



Designation: E 805 – 01a

## Standard Practice for Identification of Instrumental Methods of Color or Color- Difference Measurement of Materials<sup>1</sup>

This standard is issued under the fixed designation E 805; 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 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:*

**D 1535** Practice for Specifying Color by the Munsell System<sup>2</sup>

**D 2244** Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates<sup>2</sup>

**D 5386** Test Method for Color of Liquids Using Tristimulus Colorimetry<sup>3</sup>

**D 6166** Test Method for Color of Naval Stores and Related

Products (Instrumental Determination of Gardner Color)<sup>4</sup>

**E 179** Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Materials<sup>2</sup>

**E 259** Practice for Preparation of Pressed Powder White Reflectance Factor Transfer Standards for Hemispherical and Bi-Directional Geometries<sup>2</sup>

**E 284** Terminology of Appearance<sup>2</sup>

**E 308** Practice for Computing the Colors of Objects by Using the CIE System<sup>2</sup>

**E 313** Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates<sup>2</sup>

**E 991** Practice for Color Measurement of Fluorescent Specimens<sup>2</sup>

**E 1164** Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation<sup>2</sup>

**E 1247** Test Method for Identifying Fluorescence in Object-Color Specimens by Spectrophotometry<sup>2</sup>

**E 1331** Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry<sup>2</sup>

**E 1345** Practice for Reducing the Effect of Variability of Color Measurement by Use of Multiple Measurements<sup>2</sup>

**E 1347** Test Method for Color and Color-Difference Measurement by Tristimulus (Filter) Colorimetry<sup>2</sup>

**E 1348** Test Method for Transmittance and Color by Spectrophotometry Using Hemispherical Geometry<sup>2</sup>

**E 1349** Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional Geometry<sup>2</sup>

**E 1708** Practice for Electronic Interchange of Color and Appearance Data<sup>2</sup>

**E 1767** Practice for Specifying the Geometry of Observations and Measurements to Characterize the Appearance of Materials<sup>2</sup>

**E 2152** Practice for Computing the Colors of Fluorescent Objects from Bispectral Photometric Data<sup>2</sup>

**E 2153** Practice for Obtaining Bispectral Photometric Data for Evaluation of Fluorescent Color<sup>2</sup>

2.2 *CIE Document:*

CIE Publication 51 A Method for Assessing the Quality of

<sup>1</sup> 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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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 06.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 06.04.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 06.03.

(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

Daylight Simulators for Colorimetry<sup>5</sup>

3. Terminology

3.1 Definitions of terms in Terminology E 284 are applicable to this practice.

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 inter-laboratory 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 E 179, Practices E 991, E 1164, E 1345, E 1708, E 1767, and E 2152 and Test Methods D 5386, D 6166, E 1247, E 1331, E 1347, E 1348, and E 1349 for specific details of measurements.

5. Identification of Samples and Specimens

5.1 Identification of Samples and Specimens:

5.1.1 Identify samples by material and form, together with markings or document identification.

5.1.2 Mark each specimen with a serial number or letter, and other identifying markings.

5.2 Description of Specimens—For specific forms of specimens, additional identification shall be included:

<sup>5</sup> Available from USNC/CIE Publications Office, TLA-Lighting Consultants, Inc., 7 Pond St., Salem, MA 01970-4819.