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Standard Guide for Testing Printing Inks and Related Materials[1]

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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 D 6687.

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:* [2]

D 16 Terminology for Paint, Related Coatings, Materials, and Applications

D 6687 Guide for Testing Printing Ink Vehicles and Components Thereof

3. Terminology

3.1 *Definitions:*

3.1.1 The following definition is given in Terminology D 16.

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* :

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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.

***A Summary of Changes section appears at the end of this standard.**

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.

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
D 16	06.01	Terminology for Paint, Related Coatings, Materials, and Applications
D 56	05.03	Test Method for Flash Point by Tag Closed Cup Tester
	06.04	
D 93	04.09	Test Method for Flash Point by Pensky-Martin Closed Tester
	05.01	
	06.04	
D 185	06.03	Test Methods for Coarse Particles in Pigments, Pastes, and Paints
D 344	06.01	Test Method for Relative Dry Hiding Power of Paints by the Visual Evaluation of Brushouts
D 523	06.01	Test Method for Specular Gloss
D 528	15.09	Test Method for Machine Direction of Paper and Paperboard
D 562	06.01	Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
D 644	15.09	Test Method for Moisture Content of Paper and Paperboard by Oven Drying
D 685	15.09	Method for Conditioning Paper and Paperboard Products for Testing
D 724	15.09	Test Method for Surface Wettability of Paper (Angle-of-Contact Method)
D 780	15.09	Test Method for Printing Ink Permeation of Paper (Castor Oil Test)
D 822	06.01	Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
D 869	06.02	Test Method for Evaluating the Degree of Settling of Paint
D 918	15.09	Test Method for Blocking Resistance of Paper and Paperboard
D 971	05.01	Test Method for Interfacial Tension of Oil Against Water by the Ring Method
D 1006	06.01	Practice for Conducting Exterior Exposure Tests of Paints on Wood
D 1014	06.01	Practice for Conducting Exterior Exposure Tests of Paints and Coatings on Metal Substrates
D 1200	06.01	Test Method for Viscosity by Ford Viscosity Cup
D 1210	06.01	Test Method for Fineness of Dispersion of Pigment-Vehicle Systems
D 1259	06.01	Test Methods for Nonvolatile Content of Resin Solutions
D 1308	06.01	Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
D 1310	05.01	Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
	06.04	
D 1316	06.02	Test Method for Fineness of Grind of Printing Inks by the NPIRI Grindometer
D 1331	15.04	Test Methods for Surface and Interfacial Tension of Solutions of Surface-Active Agents
D 1353	06.04	Test Method for Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products
D 1474	06.01	Test Methods for Indentation Hardness of Organic Coatings
D 1475	06.01	Test Method for Density of Paint, Varnish, Lacquer, and Related Products
D 1535	06.01	Test Method for Specifying Color by the Munsell System
D 1544	06.01	Test Method for Color of Transparent Liquids (Gardner Color Scale)
D 1545	06.03	Test Method for Viscosity of Transparent Liquids by Bubble Time Method
D 1590	11.01	Test Methods for Surface Tension of Water and Waste Water
D 1640	06.03	Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
D 1644	06.01	Test Methods for Nonvolatile Content of Varnishes
D 1653	06.01	Test Methods for Water Vapor Permeability of Organic Coating Films
D 1725	06.03	Test Method for Viscosity of Resin Solutions
D 1729	06.01	Practice for Visual Evaluation of Color Differences of Opaque Materials
D 1849	06.02	Test Method for Package Stability of Paint
D 1963	06.03	Test Method for Specific Gravity of Drying Oils, Varnishes, Resins, and Related Materials at 25/25°C
D 2066	06.02	Test Methods for Relative Tinting Strength of Paste-Type Printing Ink Dispersions
D 2067	06.02	Test Method for Coarse Particles in Printing Ink Dispersions
D 2090	06.03	Test Method for Clarity and Cleanness of Paint and Ink Liquids
D 2091	06.02	Test Method for Print Resistance of Lacquers
~~D 2196~~	~~06.01~~	~~Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield) Viscometer~~
D 2196	06.01	Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer
D 2243	06.02	Test Method for Freeze-Thaw Resistance of Water-Borne Coatings
D 2244	06.01	Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates
D 2248	06.01	Practice for Detergent Resistance of Organic Finishes
D 2337	06.02	Test Method for Freeze-Thaw Stability of Multicolor Lacquers
D 2369	06.01	Test Method for Volatile Content of Coatings
D 2482	15.09	Method for Wax Pick Test for Surface Strength of Paper
D 2574	06.01	Test Method for Resistance of Emulsion Paints in the Container to Attack by Microorganisms
D 2578	08.02	Test Method for Wetting Tension of Polyethylene and Polypropylene Films
D 2616	06.01	Test Method for Evaluation of Visual Color Difference with a Gray Scale
D 2794	06.01	Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
D 2805	06.01	Test Method for Hiding Power of Paints by Reflectometry
D 3134	06.01	Practice for Establishing Color and Gloss Tolerances

TABLE 1 *Continued*

ASTM Designation	Volume	Title
D 3258	06.02	Test Method for Porosity of Paint Films
D 3278	06.01	Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
D 3359	06.01	Test Methods for Measuring Adhesion by Tape Test
D 3361	06.01	Practice for Unfiltered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
D 3363	06.01	Test Method for Film Hardness by Pencil Test
D 3424	06.02	Test Methods for Evaluating the Relative Lightfastness and Weatherability of Printed Matter
D 3456	06.01	Practice for Determining by Exterior Exposure Tests the Susceptibility of Paint Films to Microbiological Attack
D 3732	06.02	Practice for Reporting Cure Times of Ultraviolet-Cured Coatings
D 3792	06.01	Test Method for Water Content of Water-Reducible Paints by Direct Injection into a Gas Chromatograph
D 3825	05.03	Test Method for Dynamic Surface Tension by the Fast Bubble Technique
D 3828	05.03	Test Method for Flash Point by Small Scale Closed Cup Tester
D 3924	06.01	Specification for Standard Environment for Conditioning and Testing Paint, Varnish, Lacquers, and Related Materials
D 3925	06.01	Practice for Sampling Liquid Paints and Related Pigmented Coatings
D 3928	06.02	Test Method for Evaluation of Gloss or Sheen Uniformity
D 3934	06.01	Test Method for Flash/No Flash Test—Equilibrium Method by a Closed-Cup Apparatus
D 3960	06.01	Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
D 4017	06.01	Test Method for Water in Paints and Paint Materials by Karl Fischer Method
D 4040	06.02	Test Method for Rheological Properties of Paste Printing Inks and Vehicles by the Falling-Rod Viscometer
D 4060	06.01	Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
D 4086	06.01	Practice for Visual Evaluation of Metamerism
D 4141	06.01	Practice for Conducting Accelerated Outdoor Exposure Tests of Coatings
D 4144	06.02	Method for Estimating Package Stability of Coatings for Ultraviolet Curing
D 4147	06.02	Practice for Applying Coil Coatings Using the Wire-Wound Drawdown Bar
D 4212	06.01	Test Method for Viscosity by Dip-Type Viscosity Cups
D 4287	06.01	Test Method for High-Shear Viscosity Using the ICI Cone/Plate Viscometer
D 4302	06.02	Specification for Artists' Oil, Resin-Oil, and Alkyd Paints
D 4303	06.02	Test Methods for Lightfastness of Colorants Used in Artists' Paints
D 4359	06.01	Test Method for Determining Whether a Material is a Liquid or a Solid
D 4361	06.01	Test Method for Apparent Tack of Printing Inks and Vehicles by a Three-Roller Tackmeter
D 4366	06.01	Test Methods for Hardness of Organic Coatings by Pendulum Damping Tests
D 4449	06.01	Test Method for Visual Evaluation of Gloss Differences Between Surfaces of Similar Appearance
D 4459	08.03	Practice for Operating an Accelerated Lightfastness Xenon-Arc-Type (Water Cooled) Light-Exposure Apparatus for the Exposure of Plastics for Indoor Applications
D 4518	06.01	Test Methods for Measuring Static Friction of Coating Surfaces
D 4541	06.02	Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
D 4674	08.03	Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments
D 4713	06.02	Test Methods for Nonvolatile Content of Printing Inks, Resin Solutions, and Vehicles
D 4758	06.03	Test Method for Nonvolatile Content of Latexes
D 4942	06.02	Test Methods for Water Pickup of Lithographic Printing Inks and Vehicles in a Laboratory Mixer
D 5031	06.01	Practice for Enclosed Carbon-Arc Exposure Tests of Paint and Related Coatings
D 5039	15.09	Methods for Identification of Wire Side of Paper
D 5067	06.02	Specification for Artists' Watercolor Paints
D 5098	06.02	Specification for Artists' Acrylic Emulsion Paints
D 5181	06.02	Test Method for Abrasion Resistance of Printed Matter by the GA-CAT Comprehensive Abrasion Tester
D 5264	15.09	Practice for Abrasion Resistance of Printed Materials by the Sutherland Rub Tester
D 5383	06.02	Practice for Visual Determination of the Lightfastness of Art Materials by Art Technologists
D 5398	06.02	Practice for Visual Evaluation of the Lightfastness of Art Materials by the User
D 5403	06.02	Test Method for Volatile Content of Radiation Curable Materials
D 5717	06.02	Test Method for Determining Extractability of Metals from Art Materials
D 5724	06.02	Specification for Gouache Paints
D 5909	06.02	Test Method for Drying Time of Oxidative-Drying Printing Inks by Squalene Resistance
D 6073	06.02	Test Method for the Relative Setting of Heatset Printing Inks by the Sinvatrol Tester
D 6419	06.02	Test Method for Volatile Content of Sheet-Fed and Coldset Web Offset Printing Inks
D 6487	06.02	Practice for Preparing Prints of Paste Printing Inks by Rollouts on a Laboratory Flat-Bed Press
D 6488	06.02	Terminology Relating to Print Problems
D 6531	06.02	Test Method for Relative Tinting Strength of Aqueous Ink Systems by Instrumental Measurement
D 6606	06.03	Test Method for Viscosity and Yield of Vehicles and Varnishes by the Duke Viscometer
D 6687	06.03	Guide for Testing Printing Ink Vehicles and Components Thereof
D 6688	06.02	Test Method for Relative Resistance of Printed Matter to Liquid Chemicals by a Sandwich Method
D 6695	06.01	Practice for Xenon-Arc Exposure to Paints and Related Coatings
D 6846	06.02	Practice for Preparing Prints of Paste Printing Inks With a Printing Gage
D 7163	06.02	Test Method for Specular Gloss of Printed Matter
D 7188	06.02	Terminology for Printing Inks, Materials, and Processes
D 7189	06.02	Test Method for Relative Mileage of News Inks on Newsprint
D 7244	06.02	Test Method for Relative Cure of Energy-Cured Inks and Coatings
D 7305	06.02	Test Method for Reflection Density of Printed Matter
E 284	06.01	Terminology of Appearance
E 308	06.01	Test Method for Computing the Colors of Objects by Using the CIE System
E 313	06.01	Test Method for Indexes of Whiteness and Yellowness of Near-White, Opaque Materials
E 429	06.01	Method for Measurement and Calculation of Reflecting Characteristics of Metallic Surfaces Using Integrating Sphere Instruments
E 430	06.01	Method for Measurement of Gloss of High-Gloss Surfaces by Goniophotometry
E 691	06.04	Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method