air (or gas), n—in liquids*, a two-phase mixture of air (or gas) dispersed in a liquid in which the liquid is the major component on a volumetric basis.

3.1.3.1 *Discussion*—Entrained air (or gas) may form micro size bubbles in liquids that are not uniformly dispersed and that may coalesce to form larger bubbles below or at the surface which break or form foam.

3.1.4 *foam, n—in liquids*, a collection of bubbles formed in or on the surface of a liquid in which the air or gas is the major component on a volumetric basis.

[1] This test method is under the jurisdiction of Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.06 on Analysis of Liquid Fuels and Lubricants.

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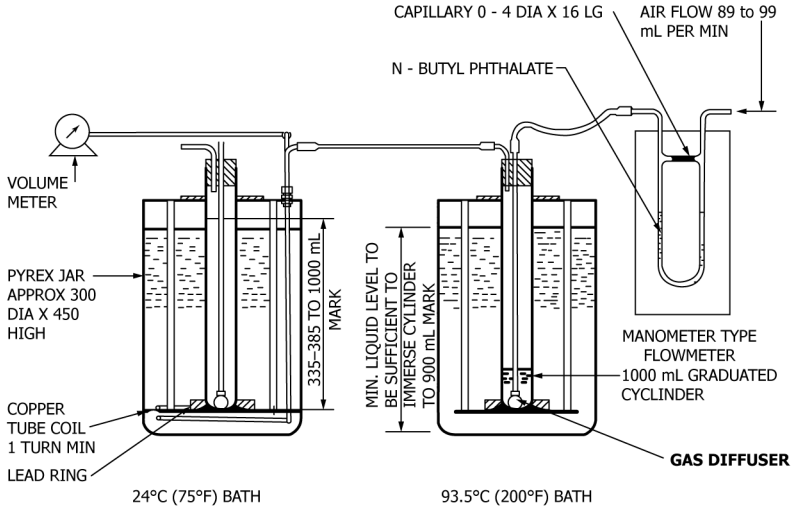
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**



All dimensions in millimetres.

FIG. 1 Foaming Test Apparatus

3.1.5 *lubricant, n*—any material interposed between two surfaces that reduces friction or wear between them. D6082

3.1.5.1 *Discussion*—In this test method, the lubricant is an oil which may or may not contain additives such as foam inhibitors.

3.1.6 *maximum pore diameter, n—in gas diffusion*, the diameter of a circular cross-section of a capillary is equivalent to the largest pore of the diffuser under consideration.

3.1.6.1 *Discussion*—The pore dimension is expressed in micrometres (μm).

3.1.7 *permeability, n—in gas diffusion*, the rate of a substance that passes through a material (diffuser) under given conditions.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *dynamic bubble, n*—the first bubble to pass through and escape from the diffuser followed by a continuous succession of bubbles when testing for the maximum pore diameter in Annex A1.

3.2.1.1 *Discussion*—When a diffuser is immersed in a liquid, air can be trapped in the pores. It can escape eventually or as soon as a pressure is applied to the diffuser. When testing for maximum pore diameter (Annex A1) the escape of such bubble shall be ignored.

3.2.2 *foam stability, n*—in foam testing, the amount of foam remaining at the specified time following the disconnecting of the air supply.

3.2.2.1 *Discussion—In this test method,* foam stability is determined from measurements made 10 min ± 10 s after disconnecting the air supply. In cases after the air supply has been disconnected, where the foam collapses to 0 mL before the 10 min settling time has elapsed, the test may be terminated and the foam stability result recorded as 0 mL.

3.2.3 *foaming tendency, n*—in foam testing, the amount of foam determined from measurements made immediately after the cessation of air flow.

4. Summary of Test Method

4.1 *Sequence I*—A portion of sample, maintained at a bath temperature of 24 °C ± 0.5 °C is blown with air at a constant rate (94 mL/min ± 5 mL/min) for 5 min, then allowed to settle for 10 min (unless the case described in 3.2.2.1 applies, in which case, the time duration can be shortened). The volume of foam is measured at the end of both periods.

4.2 *Sequence II*—A second portion of sample, maintained at a bath temperature of 93.5 °C ± 0.5 °C, is analyzed using the same air flow rate and blowing and settling time duration as indicated in 4.1.

4.3 *Sequence III*—The sample portion used in conducting Sequence II is used for Sequence III, where any remaining foam is collapsed and the sample portion temperature cooled below 43.5 °C by allowing the test cylinder to stand in air at room temperature, before placing the cylinder in the bath maintained at 24 °C ± 0.5 °C. The same air flow rate and blowing and settling time duration as indicated in 4.1 is followed.

5. Significance and Use

5.1 The tendency of oils to foam can be a serious problem in systems such as high-speed gearing, high-volume pumping, and splash lubrication. Inadequate lubrication, cavitation, and overflow loss of lubricant can lead to mechanical failure. This test method is used in the evaluation of oils for such operating conditions.

6. Apparatus

6.1 *Foaming Test Apparatus,* an example of a suitable set-up is shown in Fig. 1, consisting of a 1000 mL graduated cylinder or cylinders (meeting Specification E1272 class B tolerance requirement of ±6 mL and at least graduations of 10 mL) held in position when placed in the baths, such as fitted with a heavy ring or clamp assembly to overcome the