Designation: D564 – 87 (Reapproved 2023)

Standard Test Methods for Liquid Paint Driers[1]

This standard is issued under the fixed designation D564; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 These test methods cover the test procedures to be applied to liquid paint driers used in paints and related coatings. Typical paint driers, listed in Specification D600, are carboxylates of lead, cobalt, manganese, zinc, iron, calcium, and zirconium.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D234 Specification for Raw Linseed Oil (Withdrawn 2007)[3]

D235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

D600 Specification for Liquid Paint Driers (Withdrawn 2021)[3]

D1544 Test Method for Color of Transparent Liquids (Gardner Color Scale)

D1640 Test Methods for Drying, Curing, or Film Formation of Organic Coatings

D1644 Test Methods for Nonvolatile Content of Varnishes

D2090 Test Method for Clarity and Cleanness of Paint and Ink Liquids (Withdrawn 2007)[3]

D2373 Test Method for Determination of Cobalt in Paint Driers by EDTA Method (Withdrawn 2016)[3]

D2374 Test Method for Lead in Paint Driers by EDTA Method (Withdrawn 2016)[3]

D2375 Test Method for Manganese in Paint Driers by EDTA Method (Withdrawn 2016)[3]

D2613 Test Method for Calcium or Zinc in Paint Driers by EDTA Method

D3804 Test Method for Iron in Paint Driers by EDTA Method

D3924 Specification for Standard Environment for Conditioning and Testing Paint, Varnish, Lacquer, and Related Materials

D3969 Test Method for Zirconium in Paint Driers by EDTA Method

D3970 Test Method for Cerium in Paint Driers by Oxidimetric Determination

D3980 Practice for Interlaboratory Testing of Paint and Related Materials (Withdrawn 1998)[3]

D3988 Test Method for Vanadium in Paint Driers by EDTA Method

D3989 Test Method for Total Rare Earth Metals in Paint Driers by EDTA Method

3. Significance and Use

3.1 Driers accelerate the drying of oil, paint, printing ink, and varnish.

3.2 These test methods are applicable to liquid driers manufactured for use in paints and related coatings.

3.3 The tests for metallic content using ethylenediaminetetraacetic acid dihydrate (EDTA) are intended for concentrated solutions of single metals; two or more metals may cause interference.

4. Physical Tests

4.1 *Sampling*—Sample in accordance with Practice D3980.

[1] These test methods are under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and are the direct responsibility of Subcommittee D01.21 on Chemical Analysis of Paints and Paint Materials.

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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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

4.2 *Conditioning*—Follow Specification D3924 except where other temperatures are specified.

4.3 *Appearance*—After conditioning overnight at room temperature (see Specification D3924) examine the drier without aid of magnification for clarity and cleanness and for presence of foreign matter, sediment, skins, turbidity or haziness, in accordance with Test Method D2090.

4.4 *Sediment or Suspended Matter*—If sediment or suspended matter is observed, proceed as follows:

4.4.1 Weigh to 1 mg, by difference, 1 g to 5 g of drier into a tared 10 µm to 15 µm fritted-glass crucible. After most of the drier has passed through wash with mineral spirits conforming to Specification D235 and dry at 50 °C until the weight is constant to 1 mg. Calculate the difference in weight and report as percent sediment in the drier.

4.5 *Color*—Determine color in accordance with Test Method D1544.

NOTE 1—This scale is useful for yellow and brown organic chromophores, but not with the reds or purple of cobalt and certain other metal compounds.

4.6 *Nonvolatile Matter*—Determine the nonvolatile content in accordance with Test Methods D1644 using either Method A or B as mutually agreed upon between the supplier and the user.

4.7 *Miscibility with Oil*—Mix 1 volume of the sample with 19 volumes of raw linseed oil under room temperature conditions. Record any signs of separation or clouding. Observe the mixture at 1 h intervals for 3 h and again after 24 h. For the reference use the raw linseed oil kept in a container similar to the one with the test specimens.

NOTE 2—In case of disagreement between the supplier and the user, make the test for miscibility with oil at 25 °C ± 1 °C.

NOTE 3—The linseed oil specified in Specification D234 may vary in clarity from one commercial source or linseed crop year to another and in content of small amounts of moisture. Aging from one to six months in a closed container at 23 °C or (or even 10 °C) and then decanting supernatant oil from sediment may yield a more uniform linseed oil for miscibility testing.

4.8 *Stability*—Each drier shall show no clotting or gelation or evidence of precipitation after standing for 7 days at 25 °C, −20 °C, 50 °C. If there is evidence of clotting, gelation, or precipitation after 7 days at −20 °C or 50 °C, the drier is still considered satisfactory if all signs of clotting, gelation, or precipitation disappear after it is permitted to stand overnight at room temperature.

4.9 *Drying Power*—Determine the drying power in accordance with Test Methods D1640. It is useful to test a previously evaluated standard of known drying power for comparative purposes.

NOTE 4—The drying powers or efficiencies of individual metal driers may be a function of: (*1*) the class of carboxylic acids, for example, octoate versus naphthenate, etc., (*2*) additives in drier solutions, for example, stabilizers, etc., (*3*) chemical unsaturation of the drying oil, (*4*) other metals used in conjunction with the subject drier, and (*5*) the other components (for example, pigments, etc.) in the formulated paint.

5. Chemical Analysis

5.1 *Cobalt*—Determine in accordance with Test Method D2373.

5.2 *Lead*—Determine in accordance with Test Method D2374.

5.3 *Manganese*—Determine in accordance with Test Method D2375.

5.4 *Calcium*—Determine in accordance with Test Method D2613.

5.5 *Zinc*—Determine in accordance with Test Method D2613.

5.6 *Iron*—Determine in accordance with Test Method D3804.

5.7 *Zirconium*—Determine in accordance with Test Method D3969.

5.8 *Cerium*—Determine in accordance with Test Method D3970.

5.9 *Vanadium*—Determine in accordance with Test Method D3988.

5.10 *Rare Earth*—Determine in accordance with Test Method D3989.

6. Keywords

6.1 driers; liquid paint driers; standard tests

APPENDIX

(Nonmandatory Information)

X1. HISTORICAL INFORMATION

X1.1 Historic methods for testing lead, cobalt, calcium, zinc, manganese, and iron can be found in the 1979 *Annual Book of ASTM Standards*, Part 29, Method D564.

X1.1.1 These methods were of primary interest before the introduction (about 1930) of commercial naphthenate driers that enabled higher concentrations of drier metals in solution, than in much earlier practice when the oxides and salts of lead, manganese, and cobalt were saponified while heating with linseed oil, resin, and other naturally occurring organic acids or esters. Metal concentrations were then as low as 10 % lead, 1 % manganese, or 0.5 % cobalt.