



Designation: E805 – 06

Standard Practice for Identification of Instrumental Methods of Color or Color- Difference Measurement of Materials¹

This standard is issued under the fixed designation E805; 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 practice covers the documentation of instrumental measurement of color or color difference for current communication or for future reference. The practice is applicable to instrumental measurements of materials where color is seen by reflected, transmitted or emitted light and any combinations of one or more of these processes. The practice is recommended for documentation of methodology in interlaboratory color-measurement programs.

1.2 An adequate identification of an instrumental measure of color or color-difference consists of five parts:

1.2.1 Nature and source of available samples and the form of specimens actually measured,

1.2.2 Instrumental conditions of measurement, including instrument geometrical and spectral conditions of measurement,

1.2.3 Standards used,

1.2.4 Data acquisition procedure, and

1.2.5 Color scales employed.

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 whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D1535 Practice for Specifying Color by the Munsell System

D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

D5386 Test Method for Color of Liquids Using Tristimulus Colorimetry

D6166 Test Method for Color of Naval Stores and Related Products (Instrumental Determination of Gardner Color)

E179 Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Materials

E259 Practice for Preparation of Pressed Powder White Reflectance Factor Transfer Standards for Hemispherical and Bi-Directional Geometries

E284 Terminology of Appearance

E308 Practice for Computing the Colors of Objects by Using the CIE System

E313 Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates

E991 Practice for Color Measurement of Fluorescent Specimens Using the One-Monochromator Method

E1164 Practice for Obtaining Spectrometric Data for Object-Color Evaluation

E1247 Practice for Detecting Fluorescence in Object-Color Specimens by Spectrophotometry

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

E1345 Practice for Reducing the Effect of Variability of Color Measurement by Use of Multiple Measurements

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

E1348 Test Method for Transmittance and Color by Spectrophotometry Using Hemispherical Geometry

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

E1708 Practice for Electronic Interchange of Color and Appearance Data

E1767 Practice for Specifying the Geometries of Observation and Measurement to Characterize the Appearance of Materials

E2152 Practice for Computing the Colors of Fluorescent Objects from Bispectral Photometric Data

E2153 Practice for Obtaining Bispectral Photometric Data for Evaluation of Fluorescent Color

¹ This practice is under the jurisdiction of ASTM Committee E12 on Color and Appearance and is the direct responsibility of Subcommittee E12.04 on Color and Appearance Analysis.

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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.

(1) Instrumental Method for Measurements of: Color Color difference of : _____

(2) Color Scales Used (Section 9): _____

(3) Specimen Description (Section 5)

(a) Form: _____

(b) Additional information (see 5.3) _____
 thickness (number of layers) single layer backed by powder (note packing pressure) paste liquid film drawdown (specify thickness and backing material).

(c) Special Considerations:
 Sensitivity to Environmental Conditions: temperature: _____, humidity _____

(d) Specimen Directionality: Specify orientation and rotation _____

(e) Specimen Conditioning: _____

(4) Instrument Description (Section 6)

Spectrophotometer Tristimulus Colorimeter

Make and model _____

(a) Measurement Mode _____

(b) Geometry: Influx and Efflux Geometry _____
 Specular Component included or excluded? _____
 Light Trap (if applicable) size, shape, and position _____
 Size and Shape of aperture _____
 Cover glass at specimen window ___ Yes ___ No
 Method of Correction _____

(c) Spectral: Lamp _____ Filters and elements used _____
 Detector _____ Modified by filters and elements _____

(5) Material Standard Used: _____
 Date of preparation or calibration: _____

(6) Reduction of Data: _____

(a) Tristimulus Integration: Filter Computed from spectral data taken every _____ nm over range _____ nm to _____ nm, with spectral bandwidth _____ nm bandpass correction _____ E308 Table 5 _____ E308 Table 6

(b) Color Difference Equation and Parameters used _____

FIG. 1 Sample Report Form

[E2175 Practice for Specifying the Geometry of Multiangle Spectrophotometers](#)

[E2194 Practice for Multiangle Color Measurement of Metal Flake Pigmented Materials](#)

2.2 Other Standard Documents:

[CIE Publication 51](#) A Method for Assessing the Quality of Daylight Simulators for Colorimetry³

[DIN 6176](#) Farbmétrische, Bestimmung von Farbabstände bie Körperfarben nach der DIN99-Formel⁴

3. Terminology

3.1 Definitions of terms in Terminology [E284](#) are applicable to this practice.

³ Available from U.S. National Committee of the CIE (International Commission on Illumination), C/o Thomas M. Lemons, TLA-Lighting Consultants, Inc., 7 Pond St., Salem, MA 01970, <http://www.cie-usnc>.

⁴ Available from Beuth Verlag GmbH (DIN-Deutsches Institut für Normung e.V.), Burggrafenstrasse 6, 10787, Berlin, Germany, <http://www.en.din.de>.

4. Significance and Use

4.1 The options available in methods for the measurement of color or color-difference are many. These involve choices in: (1) specimens, (2) geometric and spectral properties of instruments, (3) calibration bases for standards used, (4) procedure for sample handling including conditioning, (5) procedure for taking data, and (6) equations for converting instrumental data to final results. Once the measurements have been made, it is essential to document what has been done for the purpose of interlaboratory comparisons, or for future use. A sample form is provided in [Fig. 1](#) to record identifying information applicable to any instrumental method of color or color-difference measurement.

4.2 Refer to Guide [E179](#), Practices [E991](#), [E1164](#), [E1345](#), [E1708](#), [E1767](#), [E2152](#), and [E2194](#) and Test Methods [D5386](#), [D6166](#), [E1247](#), [E1331](#), [E1347](#), [E1348](#), and [E1349](#), for specific details of measurements.