Designation: ~~F36 – 99 (Reapproved 2009)~~ F36 – 15

Standard Test Method for Compressibility and Recovery of Gasket Materials[1]

This standard is issued under the fixed designation F36; 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 determination of the short-time compressibility and recovery at room temperature of sheet-gasket materials, form-in-place gaskets, and in certain cases, gaskets cut from sheets. It is not intended as a test for compressibility under prolonged stress application, generally referred to as "creep," or for recovery following such prolonged stress application, the inverse of which is generally referred to as "compression set." Also, it is not intended for tests at other than room temperature. A resiliency characteristic (the amount recovered expressed as a percentage of the compressed thickness) may also be calculated from the test data where desired.

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

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D3297 Practice for Molding and Machining Tolerances for PTFE Resin Parts (Withdrawn 1997)[3]

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

F104 Classification System for Nonmetallic Gasket Materials

3. Apparatus

3.1 The testing machine[4] shall consist of the following components:

3.1.1 *Anvil*—A hardened and ground surface of 31.7 mm (1.250 in.) minimum diameter.

3.1.2 *Penetrator*—A steel cylinder of diameter (within ± 0.025 mm (0.001 in.)) specified for the type of material being tested, with the cylinder end hardened and ground. Penetrator diameters for various types of gasket materials are as shown in Table 1, unless otherwise specified.

3.1.3 *Dial*—An indicating dial, or dials, graduated in 0.025 mm (0.001 in.) to show the thickness of the specimen during the test. Readings shall be estimated to the nearest 0.002 mm (0.0001 in.).

3.1.4 *Preload*—A preload which shall include the weight of the penetrator itself and added weights to give the value specified within ±1 %. Preloads for various types of gasket materials are as shown in Table 1, unless otherwise specified.

3.1.5 *Loading Device*— A device for applying a specified major load to the upper end of the penetrator, which may consist of an arrangement of dead weights, a hydraulic cylinder, an air cylinder, or any other device capable of applying the major load at a slow uniform rate and to an accuracy of ±1 %. The major load shall be in addition to the specified preload. Major loads for various types of gasket materials are as shown in Table 1, unless otherwise specified.

4. Test Specimen

4.1 The test specimen in Procedures A through K, inclusive, as described in Table 1, shall have a minimum area of 6.5 cm^2 (1 $in.^2$) in the form of a square, except in the case of cork composition, and cork and cellular rubber materials, which shall have a

[1] This test method is under the jurisdiction of ASTM Committee F03 on Gaskets and is the direct responsibility of Subcommittee F03.20 on Mechanical Test Methods. Current edition approved ~~Oct. 1, 2009~~Jan. 1, 2015. Published ~~March 2010~~February 2015. Originally approved in 1951. Redesignated F36 in 1963. Last previous edition approved in ~~2003~~2009 as F36 – 99 ~~(2003).~~(2009). DOI: ~~10.1520/F0036-99R09.~~10.1520/F0036-15.

[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] Contact ASTM for a list of recommended suppliers.

TABLE 1 Conditioning and Test Loads for Gasket Materials

Procedure[A]	Type of Gasket Material	F104 Identification First Two Numerals of Six-Digit Number	Conditioning Procedure[B]	Penetrator Diameter, mm (in.)	Pre-Load N (lbf)	Major Load, N (lbf)	Total Load (Sum of Major Load and Pre-Load)	
							N (lbf)	MPa (psi)
~~A~~	~~Compressed asbestos sheet; asbestos beater sheet; flexible graphite~~	~~F11, F12, F51, F52~~	~~1 h at 100 ± 2°C (212± 3.6°F). Cool in desiccator over a suitable desiccant at 21 to 30°C (70 to 85°F)~~	~~6.4 (0.252)~~	~~22.2 (5)~~	~~1090 (245)~~	~~1112 (250)~~	~~34.5 (5000)~~
A	Compressed asbestos sheet; asbestos beater sheet; flexible graphite	F11, F12, F51, F52	1 h at 100 ± 2°C (212± 3.6°F). Cool in desiccator over a suitable desiccant at 21 to 30°C (70 to 85°F)	6.4 (0.252)	22.2 (5)	1090 (245)	1112 (250)	34.5 (5000)
H	Asbestos paper and millboard	F13	4 h at 100 ± 2°C (212± 3.6°F). Cool as in Procedure A	6.4 (0.252)	4.4 (1)	218 (49)	222 (50)	6.89 (1000)
~~F~~	~~Cork composition Cork and cellular rubber~~	~~F21, F23~~	~~at least 46 h at 21 to 30°C (70 to 85°F) and 50 to 55 % relative humidity~~	~~28.7 (1.129)~~	~~4.4 (1)~~	~~440 (99)~~	~~445 (100)~~	~~0.69 (100)~~
F	Cork composition Cork and cellular rubber	F21, F23	at least 46 h at 21 to 30°C (70 to 85°F) and 50 to 55 % relative humidity	28.7 (1.129)	4.4 (1)	440 (99)	445 (100)	0.69 (100)
B	Cork and rubber	F22	at least 46 h at 21 to 30°C (70 to 85°F) and 50 to 55 % relative humidity	12.8 (0.504)	4.4 (1)	351 (79)	356 (80)	2.76 (400)
~~G~~	~~Treated and untreated papers from cellulose or other organic fibers~~	~~F31, F32, F33, F34~~	~~4 h at 21 to 30°C (70 to 85°F) over a suitable desiccant followed immediately by at least 20 h at 21 to 30°C and 50 to 55 % relative humidity~~	~~6.4 (0.252)~~	~~4.4 (1)~~	~~218 (49)~~	~~222 (50)~~	~~6.89 (1000)~~
G	Treated and untreated papers from cellulose or other organic fibers	F31, F32, F33, F34	4 h at 21 to 30°C (70 to 85°F) over a suitable desiccant followed immediately by at least 20 h at 21 to 30°C and 50 to 55 % relative humidity	6.4 (0.252)	4.4 (1)	218 (49)	222 (50)	6.89 (1000)
~~J~~	~~Compressed nonasbestos sheet; non-asbestos beater sheet~~	~~F71, F72~~	~~1 h at 100 ± 2°C (212 ± 3.6°F). Cool in desiccator over a suitable desiccant at 21 to 30°C (70 to 85°F)~~	~~6.4 (0.252)~~	~~22.2 (5)~~	~~1090 (245)~~	~~1112 (250)~~	~~34.5 (5000)~~
J	Compressed nonasbestos sheet; non-asbestos beater sheet	F71, F72	1 h at 100 ± 2°C (212 ± 3.6°F). Cool in desiccator over a suitable desiccant at 21 to 30°C (70 to 85°F)	6.4 (0.252)	22.2 (5)	1090 (245)	1112 (250)	34.5 (5000)
~~K~~	~~Non-asbestos paper and millboard~~	~~F73~~	~~4 h at 100 ± 2°C (212 ± 3.6°F). Cool as in Procedure J.~~	~~6.4 (0.252)~~	~~4.4 (1)~~	~~218 (49)~~	~~222 (50)~~	~~6.89 (1000)~~
K	Non-asbestos paper and millboard	F73	4 h at 100 ± 2°C (212 ± 3.6°F). Cool as in Procedure J.	6.4 (0.252)	4.4 (1)	218 (49)	222 (50)	6.89 (1000)
~~L~~	~~Fluorocarbon polymer~~	~~F42~~	~~None~~	~~6.4~~	~~22.2~~	~~534~~	~~556~~	~~17.25~~
L	Fluorocarbon polymer[C] (Sheet, Form-in-Place Gaskets)	F41, F42, F45	1 h at 21 to 30°C (70 to 85°F) and 50 to 55 % relative humidity	6.4 (0.252)	22.2 (5)	534 (120)	556 (125)	17.25 (2500)
	~~(Form-in-Place Gaskets)~~			~~(0.252)~~	~~(5)~~	~~(120)~~	~~(125)~~	~~(2500)~~
M	Fluorocarbon polymer[C] (Sheet, Form-in-Place Gaskets)	F41, F42, F45	1 h at 21 to 30°C (70 to 85°F) and 50 to 55 % relative humidity	6.4 (0.252)	22.2 (5)	1090 (245)	1112 (250)	34.5 (5000)

[A] Procedures C, D, and E were deleted from Test Method F36 to ensure compliance with conditioning procedures in Sections 6 and 7 of Specification D1170, which appear as part of Classification F104.
[B] Anhydrous calcium chloride and silica gel have been determined to be suitable desiccants.
[C] Please refer to 6.1 for specific information regarding Fluorocarbon polymer, Type 4, materials.

test specimen in the form of a circle 6.5 cm^2 in area. The test specimen shall consist of a single ply or a number of superimposed plies sufficient to give a minimum nominal thickness of 1.6 mm (1/16 in.)[5] for all materials except cork composition, cork and rubber materials, and cork and cellular rubber materials, for which the minimum nominal thickness shall be 3.2 mm (1/8 in.). If applied to specimens outside of the test thicknesses, the results shall be regarded merely as indicative. For specification purposes, agreement on compressibility and recovery figures shall be reached between producer and consumer for those materials whose thickness in a single ply or multiple plies does not fall within the tolerances of the two nominal thicknesses specified. The tolerances for the test thicknesses are listed in Classification F104, Table 3. The specimen shall contain no joint or separation within the minimum test area.

[5] Use of thicker specimens may result in lower compressibility and higher recovery versus standard.