Designation: F 1315 – 00

Standard Test Method for Density of a Sheet Gasket Material[1]

This standard is issued under the fixed designation F 1315; 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 procedure for determining the density of a gasket material.

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:*

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[2]

F 104 Classification System for Nonmetallic Gasket Materials[3]

3. Summary of Test Method

3.1 A die-cut specimen conditioned. Thickness, weight and area are measured and the density is calculated and reported.

4. Significance and Use

4.1 Density is an important property of a gasket material, since it has an inverse relationship to the void volume of the material. Density is often used in a specification, since relationships to sealability, compressibility, creep relaxation, and tensile strength can be found for a given gasket grade.

4.2 Density is a measurement of the mass to the volume ratio and therefore easily determined with a weight scale and thickness measuring device. This test method requires from 1 h to two days of sample conditioning, which is necessary to achieve a high level of precision, but which detracts from its usefulness as a production test method. Where it must be modified for manufacturing control, it is recommended that thickness and weight measurement methods be adhered to strictly.

5. Interferences

5.1 Moisture adds to the weight of most gasket specimens, and may cause the material to swell. Proper conditioning of the specimen should control moisture as a variable.

6. Apparatus

6.1 *Thickness*—A thickness measurement device actuated by a dead weight load as specified in Table 1. The presser foot shall be 6.40 ± 0.13 mm (0.252 ± 0.005 in.) in diameter. The device shall be capable of reading within 1% of the thickness being measured. The anvil shall have a diameter not less than that of the presser foot.

6.2 *Weight*—An analytical balance accurate to ±1% of the specimen weight.

7. Specimen Conditioning

7.1 Specimen shall be conditioned in accordance with their classification as specified in Classification System F 104 prior to testing.

8. Test Specimen

8.1 Three specimens are to be measured.

8.2 Specimen size and shape is left to the discretion of the tester. In no case, however, should the area of the specimen be less than 25 cm^2(4 $in.^2$). The area of the specimen shall be measured accurate to ±1%. For this reason a die cut specimen is required.

9. Procedure

9.1 Remove the specimens one at a time from the conditioning chamber if not in a properly conditioned room, and weigh on the analytical balance, recording the weight.

9.2 Measure area of specimen.

9.3 Measure the thickness of the specimen using the proper size presser foot and dead weight as specified in Table 1. The number of points to be measured will be dependent upon the

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

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

TABLE 1 Applied Pressures

Type of Material (First Numeral of Six Digit Number (from F 104))	Pressure on Specimen, kPa (psi)	Total Force on Presser Foot, N (oz) (reference)
1, 5, or 7	80.3 ± 6.9 (11.5 ± 1.0)	2.50 (9.0)
2 or 4	35 ± 6.9 (5.1 ± 1.0)	1.11 (4.0)
3	55 ± 6.9 (8.0 ± 1.0)	1.75 (6.3)
0 or 9[A]	55 ± 6.9 (8.0 ± 1.0)	1.75 (6.3)

[A] Unless otherwise specified on engineering drawing or other supplement to this test method.

TABLE 2 Precision Data

Material Designation	Mean Value kg/m^3 ($\times 10^3$)	Within Laboratory		Between Laboratories
		S	CV%	CV%
A	0.3972	0.0106	2.68	3.11
B	1.0133	0.0062	0.61	1.44
C	1.1148	0.0201	1.80	2.88
D	1.6232	0.0135	1.22	1.83
E	1.3465	0.0198	1.00	1.97

specimen size and shape, but a minimum of five points must be measured and the average used. Record the thickness.

10. Calculation

10.1

$$\text{Density } (g/cm^3) = \frac{W \times 10}{T \times A} \quad (1)$$

where:

W = weight of specimen, g,
T = thickness of specimen, mm, and
A = area of specimen, cm^2.

11. Report

11.1 Report the following information:

11.1.1 Specimen label (for example, grade designation, batch number, etc.).

11.1.2 Specimen thickness.

11.1.3 Specimen area.

11.1.4 Specimen weight.

11.1.5 Manufacturing date, if known.

11.1.6 Test date.

11.1.7 Density in kg/m^3(g/cm^3).

11.1.8 Tester's identification.

12. Precision and Bias

12.1 *Precision*—The inherent variability for this test method was determined by an interlaboratory test program using five materials in 12 laboratories with five measurements per material. The data were analyzed using Practice E 691 for statistical inferences. Results are listed in Table 2.

12.2 *Bias*—Since there is no accepted reference material suitable for determining bias for the procedure in this test method for measuring density, no statement on bias is being made.

13. Keywords

13.1 density; gasket material; sheet