



# Standard Guide for Testing Printing Ink Vehicles and Components Thereof<sup>1</sup>

This standard is issued under the fixed designation D 6687; 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 guide covers a list of test methods, practices, guides, and specifications that can be used for the testing and evaluation of printing ink vehicles and components thereof (see Table 1).

1.2 This guide includes methods that were developed to test impact and non-impact inks and vehicles associated with letterpress, lithography, flexography and gravure. Tests on raw materials and analytical tests in general have been included.

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

1.4 *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 requirements prior to use.*

## 2. Terminology

### 2.1 Definitions:

2.1.1 *printing ink, n*—a colored or pigmented liquid or paste

composition that is applied by printing machinery.

2.1.1.1 *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.

2.1.2 *vehicle, n*—the portion of a printing ink that excludes the colorant.

2.1.2.1 *Discussion*—Ink vehicles typically include the resin/solvent portion of the printing ink. Other printing ink additives, generally not included in the vehicle, are waxes, antioxidants and driers.

## 3. Test Categories

3.1 For convenience in selection, the test methods, practices, guides, and specifications listed in this guide are listed numerically (see Table 1) and by property of interest (see Table 2).

## 4. Precision and Bias

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

## 5. Keywords

5.1 printing inks; printing ink vehicles; test methods and practices (tabulation of); vehicles

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.37 on Ink Vehicles.

Current edition approved May 10, 2002. Published July 2002. Originally published as D 6687 - 01. Last previous edition D 6687 - 01.

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

ASTM Designation	Volume	Title
D 16	06.01	Terminology for Paint, Related Coatings, Materials and Applications
D 56	05.01	Test Method for Flash Point by Tag Closed Tester
D 86	05.01	Test Method for Distillation of Petroleum Products at Atmospheric Pressure
D 93	05.01	Test Method for Flash Point by Pensky-Martens Closed Cup Tester
D 154	06.03	Guide for Testing Varnishes
D 445	05.01	Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)
D 562	06.01	Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using the Stormer Viscometer
D 611	05.01	Test Methods for Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents
D 971	10.03	Test Method for Interfacial Tension of Oil Against Water by the Ring Method
D 1200	06.01	Test Method for Viscosity by Ford Viscosity Cup
D 1259	06.01	Test Method for Nonvolatile Content of Resin Solutions
D 1310	06.01	Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
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 1475	06.01	Test Method for Density of Liquid Coatings, Inks, and Related Products
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 1639	06.03	Test Method for Acid Value of Organic Coating Materials
D 1725	06.03	Test Method for Viscosity of Resin Solutions
D 1963	06.03	Test Method for Specific Gravity of Drying Oils, Varnishes, Resins, and Related Materials at 25/25°C
D 2074	06.03	Test Methods for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
D 2196	06.01	Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield Type) Viscometer
D 2369	06.01	Test Method for Volatile Content of Coatings
D 3278	06.01	Test Method for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
D 3792	06.01	Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph
D 3825	05.02	Test Method for Dynamic Surface Tension by the Fast-Bubble Technique
D 3828	05.02	Test Method for Flash Point by Small Scale Closed Tester
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 Viscosity of Printing Inks and Vehicles by the Falling-Rod Viscometer
D 4212	06.01	Test Method for Viscosity by Dip-Type Viscosity Cups
D 4287	06.01	Test Method for High-Shear Viscosity Using a Cone/Plate Viscometer
D 4302	06.02	Specification For Artists' Oil, Resin-Oil, and Alkyd Paints
D 4359	06.01	Test Method for Determining Whether a Material is a Liquid or a Solid
D 4361	06.02	Test Method for Apparent Tack of Printing Inks and Vehicles by a Three-Roller Tackmeter
D 4713	06.02	Test Methods for Nonvolatile Content of Heatset and Liquid Printing Ink Systems
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 5010	06.02	Guide for Testing Printing Inks and Related Materials
D 5062	06.03	Test Method for Resin Solution Dilutability by Volumetric/Gravimetric Determination
D 5165	06.03	Practice for Laboratory Preparation of Gelled Vehicles Using a Resin Kettle
D 5166	06.03	Practice for Laboratory Preparation of Gelled Vehicle Samples Using a Microwave Oven
D 5661	06.03	Test Method for Relative Solvency of Petroleum Oils by the PKP Method
D 5958	06.03	Practices for Preparation of Oil-Based Ink Resin Solutions
D 6038	06.03	Test Method for Determining the Compatibility of Resin/Solvent Mixtures by Precipitation Temperature
D 6336	06.03	Practice for Evaluation of Vehicles for Pigment Wetting Using a Vacuum Modified Sigma Blade Mixer
D 6419	06.02	Test Method for Volatile Content of Sheet-Fed and Coldset Web Offset Printing Inks
E 1	14.03	Specification for ASTM Thermometers
E 28	06.03	Test Method for Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus
E 70	15.05	Test Method for pH of Aqueous Solutions With the Glass Electrode
E 222	15.05	Test Methods for Hydroxyl Groups Using Acetic Anhydride Acetylation
E 230	14.03	Specification and Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples
E 691	14.02	Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

**TABLE 2 Index of Standards by Property**

ASTM Designation	Volume	Title
<b>Testing in General</b>		
D 4359	06.01	Determining Whether a Material is a Liquid or a Solid
D 5010	06.02	Guide for Testing Printing Inks and Related Materials
D 154	06.03	Guide for Testing Varnishes
E 691	14.02	Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
D 4302	06.02	Specification For Artists' Oil, Resin-Oil, and Alkyd Paints
E 1	14.03	Specification for ASTM Thermometers
E 230	14.03	Specification and Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples
D 16	06.01	Terminology for Paint, Related Coatings, Materials and Applications
<b>Color</b>		
D 1544	06.01	Color of Transparent Liquids (Gardner Color Scale)
<b>Density</b>		
D 1475	06.01	Density of Liquid Coatings, Inks, and Related Products
D 1963	06.03	Specific Gravity of Drying Oils, Varnishes, Resins, and Related Materials at 25/25°C
<b>Heat Stability</b>		
D 3934	06.01	Flash/No Flash Test- Equilibrium Method by a Closed-Cup Apparatus
D 1310	06.01	Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
D 93	05.01	Flash Point by Pensky-Martens Closed Cup Tester
D 3828	05.02	Flash Point by Small Scale Closed Tester
D 56	05.01	Flash Point by Tag Closed Tester
D 3278	06.01	Flash Point of Liquids by Small Scale Closed-Cup Apparatus
D 4713	06.02	Nonvolatile Content of Heatset and Liquid Printing Ink Systems
D 4758	06.03	Nonvolatile Content of Latexes
D 1259	06.01	Nonvolatile Content of Resin Solutions
D 1353	06.04	Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products
D 3960	06.01	Practice For Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
D 2369	06.01	Volatile Content of Coatings
D 6419	06.02	Volatile Content of Sheet-Fed and Coldset Web Offset Printing Inks
<b>Laboratory Preparations of Vehicles</b>		
D 6038	06.03	Determining the Compatibility of Resin/Solvent Mixtures by Precipitation Temperature
D 6336	06.03	Practice for Evaluation of Vehicles for Pigment Wetting Using a Vacuum Modified Sigma Blade Mixer
D 5166	06.03	Practice for Laboratory Preparation of Gelled Vehicle Samples Using a Microwave Oven
D 5165	06.03	Practice for Laboratory Preparation of Gelled Vehicles Using a Resin Kettle
D 5958	06.03	Practices for Preparation of Oil-Based Ink Resin Solutions
D 5062	06.03	Resin Solution Dilutability by Volumetric/Gravimetric Determination
<b>Raw Material Testing</b>		
D 1639	06.03	Acid Value of Organic Coating Materials
D 611	05.01	Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents
D 86	05.01	Distillation of Petroleum Products at Atmospheric Pressure
E 222	15.05	Hydroxyl Groups Using Acetic Anhydride Acetylation
E 70	15.05	pH of Aqueous Solutions With the Glass Electrode
D 5661	06.03	Relative Solvency of Petroleum Oils by the PKP Method
E 28	06.03	Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus
D 2074	16.03	Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
<b>Rheology</b>		
D 4361	06.02	Apparent Tack of Printing Inks and Vehicles by a Three-Roller Tackmeter
D 562	06.01	Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using the Stormer Viscometer
D 4287	06.01	High-Shear Viscosity Using a Cone/Plate Viscometer
D 445	05.01	Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)
D 2196	06.01	Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield Type) Viscometer
D 4212	06.01	Viscosity by Dip-Type Viscosity Cups
D 1200	06.01	Viscosity by Ford Viscosity Cup
D 4040	06.02	Viscosity of Printing Inks and Vehicles by the Falling-Rod Viscometer
D 1725	06.03	Viscosity of Resin Solutions
D 1545	06.03	Viscosity of Transparent Liquids by Bubble Time Method

**TABLE 2** *Continued*

ASTM Designation	Volume	Title
<b>Surface Tension</b>		
D 3825	05.02	Dynamic Surface Tension by the Fast-Bubble Technique
D 971	10.03	Interfacial Tension of Oil Against Water by the Ring Method
D 1331	15.04	Surface and Interfacial Tension of Solutions of Surface-Active Agents
<b>Water Content/Water Pickup</b>		
D 3792	06.01	Water Content of Coatings by Direct Injection Into a Gas Chromatograph
D 4017	06.01	Water in Paints and Paint Materials by Karl Fischer Method
D 4942	06.02	Water Pickup of Lithographic Printing Inks and Vehicles in a Laboratory Mixer

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