Designation: E 805 – 01

Standard Practice for Identification of Instrumental Methods of Color or Color-Difference Measurement of Materials[1]

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 (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:*

D 1535 Practice for Specifying Color by the Munsell System[2]

D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates[2]

D 5386 Test Method for Color of Liquids Using Tristimulus Colorimetry[3]

D 6166 Test Method for Color of Naval Stores and Related Products (Instrumental Determination of Gardner Color)[4]

E 179 Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Materials[2]

E 259 Practice for Preparation of Pressed Powder White Reflectance Factor Transfer Standards for Hemispherical and Bi-Directional Geometries[2]

E 284 Terminology of Appearance[2]

E 308 Practice for Computing the Colors of Objects by Using the CIE System[2]

E 313 Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates[2]

E 991 Practice for Color Measurement of Fluorescent Specimens[2]

E 1164 Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation[2]

E 1247 Test Method for Identifying Fluorescence in Object-Color Specimens by Spectrophotometry[2]

E 1331 Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry[2]

E 1345 Practice for Reducing the Effect of Variability of Color Measurement by Use of Multiple Measurements[2]

E 1347 Test Method for Color and Color- Difference Measurement by Tristimulus (Filter) Colorimetry[2]

E 1348 Test Method for Transmittance and Color by Spectrophotometry Using Hemispherical Geometry[2]

E 1349 Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional Geometry[2]

E 1708 Practice for Electronic Interchange of Color and Appearance Data[2]

E 1767 Practice for Specifying the Geometry of Observations and Measurements to Characterize the Appearance of Materials[2]

2.2 *CIE Document:*

CIE Publication 51 A Method for Assessing the Quality of Daylight Simulators for Colorimetry[5]

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

[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] *Annual Book of ASTM Standards*, Vol 06.01.

[3] *Annual Book of ASTM Standards*, Vol 06.04.

[4] *Annual Book of ASTM Standards*, Vol 06.03.

[5] Available from USNC/CIE Publications Office, TLA-Lighting Consultants, Inc., 7 Pond St., Salem, MA 01970–4819.

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, and E 1767 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:

5.2.1 Solid sheet or web, specify thickness and backing material.

5.2.2 Powder or granular substance (packed or poured); if placed behind window, state material and thickness.

5.2.3 Fiber or yarn, describe form, type of transparent specimen window (if used), pressure on backing plate.

5.2.4 Paste (if placed behind window), state material and thickness.

5.2.5 Liquid (if observed through window), state window material and path length.

5.2.6 Film drawdown, specify film thickness and background.

(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