



Designation: D6973 – 14 (Reapproved 2024)

Standard Test Method for Indicating Wear Characteristics of Petroleum Hydraulic Fluids in a High Pressure Constant Volume Vane Pump¹

This standard is issued under the fixed designation D6973; 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 a constant volume high-pressure vane pump test procedure for indicating the wear characteristics of petroleum hydraulic fluids. See [Annex A1](#) for recommended testing conditions for water-based synthetic fluids.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

2.2 ISO Standards:³

[ISO 4021 Hydraulic Fluid Power—Particulate Contamination Analysis—Extraction of Fluid Samples from Lines of an Operating System](#)

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.N0 on Hydraulic Fluids.

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

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

[ISO 4406 Hydraulic Fluid Power—Fluids—Method for Coding the Level of Contamination by Solids Particles](#)

[ISO 7745 Hydraulic Fluid Power—Fire-Resistant \(FR\) Fluids—Guidelines for Use](#)

[ISO 11171 Hydraulic Fluid Power—Calibration of Automatic Particle Counters for Liquids](#)

[ISO 11500 Hydraulic Fluid Power—Determination of Particulate Contamination by Automatic Counting Using the Light Extinction Principle](#)

2.3 Other Documents:

[SAE 100R13–20 Hydraulic Hose Specification](#)⁴

[ANSI/NFPA T2.13.1 R3-1998 Recommended Practice—Hydraulic Fluid Power—Use of Fire-Resistant Fluids in Industrial Systems](#)⁵

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *flushing, v*—the process of cleaning the test system before testing to prevent cross-contamination.

4. Summary of Test Method

4.1 Hydraulic fluid in the amount of 190 L $\pm$ 4 L (50 gal $\pm$ 1 gal) is circulated through a rotary vane pump system for 50 h at a pump speed of 2400 r/min $\pm$ 20 r/min and a pump outlet pressure of 20.7 MPa $\pm$ 0.2 MPa (3000 psig $\pm$ 20 psig). Fluid temperature at the pump inlet is 95 °C $\pm$ 3 °C (203 °F $\pm$ 5 °F). An ISO Grade 32 or 10W viscosity is required.

4.2 The mass of the cam ring and all ten vanes should be individually determined before and after the test. The mass loss of the cam ring should be reported with the combined mass loss of all ten vanes. The intra-vanes (inserts) are not part of the required mass loss measurements and should be separately measured if desired. Other reported values are fluid cleanliness before and after the test, initial flow rate, and final flow rate.

4.3 Prior to installing the hydraulic test fluid into the rig, a stand flush is required to remove any contaminants. A minimum quantity of 190 L $\pm$ 4 L (50 gal $\pm$ 1 gal) of fluid (see

⁴ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.