



Designation: D 1316 – 93 (Reapproved 2001)

## Standard Test Method for Fineness of Grind of Printing Inks By the NPIRI Grindometer<sup>1</sup>

This standard is issued under the fixed designation D 1316; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method describes the procedure for determining the fineness of grind of printing inks using a NPIRI grindometer. It evaluates the size of the largest particles in a finished dispersion but not average particle size or concentration of sizes.

1.2 This test method is applicable to any dispersion that is fine enough to fall within the 0–25  $\mu\text{m}$  range of the specified grind gage. With a minor variation in procedure, it is applicable to both paste (nonvolatile) and liquid (volatile) inks.

NOTE 1—The 0–25  $\mu\text{m}$  gage specified in this test method is similar in principle to the 0–100  $\mu\text{m}$  Hegman gage described in Test Method D 1210. Sieve analysis for concentration of particles above 45  $\mu\text{m}$  is covered in Test Method D 2067.

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:* <http://www.astm.org/catalog/standards/sist/5ec77a7e-bf19-489a-9310-0001>
- D 1210 Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage<sup>2</sup>
  - D 2067 Test Method for Coarse Particles in Printing Ink Dispersions<sup>3</sup>
  - E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method<sup>4</sup>

### 3. Terminology

#### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *fineness of grind*—a measure of the size and prevalence of oversize particles in a printing ink dispersion.

3.1.2 *scratch*—a depression at least 10 mm in length in the surface of a grind gage drawdown. A scratch develops when a particle (or agglomerate) is trapped between the blade and the bottom of the path and is drawn along by the blade.

3.1.3 *speckle*—protuberance of particles above the surface of a grind gage drawdown. Speckles occur at gage depths greater than those at which scratches occur and are caused by oversize particles that are not hard enough or of the proper size to produce scratches.

### 4. Summary of Test Method

4.1 This test method utilizes a grind gage having two precision machined grooves each 1 in. (25.4 mm) wide and with a 0–1 mil (0–25  $\mu\text{m}$ ) taper. The test specimen is drawn down the paths slowly if a nonvolatile (paste) ink, briskly if a volatile (liquid) ink. The drawdowns are examined for the scale readings at which four and ten scratches appear and at which a preponderance of speckles disappear. The mean of readings from four paths constitutes a single determination.

### 5. Significance and Use

5.1 Oversize particles in a printing ink may damage a printing plate and adversely affect the appearance of printed ink films. Fineness of grind measurements are useful for deciding when to stop the dispersion process and for determining if the test material meets specifications as agreed upon between the supplier and the customer.

5.2 Speckle endpoints identify the size of the largest particles in a finished printing ink. They provide a better measure of overall dispersion quality than do scratch endpoints but, while their single-operator precision is better, their between-laboratory precision is far poorer.

5.3 Scratch endpoints indicate the size and relative number of the coarsest hard particles in a finished printing ink. They provide a measure of grittiness; the higher the 4-scratch endpoint, the grittier the ink; the smaller the difference between the 4- and 10-scratch endpoints, the larger the number of gritty particles in this range. Scratch endpoints may, however, miss gritty particles that ride in the bank ahead of the scraper; for this reason, they are not recommended for premixes or other dispersions containing a preponderance of gritty particles.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.56 on Printing Inks.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 06.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 06.02.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 14.02.