



# Standard Guide for Testing Printing Inks and Related Materials<sup>1</sup>

This standard is issued under the fixed designation D5010; 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.

<sup>ε1</sup> NOTE—Editorial changes were made in Table 1 and Table 2 in May 2009.

## 1. Scope\*

1.1 This guide covers a list of test methods, practices, and specifications that can be used for the testing and evaluation of printing inks, printed ink films, and substrates used in their production (see [Table 1](#)).

1.2 This guide includes methods that were developed to test paints, paint films, and substrates, but may be adapted for use in testing printing inks and printed matter. Tests on raw materials and analytical methods in general have not been included. Tests for printing ink vehicles are covered in Guide [D6687](#).

NOTE 1—For the purpose of this guide, clear coatings such as overprint varnishes are classed as printing inks.

1.3 Other ASTM standards not specified here may also be applicable.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

[D16 Terminology for Paint, Related Coatings, Materials, and Applications](#)

[D6687 Guide for Testing Printing Ink Vehicles and Components Thereof](#)

## 3. Terminology

### 3.1 Definitions:

3.1.1 The following definition is given in Terminology [D16](#).

3.1.2 *printing ink, n*—a colored or pigmented liquid or paste composition that dries to a solid film after application as a thin layer by printing machinery.

3.1.2.1 *Discussion*—Printing inks may contain vehicles, colorants, waxes, solvents, and other additives. Bulk inks are

tested for dispersion, tinting strength, density, heat and storage stability, rheology, and printing properties.

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

3.2.1 *printed ink film, n*—thin layer of a printing ink deposited onto a substrate by means of a laboratory or production printing press, occasionally by a drawdown or roll-out technique.

3.2.1.1 *Discussion*—Printed matter is the usual medium by which inks are tested for appearance properties, drying, and resistance to various agents.

3.2.2 *printing substrate, n*—material onto which ink is deposited in the production of printed matter.

3.2.2.1 *Discussion*—Printing substrates include paper, paperboard, plastic film, glass, and metallic surfaces. In this guide, standards relating to substrates are largely restricted to properties associated with appearance and printability.

## 4. Test Categories

4.1 For convenience in selection, the test methods, practices, and specifications, listed in this guide are classified into three groups by type of printing process and in subgroups indicating whether the test is conducted on a bulk ink, a printed ink film, or a substrate (see [Table 2](#)). The group is given in the left column preceding the test method reference. The classifications are as follows:

### 4.1.1 Group 1—Applicable in General:

*Class A*—Bulk inks.

*Class B*—Printed ink films.

*Class C*—Substrates.

### 4.1.2 Group 2—Applicable to Low Viscosity or Liquid Inks Associated With Flexography or Gravure:

*Class A*—Bulk inks.

*Class B*—Printed ink films.

*Class C*—Substrates.

### 4.1.3 Group 3—Applicable to High Viscosity or Paste Inks Associated With Letterpress, Lithography, or Silk Screen:

*Class A*—Bulk inks.

*Class B*—Printed ink films.

*Class C*—Substrates.

<sup>1</sup> This guide is under the jurisdiction of the ASTM Committee [D01](#) on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee [D01.56](#) on Printing Inks.

Current edition approved June 1, 2008. Published July 2008. Originally approved in 1991. Last previous edition approved in 2008 as D5010–08. DOI: 10.1520/D5010-08AE01.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

## 5. Precision and Bias

5.1 If available, precision for each test method listed can be found in the latest revision of that test method.

## 6. Keywords

6.1 printed matter; printing inks; printing substrates; test methods and practices (tabulation of)

**TABLE 1 Numerical Listing of Ink-Related Standards**

ASTM Designation	Volume	Title
D16	06.01	Terminology for Paint, Related Coatings, Materials, and Applications
D56	05.03 06.04	Test Method for Flash Point by Tag Closed Cup Tester
D93	04.09 05.01 06.04	Test Methods for Flash Point by Pensky-Martens Closed Cup Tester
D185	06.03	Test Methods for Coarse Particles in Pigments
D344	06.01	Test Method for Relative Hiding Power of Paints by the Visual Evaluation of Brushouts
D523	06.01	Test Method for Specular Gloss
D528	15.09	Test Method for Machine Direction of Paper and Paperboard
D562	06.01	Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
D644	15.09	Test Method for Moisture Content of Paper and Paperboard by Oven Drying
D685	15.09	Practice for Conditioning Paper and Paperboard Products for Testing
D724	15.09	Test Method for Surface Wettability of Paper (Angle-of-Contact Method)
D780	15.09	Test Method for Printing Ink Permeation of Paper (Castor Oil Test)
D822	06.01	Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
D869	06.02	Test Method for Evaluating the Degree of Settling of Paint
D918	15.09	Test Method for Blocking Resistance of Paper and Paperboard
D971	05.01	Test Method for Interfacial Tension of Oil Against Water by the Ring Method
D1006	06.01	Practice for Conducting Exterior Exposure Tests of Paints on Wood
D1014	06.01	Practice for Conducting Exterior Exposure Tests of Paints and Coatings on Metal Substrates
D1200	06.01	Test Method for Viscosity by Ford Viscosity Cup
D1210	06.01	Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage
D1259	06.01	Test Methods for Nonvolatile Content of Resin Solutions
D1308	06.01	Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
D1310	05.01 06.04	Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
D1316	06.02	Test Method for Fineness of Grind of Printing Inks by the NPIRI Grindometer
D1331	15.04	Test Methods for Surface and Interfacial Tension of Solutions of Surface-Active Agents
D1353	06.04	Test Method for Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products
D1474	06.01	Test Methods for Indentation Hardness of Organic Coatings
D1475	06.01	Test Method for Density of Liquid Coatings, Inks, and Related Products
D1535	06.01	Practice for Specifying Color by the Munsell System
D1544	06.01	Test Method for Color of Transparent Liquids (Gardner Color Scale)
D1545	06.03	Test Methods for Viscosity of Transparent Liquids by Bubble Time Method
D1590	11.01	Test Methods for Surface Tension of Water and Waste Water
D1640	06.03	Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
D1644	06.01	Test Methods for Nonvolatile Content of Varnishes
D1653	06.01	Test Methods for Water Vapor Transmission of Organic Coating Films
D1725	06.03	Test Method for Viscosity of Resin Solutions
D1729	06.01	Practice for Visual Evaluation of Colors and Color Differences of Diffusely-Illuminated Opaque Materials
D1849	06.02	Test Method for Package Stability of Paint
D1963	06.03	Test Method for Specific Gravity of Drying Oils, Varnishes, Resins, and Related Materials at 25/25°C
D2066	06.02	Test Methods for Relative Tinting Strength of Paste-Type Printing Ink Dispersions
D2067	06.02	Test Method for Coarse Particles in Printing Ink Dispersions
D2090	06.03	Test Method for Clarity and Cleanliness of Paint and Ink Liquids
D2091	06.02	Test Method for Print Resistance of Lacquers
D2196	06.01	Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer
D2243	06.02	Test Method for Freeze-Thaw Resistance of Water-Borne Coatings
D2244	06.01	Practice for Calculation of Color Differences from Instrumentally Measured Color Coordinates
D2248	06.01	Practice for Detergent Resistance of Organic Finishes
D2337	06.02	Test Method for Freeze-Thaw Stability of Multicolor Lacquers
D2369	06.01	Test Method for Volatile Content of Coatings
D2482	15.09	Test Method for Surface Strength of Paper (Wax Pick Method)
D2574	06.01	Test Method for Resistance of Emulsion Paints in the Container to Attack by Microorganisms
D2578	08.02	Test Method for Wetting Tension of Polyethylene and Polypropylene Films
D2616	06.01	Test Method for Evaluation of Visual Color Difference with a Gray Scale
D2794	06.01	Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
D2805	06.01	Test Method for Hiding Power of Paints by Reflectometry
D3134	06.01	Practice for Establishing Color and Gloss Tolerances
D3258	06.02	Test Method for Porosity of White or Near White Paint Films by Staining
D3278	06.01	Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
D3359	06.01	Test Methods for Measuring Adhesion by Tape Test
D3361	06.01	Practice for Unfiltered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
D3363	06.01	Test Method for Film Hardness by Pencil Test
D3424	06.02	Practice for Evaluating the Relative Lightfastness and Weatherability of Printed Matter
D3456	06.01	Practice for Determining by Exterior Exposure Tests the Susceptibility of Paint Films to Microbiological Attack
D3732	06.02	Practice for Reporting Cure Times of Ultraviolet-Cured Coatings
D3792	06.01	Test Method for Water Content of Coatings by Direct Injection into a Gas Chromatograph
D3825	05.03	Test Method for Dynamic Surface Tension by the Fast-Bubble Technique

**TABLE 1** *Continued*

ASTM Designation	Volume	Title
D3828	05.03	Test Method for Flash Point by Small Scale Closed Cup Tester
D3924	06.01	Specification for Standard Environment for Conditioning and Testing Paint, Varnish, Lacquer, and Related Materials
D3925	06.01	Practice for Sampling Liquid Paints and Related Pigmented Coatings
D3928	06.02	Test Method for Evaluation of Gloss or Sheen Uniformity
D3934	06.01	Test Method for Flash/No Flash Test—Equilibrium Method by a Closed-Cup Apparatus
D3960	06.01	Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
D4017	06.01	Test Method for Water in Paints and Paint Materials by Karl Fischer Method
D4040	06.02	Test Method for Rheological Properties of Paste Printing and Vehicles by the Falling-Rod Viscometer
D4060	06.01	Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
D4086	06.01	Practice for Visual Evaluation of Metamerism
D4141	06.01	Practice for Conducting Black Box and Solar Concentrating Exposures of Coatings
D4144	06.02	Test Method for Estimating Package Stability of Coatings for Ultraviolet Curing
D4147	06.02	Practice for Applying Coil Coatings Using the Wire-Wound Drawdown Bar
D4212	06.01	Test Method for Viscosity by Dip-Type Viscosity Cups
D4287	06.01	Test Method for High-Shear Viscosity Using the ICI Cone/Plate Viscometer
D4302	06.02	Specification for Artists' Oil, Resin-Oil, and Alkyd Paints
D4303	06.02	Test Methods for Lightfastness of Colorants Used in Artists' Materials
D4359	06.01	Test Method for Determining Whether a Material is a Liquid or a Solid
D4361	06.01	Test Method for Apparent Tack of Printing Inks and Vehicles by a Three-Roller Tackmeter
D4366	06.01	Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests
D4449	06.01	Test Method for Visual Evaluation of Gloss Differences Between Surfaces of Similar Appearance
D4459	08.03	Practice for Xenon-Arc Exposure of Plastics Intended for Indoor Applications
D4518	06.01	Test Methods for Measuring Static Friction of Coating Surfaces
D4541	06.02	Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
D4674	08.03	Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments
D4713	06.02	Test Methods for Nonvolatile Content of Heatset and Liquid Printing Ink and Systems
D4758	06.03	Test Method for Nonvolatile Content of Latexes
D4942	06.02	Test Methods for Water Pickup of Lithographic Printing Inks and Vehicles in a Laboratory Mixer
D5031	06.01	Practice for Enclosed Carbon-Arc Exposure Tests of Paint and Related Coatings
D5039	15.09	Test Methods for Identification of Wire Side of Paper
D5067	06.02	Specification for Artists' Watercolor Paints
D5098	06.02	Specification for Artists' Acrylic Dispersion Paints
D5181	06.02	Test Method for Abrasion Resistance of Printed Matter by the GA-CAT Comprehensive Abrasion Tester
D5264	15.09	Practice for Abrasion Resistance of Printed Materials by the Sutherland Rub Tester
D5383	06.02	Practice for Visual Determination of the Lightfastness of Art Materials by Art Technologists
D5398	06.02	Practice for Visual Evaluation of the Lightfastness of Art Materials by the User
D5403	06.02	Test Methods for Volatile Content of Radiation Curable Materials
D5717	06.02	Test Method for Determining Extractability of Metals from Art Materials
D5724	06.02	Specification for Gouache Paints
D5909	06.02	Test Method for Drying Time of Oxidative-Drying Printing Inks by Squalene Resistance
D6073	06.02	Test Method for Relative Setting of Heatset Printing Inks
D6419	06.02	Test Method for Volatile Content of Sheet-Fed and Coldset Web Offset Printing Inks
D6487	06.02	Practice for Preparing Prints of Paste Printing Inks by Rollouts on a Laboratory Flat-Bed Press
D6488	06.02	Terminology Relating to Print Problems
D6531	06.02	Test Method for Relative Tinting Strength of Aqueous Ink Systems by Instrumental Measurement
D6606	06.03	Test Method for Viscosity and Yield of Vehicles and Varnishes by the Duke Viscometer
D6687	06.03	Guide for Testing Printing Ink Vehicles and Components Thereof
D6688	06.02	Test Method for Relative Resistance of Printed Matter to Liquid Chemicals by a Sandwich Method
D6695	06.01	Practice for Xenon-Arc Exposures of Paints and Related Coatings
D6846	06.02	Practice for Preparing Prints of Paste Printing Inks With a Printing Gage
D7163	06.02	Test Method for Specular Gloss of Printed Matter
D7188	06.02	Terminology for Printing Inks, Materials, and Processes
D7189	06.02	Test Method for Relative Mileage of News Inks on Newsprint
D7244	06.02	Test Method for Relative Cure of Energy-Cured Inks and Coatings
D7305	06.02	Test Method for Reflection Density of Printed Matter
E284	06.01	Terminology of Appearance
E308	06.01	Test Method for Computing the Colors of Objects by Using the CIE System
E313	06.01	Practice for Calculating Yellowness and Whiteness Indices From Instrumentally Measured Colored Coordinates
E429	06.01	Test Method for Measurement and Calculation of Reflecting Characteristics of Metallic Surfaces Using Integrating Sphere Instruments
E430	06.01	Test Methods for Measurement of Gloss of High-Gloss Surfaces by Abridged Goniophotometry
E691	06.04	Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
E805	06.01	Practice for Identification of Instrumental Methods of Color and Color-Difference Measurement of Materials
E991	06.01	Practice for Color Measurement of Fluorescent Specimens Using the One-Monochromator Method
E1331	06.01	Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry
E1347	06.01	Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry
E1349	06.01	Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional (45:0 or 0:45) Geometry
F34	15.09	Practice for Construction of Test Cell for Liquid Extraction of Flexible Barrier Materials
F149	15.09	Terminology Relating to Optical Character Recognition
F151	15.09	Test Method for Residual Solvents in Flexible Barrier Materials
F372	15.09	Test Method for Water Vapor Transmission Rate of Flexible Barrier Materials Using an Infrared Detector Technique
F413	15.09	Practice for Preparation of an Offset Duplicator for Use in Functional Testing of Lithographic Copy Products
F425	15.09	Terminology Relating to Lithographic Copy Products
F909	15.09	Terminology Relating to Printers
F1125	15.09	Terminology of Image Quality in Impact Printing Systems