



Standard Test Method for Permeability of Powder Metallurgy (PM) Bearings Using Nitrogen Gas¹

This standard is issued under the fixed designation B966; 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 the determination of the permeability of a PM bearing when subjected to pressurized nitrogen under controlled conditions.

1.2 The values stated in SI units are to be regarded as the standard with the exception of flow rate for which the cm^3/min unit is the industry standard.

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

B243 Terminology of Powder Metallurgy

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

2.2 *IEEE/ASTM Standards:*

IEEE/ASTM SI-10 American National Standard for Use of the International System of Units (SI): The Modern Metric System

3. Terminology

3.1 Definitions of powder metallurgy (PM) terms can be found in Terminology **B243**. Additional descriptive material is available in the Related Materials section of Volume 02.05 of the *Annual Book of ASTM Standards*.

4. Summary of Test Method

4.1 Bearings are sampled and dried.

4.2 A bearing is sealed between two plates and nitrogen is introduced into the inner diameter (ID) of the bearing at a standard pressure.

4.3 Nitrogen flow through the bearing is measured using a series of rotameters (common tapered glass tube flow meters).

5. Significance and Use

5.1 In service, there is a space between a shaft and a self-lubricating PM bearing that contains an oil film when the bearing is operating properly. In the event the oil film is disrupted or fails to form the bearing will exhibit increased wear and possibly fail. Therefore the ability for oil to flow through the porosity of a PM bearing is critical to the performance of the bearing.

5.2 The porosity of the bearing must be open to the surface and interconnected within the bearing. This allows the oil in a self-lubricating PM bearing to flow during operation to the space between the bearing and the shaft to form an oil film and protect the shaft from wear.

5.3 The ability of a gas to flow through the bearing reflects the openness and interconnected properties of the porosity in the bearing.

5.4 Data from this test can be used as an internal quality tool and can be reported to buyers of bearings.

5.5 A number of other factors also affect the performance of the bearing and the movement of oil; factors such as the oil viscosity, operating temperature, load, shaft speed, surface area, surface finishes and others. This test provides information on only one property and cannot be the sole consideration in the design and testing of a bearing application.

6. Apparatus

6.1 Source of pressurized air (700 ± 140 kPa).

6.2 Source of pressurized nitrogen (200 ± 34.5 kPa).

6.3 *Rotameters*—(calibrated at 34.5 ± 0.34 kPa)

Rotameter 1 0-50 cm^3/min

Rotameter 2 0-500 cm^3/min

Rotameter 3 0-2500 cm^3/min

Rotameter 4 0-50000 cm^3/min

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 **B09.04** on Bearings.

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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.