Designation: D6687 – 07 (Reapproved 2013)

Standard Guide for Testing Printing Ink Vehicles and Components Thereof[1]

This standard is issued under the fixed designation D6687; 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 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).[2]

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

[1] 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 June 1, 2013. Published June 2013. Originally approved in 2001. Last previous edition approved in 2007 as D6687 – 07. DOI: 10.1520/D6687-07R13.

[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.

TABLE 1 Numerical Listing of Ink Vehicle Related Standards

ASTM Designation	Volume	Title
D16	06.01	Terminology for Paint, Related Coatings, Materials and Applications
D56	05.01	Test Method for Flash Point by Tag Closed Cup Tester
D86	05.01	Test Method for Distillation of Petroleum Products at Atmospheric Pressure
D92	05.01	Test Method for Flash and Fire Points by Cleveland Open Cup Tester
D93	05.01	Test Method for Flash Point by Pensky-Martens Closed Cup Tester
D154	06.03	Guide for Testing Varnishes
D156	05.01	Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)
D445	05.01	Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)
D562	06.01	Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
D611	05.01	Test Methods for Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents
D971	10.03	Test Method for Interfacial Tension of Oil Against Water by the Ring Method
D1133	06.04	Test Method for Kauri-Butanol Value of Hydrocarbon Solvents
D1200	06.01	Test Method for Viscosity by Ford Viscosity Cup
D1218	05.01	Test Method for Refractive Index and Refractive Dispersion of Hydrocarbon Liquids
D1259	06.01	Test Method for Nonvolatile Content of Resin Solutions
D1310	06.01	Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
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
D1475	06.01	Test Method for Density of Liquid Coatings, Inks, and Related Products
D1544	06.01	Test Method for Color of Transparent Liquids (Gardner Color Scale)
D1545	06.03	Test Method for Viscosity of Transparent Liquids by Bubble Time Method
D1639	06.03	Test Method for Acid Value of Organic Coating Materials
D1725	06.03	Test Method for Viscosity of Resin Solutions
D2074	06.03	Test Methods for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
D2196	06.01	Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield Type) Viscometer
D2369	06.01	Test Method for Volatile Content of Coatings
D3278	06.01	Test Method for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
D3792	06.01	Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph
D3825	05.02	Test Method for Dynamic Surface Tension by the Fast-Bubble Technique
D3828	05.02	Test Method for Flash Point by Small Scale Closed Cup Tester
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
D4052	05.02	Test Method for Density and Relative Density of Liquids by Digital Density Meter
D4212	06.01	Test Method for Viscosity by Dip-Type Viscosity Cups
D4287	06.01	Test Method for High-Shear Viscosity Using a Cone/Plate Viscometer
D4302	06.02	Specification For Artists' Oil, Resin-Oil, and Alkyd Paints
D4359	06.01	Test Method for Determining Whether a Material is a Liquid or a Solid
D4361	06.02	Test Method for Apparent Tack of Printing Inks and Vehicles by a Three-Roller Tackmeter
D4713	06.02	Test Methods for Nonvolatile Content of Heatset and Liquid Printing Ink 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
D5010	06.02	Guide for Testing Printing Inks and Related Materials
D5062	06.03	Test Method for Resin Solution Dilutability by Volumetric/Gravimetric Determination
D5165	06.03	Practice for Laboratory Preparation of Gelled Vehicles Using a Resin Kettle
D5166	06.03	Practice for Laboratory Preparation of Gelled Vehicle Samples Using a Microwave Oven
D5661	06.03	Test Method for Relative Solvency of Petroleum Oils by the PKP Method
D5958	06.03	Practices for Preparation of Oil-Based Ink Resin Solutions
D6038	06.03	Test Method for Determining the Compatibility of Resin/Solvent Mixtures by Precipitation Temperature (Cloud Point)
D6336	06.03	Practice for Evaluation of Vehicles for Pigment Wetting Using a Vacuum Modified Sigma Blade Mixer
D6419	06.02	Test Method for Volatile Content of Sheet-Fed and Coldset Web Offset Printing Inks
D6579	06.03	Practice for Molecular Weight Averages and Molecular Weight Distribution of Hydrocarbon and Terpene Resins by Size-Exclusion Chromatography
D6606	06.03	Test Method for Viscosity and Yield of Vehicles and Varnishes by the Duke Viscometer
D6887	06.03	Test Method for Testing Alkyd Compatibility with Resin or Resin Solutions
D6989	06.03	Practices for Preparation of Solvent and Water Based Ink Resin Solutions
D7188	06.02	Terminology for Printing Inks, Materials, and Processes
D7271	06.03	Test Method for Viscoelastic Properties of Paste Ink Vehicle Using an Oscillatory Rheometer
E1	14.03	Specification for ASTM Liquid-in-Glass Thermometers
E28	06.03	Test Method for Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus
E70	15.05	Test Method for pH of Aqueous Solutions With the Glass Electrode
E222	15.05	Test Methods for Hydroxyl Groups Using Acetic Anhydride Acetylation
E230	14.03	Specification and Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples
E691	14.02	Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
E2251	14.03	Specification for Liquid-in-Glass ASTM Thermometers with Low-Hazard Precision Liquids

TABLE 2 Index of Standards by Property

ASTM Designation	Volume	Title
		Testing in General
D4359	06.01	Determining Whether a Material is a Liquid or a Solid
D5010	06.02	Guide for Testing Printing Inks and Related Materials
D154	06.03	Guide for Testing Varnishes
E691	14.02	Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
E230	14.03	Specification and Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples
D4302	06.02	Specification For Artists' Oil, Resin-Oil, and Alkyd Paints
E1	14.03	Specification for ASTM Liquid-in-Glass Thermometers
E2551	14.03	Specification for Liquid-in-Glass ASTM Thermometers with Low-Hazard Precision Liquids
D16	06.01	Terminology for Paint, Related Coatings, Materials and Applications
D7188	06.02	Terminology for Printing Inks, Materials, and Processes
		Color
D1544	06.01	Color of Transparent Liquids (Gardner Color Scale)
D156	05.01	Saybolt Color of Petroleum Products (Saybolt Chromometer Method)
		Density
D4052	05.02	Density and Relative Density of Liquids by Digital Density Meter
D1475	06.01	Density of Liquid Coatings, Inks, and Related Products
		Heat Stability
D92	05.01	Flash and Fire Points by Cleveland Open Cup Tester
D3934	06.01	Flash/No Flash Test- Equilibrium Method by a Closed-Cup Apparatus
D1310	06.01	Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
D93	05.01	Flash Point by Pensky-Martens Closed Cup Tester
D3828	05.02	Flash Point by Small Scale Closed Cup Tester
D56	05.01	Flash Point by Tag Closed Cup Tester
D3278	06.01	Flash Point of Liquids by Small Scale Closed-Cup Apparatus
D4713	06.02	Nonvolatile Content of Heatset and Liquid Printing Ink Systems
D4758	06.03	Nonvolatile Content of Latexes
D1259	06.01	Nonvolatile Content of Resin Solutions
D1353	06.04	Nonvolatile Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer, and Related Products
D3960	06.01	Practice For Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
D2369	06.01	Volatile Content of Coatings
D6419	06.02	Volatile Content of Sheet-Fed and Coldset Web Offset Printing Inks
		Laboratory Preparations of Vehicles
D6038	06.03	Determining the Compatibility of Resin/Solvent Mixtures by Precipitation Temperature (Cloud Point)
D6336	06.03	Practice for Evaluation of Vehicles for Pigment Wetting Using a Vacuum Modified Sigma Blade Mixer
D5166	06.03	Practice for Laboratory Preparation of Gelled Vehicle Samples Using a Microwave Oven
D5165	06.03	Practice for Laboratory Preparation of Gelled Vehicles Using a Resin Kettle
D5958	06.03	Practices for Preparation of Oil-Based Ink Resin Solutions
D6989	06.03	Practices for Preparation of Solvent and Water Based Ink Resin Solutions
D5062	06.03	Resin Solution Dilutability by Volumetric/Gravimetric Determination
D6887	06.03	Testing Alkyd Compatibility with Resin or Resin Solutions
		Raw Material Testing
D1639	06.03	Acid Value of Organic Coating Materials
D611	05.01	Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents
D86	05.01	Distillation of Petroleum Products at Atmospheric Pressure
E222	15.05	Hydroxyl Groups Using Acetic Anhydride Acetylation
D1133	06.04	Kauri-Butanol Value of Hydrcarbon Solvents
D6579	06.03	Molecular Weight Averages and Molecular Weight Distribution of Hydrocarbon and Terpene Resins by Size-Exclusion Chromatography
E70	15.05	pH of Aqueous Solutions With the Glass Electrode
D1218	05.01	Refractive Index and Refractive Dispersion of Hydrocarbon Liquids
D5661	06.03	Relative Solvency of Petroleum Oils by the PKP Method
E28	06.03	Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus
D2074	16.03	Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
		Rheology
D4361	06.02	Apparent Tack of Printing Inks and Vehicles by a Three-Roller Tackmeter
D562	06.01	Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
D4287	06.01	High-Shear Viscosity Using a Cone/Plate Viscometer
D445	05.01	Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)
D2196	06.01	Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield Type) Viscometer
D4040	06.01	Rheological Properties of Paste Printing and Vehicles by the Falling-Rod Viscometer

TABLE 2 *Continued*

ASTM Designation	Volume	Title
D7271	06.03	Viscoelastic Properties of Paste Ink Vehicle Using an Oscillatory Rheometer
D6606	06.03	Viscosity and Yield of Vehicles and Varnishes by the Duke Viscometer
D4212	06.01	Viscosity by Dip-Type Viscosity Cups
D1200	06.01	Viscosity by Ford Viscosity Cup
D1725	06.03	Viscosity of Resin Solutions
D1545	06.03	Viscosity of Transparent Liquids by Bubble Time Method
		Surface Tension
D3825	05.02	Dynamic Surface Tension by the Fast-Bubble Technique
D971	10.03	Interfacial Tension of Oil Against Water by the Ring Method
D1331	15.04	Surface and Interfacial Tension of Solutions of Surface-Active Agents
		Water Content/Water Pickup
D3792	06.01	Water Content of Coatings by Direct Injection Into a Gas Chromatograph
D4017	06.01	Water in Paints and Paint Materials by Karl Fischer Method
D4942	06.02	Water Pickup of Lithographic Printing Inks and Vehicles in a Laboratory Mixer