



Designation: B528 – 16 (Reapproved 2020)^{ε1}

Standard Test Method for Transverse Rupture Strength of Powder Metallurgy (PM) Specimens¹

This standard is issued under the fixed designation B528; 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.

^{ε1} NOTE—An editorial change was made to 10.1 in October 2020.

1. Scope*

1.1 This test method covers determination of the transverse rupture strength of sintered, including post-treated, powder metallurgy test specimens by subjecting them to a uniformly increasing transverse force under controlled conditions. The term “transverse rupture strength” as used herein, defines the stress, calculated from the flexure formula required to break a specimen as a simple beam supported near the ends and applying the force midway between the fixed line center of the supports.

1.2 *Limitations*—The transverse rupture test is only applicable to relatively brittle materials. In cases where a ductile specimen is being tested and the permanent deflection as a result of testing exceeds 0.02 in. (0.5 mm), the test results may be questionable.

1.3 Test Method B406 should be consulted for determining the transverse rupture strength of cemented carbides.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *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.*

1.6 *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.*

¹ This test method is under the jurisdiction of ASTM Committee B09 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.05 on Structural Parts.

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2. Referenced Documents

2.1 *ASTM Standards*:²

B243 Terminology of Powder Metallurgy

B312 Test Method for Green Strength of Specimens Compacted from Metal Powders

B406 Test Method for Transverse Rupture Strength of Cemented Carbides

B925 Practices for Production and Preparation of Powder Metallurgy (PM) Test Specimens

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

3. Terminology

3.1 *Definitions*—For definitions of terms in this test method, see Terminology B243.

4. Significance and Use

4.1 This test method is used to measure the strength of sintered, including post-treated, specimens. Transverse rupture strength is not a design value. For many sintered materials, transverse rupture strength is approximately twice the ultimate tensile strength.

5. Apparatus

5.1 *Micrometer*, capable of measuring with a resolution of 0.0001 in. (0.002 mm).

5.2 *Transverse Rupture Strength Fixture*, as shown in Fig. 1.

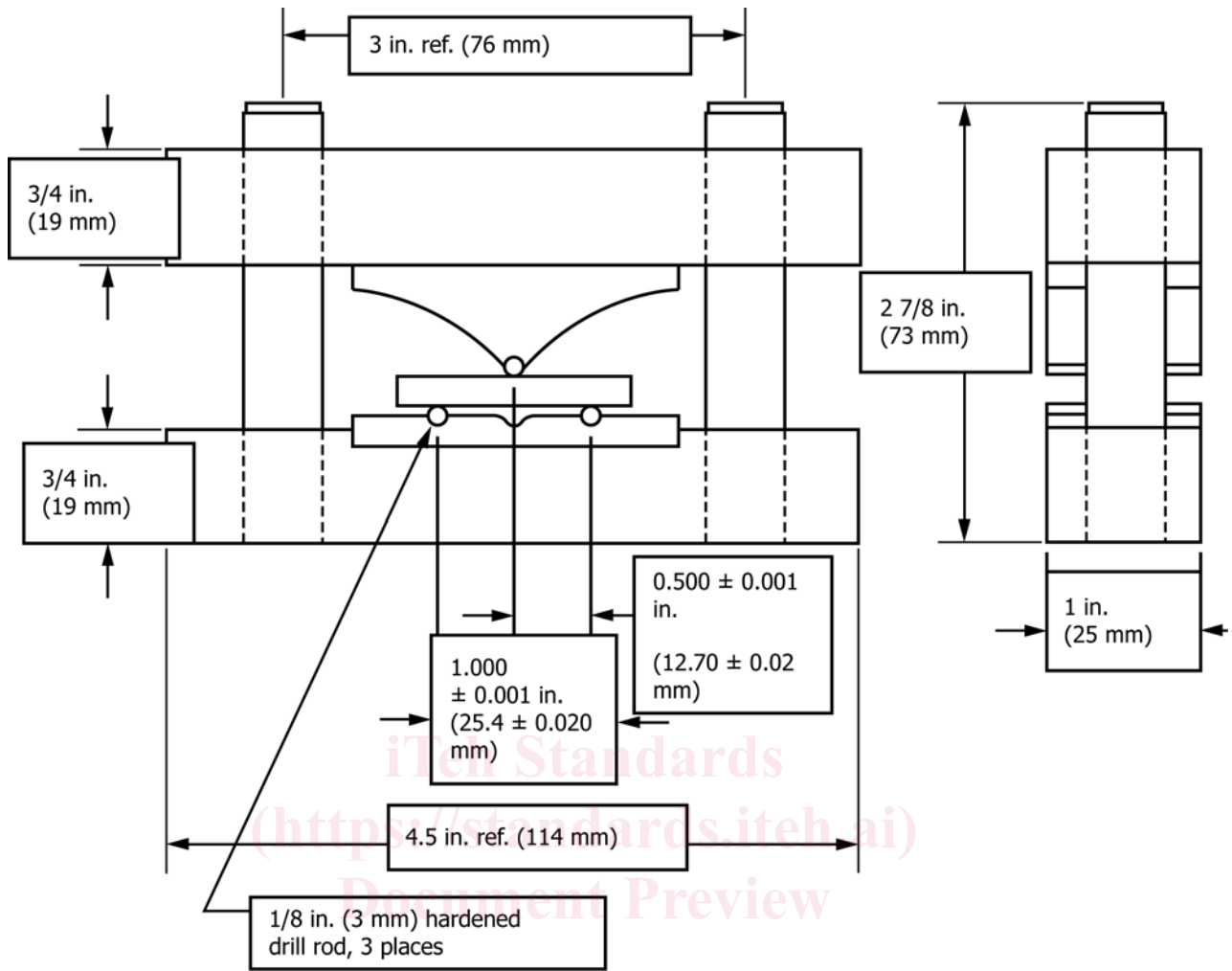
5.3 *Compression Testing Machine*, readable to within 0.1 % of full scale reading. Use the lowest testing range that can provide a measurable result.

6. Test Specimen

6.1 The thin test specimen shall have the shape and dimensions shown in the figure titled PM Transverse Rupture Strength Test Specimen of Practices B925.

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



Drill rods 0.625 in. long (16 mm) and hardened to 60 HRC min

NOTE 1—This fixture is used in Test Method B312.

FIG. 1 Transverse Rupture Test Fixture

7. Procedure

7.1 Prepare test specimens by pressing and sintering using tooling shown in the figure titled Transverse Rupture Test Specimen, Typical Laboratory Tooling of Practices B925, or machine from finished parts. Measure the width and thickness of the specimens to the nearest 0.001 in. (0.02 mm) with a micrometer.

7.2 Locate the specimen in the transverse rupture test fixture perpendicular to the supporting rods. Apply compressive force parallel to the pressing direction of the specimen at a no-load crosshead speed of not greater than 0.2 in./min (5 mm/min) until rupture occurs. Record the load at which the specimen breaks (force required to rupture specimen, P).

8. Calculation

8.1 Calculate the transverse rupture strength of the specimen as follows:

$$TRS = (3 \times P \times L) / (2 \times T^2 \times W) \quad (1)$$

where:

TRS = transverse rupture strength of the specimen, psi (MPa),

P = force required to rupture the specimen, lbf (N),

L = the distance between the centers of the supporting rods, 1.000 in. (25.4 mm),

W = width of the specimen, in. (mm), and

T = thickness of specimen, in. (mm).