Designation: F 37 – 00

Standard Test Methods for Sealability of Gasket Materials[1]

This standard is issued under the fixed designation F 37; 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 Department of Defense.

1. Scope

1.1 These test methods provide a means of evaluating the sealing properties of sheet and solid form-in-place gasket materials at room temperature. Test Method A is restricted to liquid leakage measurements, whereas Test Method B may be used for both liquid and gas leakage measurements.

1.2 These test methods are suitable for evaluating the sealing characteristics of a gasket material under different compressive flange loads. The test method may be used as an acceptance test when the producer and user have agreed to specific test conditions for the following parameters: test medium, internal pressure on medium, and flange load on gasket specimens.

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

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 and health practices and determine the applicability of regulatory limitations prior to use.* (For specific hazard statements, see Section 6, Note 3, and Note 8.)

2. Referenced Documents

2.1 *ASTM Standards:*

D 471 Test Method for Rubber Property—Effect of Liquids[2]

D 2000 Classification System for Rubber Products in Automotive Applications[3]

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[4]

F 38 Test Methods for Creep Relaxation of a Gasket Material[3]

F 104 Classification System for Nonmetallic Gasket Materials[3]

2.2 *ANSI Standard:*[5]

B57.1 Compressed Gas Cylinder Valve Outlet and Inlet Connections

3. Summary of Test Methods

3.1 Both test methods utilize a test specimen compressed between the surfaces of two smooth steel flange faces. After the specified flange load is applied, the test medium is introduced into the center of the annular gasket compressed between the flanges and the specified pressure is applied to the medium. For liquid sealability tests (Test Methods A and B), Reference Fuel A (see Test Method D 471, Motor Fuel Section of Annex) is recommended and the leakage rate is measured by a change in the level of a sight-glass located in the line upstream from the gasket testing fixture. Nitrogen is the recommended gas for the gas sealability test (Test Method B) and the leakage rate is measured by a change in the level of a water manometer located in the line upstream from the gasket testing fixture.

3.1.1 Test Method A uses a test fixture (Fig. 1) by which an external load is transferred into the fixture to produce a compressive force on the gasket specimen.

3.1.2 Test Method B uses a test fixture (Fig. 2 and Fig. 3) in which the flanges are held within a four-bolt cage that permits loading the flanges at various force levels. The flange load is measured by a transducer held within the cage.

3.2 Results of the sealability tests are expressed as a leakage rate in millilitres per hour for the test specimen under the specific conditions of the test.

4. Significance and Use

4.1 These test methods are designed to compare gasket materials under controlled conditions and to provide a precise measure of leakage rate.

4.2 These test methods are suitable for measuring leakage rates as high as 6 L/h and as low as 0.3 mL/h. In many cases, "zero" leakage may not be attainable.

4.3 These test methods evaluate leakage rates after time periods that are typically 5 to 30 min under load. Holding a gasket material under load for extended time periods may give different results.

[1] These test methods are under the jurisdiction of ASTM Committee F03 on Gaskets and are the direct responsibility of Subcommittee F 03.40 on Composite Gaskets.

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[2] *Annual Book of ASTM Standards*, Vol 09.01.

[3] *Annual Book of ASTM Standards*, Vol 09.02.

[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

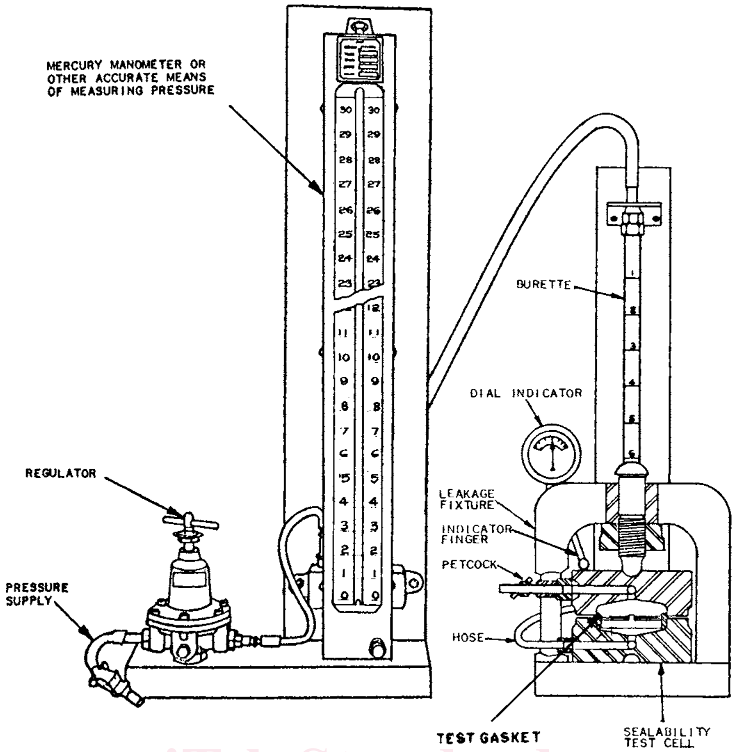

FIG. 1 Test Assembly for Determining Sealability of Gasket Materials by Liquid Leakage Measurements—Test Method A

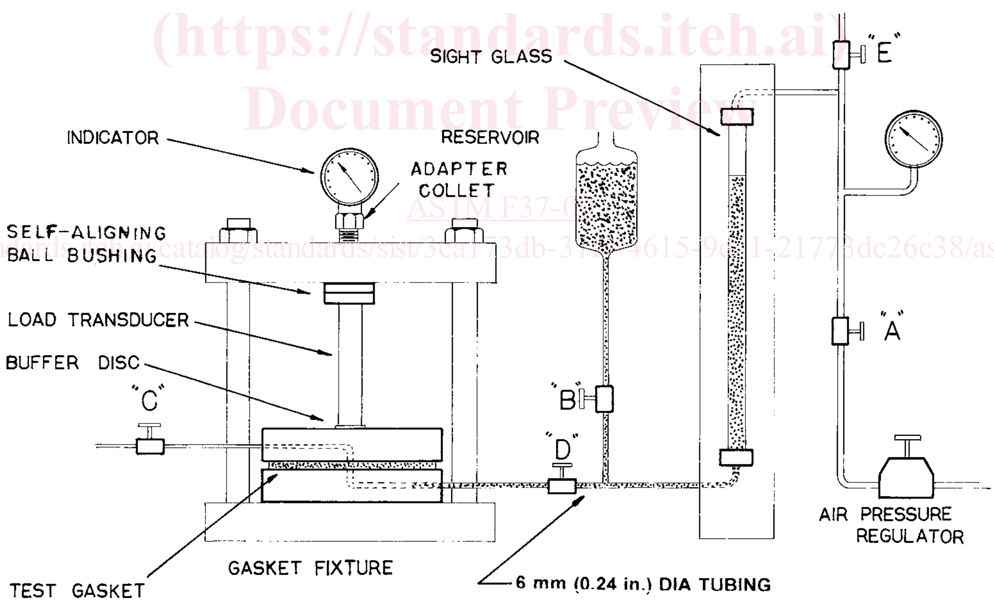

FIG. 2 Test Assembly for Determining Sealability of Gasket Materials by Liquid Leakage Measurements—Test Method B

4.4 If the fluid being used in the test causes changes, such as swelling, in the gasket material, then unpredictable results may be obtained.

5. Apparatus

5.1 *Test Method A*:

5.1.1 *Compressed Air Supply and Regulator*—A source of compressed air with a suitable regulator to control the pressure at a point between 0 and 760 mm (30 in.) of mercury.

5.1.2 *Mercury Manometer or Pressure Gage*—A 760-mm (30-in.) mercury manometer or suitable pressure gage to read the pressure to the nearest 5 mm (0.2 in.).

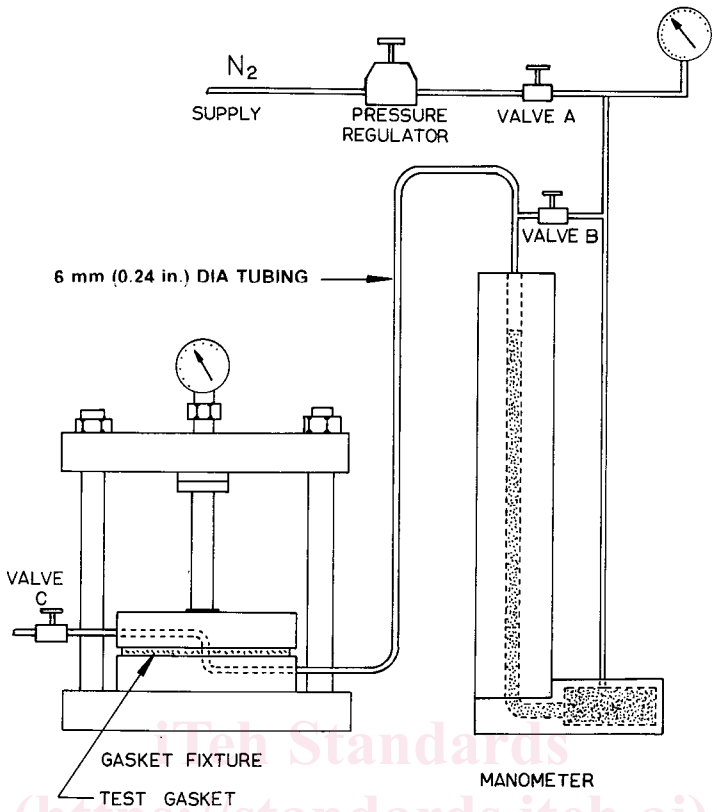

FIG. 3 Test Assembly for Determining Sealability of Gasket Materials by Gas Leakage Measurements—Test Method B

5.1.3 *Buret*, 10-mL capacity, graduated in 0.05 mL, with a connection at each end for flexible hose.

5.1.4 *Leakage Test Fixture*, [6] including a suitable dialindicator graduated in 0.025 mm (0.001 in.) and mounted as shown in Fig. 1.

5.1.5 *Petcock*, inserted in the upper flange to bleed air from the fixture.

5.1.6 *Hose*, flexible, suitable to withstand the pressure and liquid specified for the test being run.

5.1.7 *Loading Device*— A suitable means of applying an accurate external load to the leakage test fixture and of maintaining the load within ±1.0 %. Loading shall range from a minimum of 862 kPa (125 psi) to a maximum of 27.6 MPa (4000 psi).

5.2 *Test Method B*:

5.2.1 *Nitrogen Supply Cylinder and Pressure Regulator*—A cylinder of dry nitrogen with a suitable regulator to control the outlet pressure.

5.2.2 *Pressure Gage*, suitable for measuring 690-kPa (100-psig) pressure precisely. A114-mm (4.5-in.) diameter Bourdon-type gage with scale calibrated in 3.4-kPa (0.5-psig) graduations is recommended.[7]

5.2.3 *Test Fixture Cage*, consisting of top and bottom platens and four threaded studs with nuts, in accordance with Fig. 2 and Fig. 3.[8]

5.2.4 *Test Fixture Flanges*, an upper and a lower, that support the gasket being tested. The surface finish shall be 16 to 32 µin. rms.

5.2.5 *Load Transducer Assembly*, consisting of a calibrated load transducer, the diameter of which is dependent upon the load range desired (Note 1); an indicator rod that projects up the center of the transducer; a self-aligning ball bushing[9] that fits on the load transducer; and a precision dial indicator[10] for measuring the deflection of the transducer.

NOTE 1—Load transducers of various sizes will provide different load ranges. A transducer with a shaft diameter of 8.10 mm (0.319 in.) will deflect 0.025 mm/4.45 kN (0.001 in./1000 lbf). A transducer with a shaft diameter of 11.0 mm (0.433 in.) will deflect 0.025 mm/8.90 kN (0.001 in./2000 lbf). A deflection of .076 mm (.003 in.) should not be exceeded, or damage to the test fixture may result.

5.2.6 *Steel Buffer Disk*—This disk of annealed steel prevents the hardened-steel transducer from damaging the top of the flange.

[6] A suitable test fixture can be obtained from Ehrhardt Tool and Machine Co., 2224 N. 10th St., St. Louis, MO, or Metal Samples Co., Inc., Route 1, PO Box 152, Munford, AL 36268. Detailed drawings of this apparatus are available at a nominal cost from ASTM. Request Adjunct No. 12-600370-00.

[7] A suitable gage is available from U.S. Gauge Division, PO Box 152, Sellersville, PA 18960 as a 1900 Series, 200 psi pressure range.

[8] A suitable test fixture can be obtained from the Metal Samples Co., Inc., Route 1, PO Box 152, Munford, AL 36268.

[9] A Torrington self-aligning ball bushing, Model 6SF10, has been found satisfactory.

[10] A Starrett dial indicator, No. 25209, has been found satisfactory. It is 50 mm (2 in.) in diameter and has a total range of 0.152 mm (0.006 in.), with scale divisions of 0.013 mm (0.0005 in.).