



Designation: **D6131 – 97 (Reapproved 2012) D6131 – 17**

Standard Test Method for Evaluating the Relative Tint Undertone of Titanium Dioxide Pigments¹

This standard is issued under the fixed designation D6131; 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 test method is intended to be used to determine the tint undertone (blue or yellow) of titanium dioxide pigments. This relates to the effective particle size of the pigment. ~~It is based upon tinting with a black iron oxide, but other blacks may be used if found suitable.pigment~~

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~~ safety, health, and ~~health~~ 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

D16 Terminology for Paint, Related Coatings, Materials, and Applications

~~D2745~~**E308** Test Method for Relative Tinting Strength of White Pigments by Reflectance Measurements Practice for Computing the Colors of Objects by Using the CIE System

~~E313~~**E1164** Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates Obtaining Spectrometric Data for Object-Color Evaluation

E1331 Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry

E1347 Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry

E1349 Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional (45°:0° or 0°:45°) Geometry

3. Terminology

3.1 Any special terms used in this test method can be found in Terminology **D16**.

4. Summary of Test Method

4.1 Titanium dioxide pigments are dispersed in a ~~black paste with a mechanical-muller-liquid medium~~ of the user's choice by a dispersion method applicable to the user's intended end use. Test and reference pigments are treated identically. The resultant ~~grey pastes are applied to glass cover slips and white paints or colorants are drawn down on white and black cards and read instrumentally~~. These readings are then used to calculate the yellowness index.

5. Significance and Use

5.1 This test method allows the user to make a ~~quick~~ determination of the blueness or yellowness of the tint undertone of titanium dioxide pigments, versus a reference pigment agreed upon by the parties to the test. This is an important measure of tone,

¹ This test method is under the jurisdiction of ASTM Committee **D01** on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee **D01.26** on Optical Properties.

Current edition approved June 1, 2012 Dec. 1, 2017. Published July 2012 December 2017. Originally approved in 1997. Last previous edition approved in 2004 2012 as D6131 – 97 (2004) (2012). DOI: 10.1520/D6131-97R12.10.1520/D6131-17.

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.

since it gives both a measure of effective particle size, and quick approximation of the blue/yellow undertone that can be expected when a coating containing the titanium dioxide is tinted.

5.2 Such matters as the vehicle for preparing the dispersions, and the black for tinting have been suggested. However, changes in the components may be made by agreement between the buyer and the seller. dispersions and the mechanical method of preparing the dispersion are left to the user. However, variation in these practices will lead to increased variance in the results, so users ought to fix these parameters, in-so-far as is possible, within any one laboratory. This will lead to reduced uncertainty of the results within that laboratory, and it is seldom that interlaboratory comparisons of this test result is needed.

5.3 The results obtained with a mechanical muller do not necessarily correlate directly with a practice where different dispersion conditions exist. However, dispersion with a mechanical muller is a quick and inexpensive way of evaluating the undertone of a titanium dioxide pigment. Each user must decide whether the loss of accuracy in his measurements due to variation of these parameters is negligibly small for the purpose for which the data are obtained.

6. Apparatus

6.1 ~~Balance~~; Balance, meeting the requirements of Test Method ~~electronic scale with readability of 0.01 g~~ **D2745**; and resolution of 0.02 g..

6.2 Drawdown Cards, black and white sealed drawdown charts.

6.3 ~~Mechanical Muller~~; Drawdown Bars, equipped with ground-glass plates to which a variable but known force may be added in 220-N increments. The driven glass plate shall have a speed of rotation of between 70 and 120 r/min and the apparatus shall have an arrangement for presetting the number of revolutions in multiples of 50; capable of applying a coating typically 15.25 cm wide. The applicators must be capable of applying 200 microns wet film or other wet film thickness as appropriate. Bird type applicators are marked in thousandths of an inch at half the actual clearance.

6.3 ~~Rubbing Surfaces~~, meeting the requirements of Test Method **D2745**.

6.4 ~~Small Glass Slab~~, meeting the requirements of Test Method **D2745**.

6.5 ~~Spatula~~, meeting the requirements of Test Method **D2745**.

6.6 ~~Glass Cover Slips~~, No. 2 thickness, 45 by 50 mm.

6.4 Color Measuring Instrument, a colorimetric spectrophotometer meeting the requirements of Test Methods Practice **E1164** **E1331**; having **E1347**, or a spectral **E1349**, range of at least 400 to 700 nm at 10 nm intervals and having a measuring port ideally 25 mm in size, and measuring Total:Normal or smaller (di:0), sometimes called SPIN or SIN. Alternatively, but less desirably, one may utilize a smaller measuring aperture and measuring geometry Diffuse:Normal (de:0), 45°:Normal in diameter: (45:0) or (0:45), or a spectro-colorimeter, or tristimulus colorimeter, in descending order of desirability.

[/catalog/standards/astm/62d739b2-50a7-4793-9187-318260b13aa7/astm-d6131-17](http://catalog/standards/astm/62d739b2-50a7-4793-9187-318260b13aa7/astm-d6131-17)

7. Materials

7.1 ~~Reference Standard~~—A standard pigment as agreed upon between the buyer and the seller.

7.2 ~~Vehicle-Castor Oil~~, (Grade AA).

7.3 ~~Tinting Paste~~—A Vehicle/Parts by Weight paste such as one of the following:

(1)	Castor Oil	50
	Gypsum	47
	Thickener	6
	Iron Oxide-Black	3
(2)	Petroleum Jelly	97
	Lampblack	3

7. Procedure

7.1 Disperse pigment into paste as described in Test Method both reference and test pigment separately into a liquid medium in a formula **D2745**. Luminance should be approximately 40 %; that emulates the desired end use for the pigment by a dispersion method that as closely as possible simulates the actual production method of dispersion.

7.2 Apply the gray paste to the cover glass with a spatula. The area to which the paste is applied should be in the center of the cover glass, should be approximately 30 mm in diameter, and should be at least 2-mm thick. Draw down the reference white sample and the test white sample side-by-side on a coated black and white drawdown card.

7.3 Dry the drawdown by air drying, warm air circulation, or microwave drying.

7.4 View the paste through the glass from the side opposite that to which the paste was applied. Evaluate for evenness of coating, and any possible flaws. An irregular coating from this side mandates a repeat of the Inspect both sides of the drawdown visually to assure that both coatings are at complete hide. If either specimen is not at complete hide, terminate the test.