Application Note

AN 1035.00

ASTM Industrial Methods for Color Measurement

"When you measure color, there are 6 conditions that must be clearly identified to make the numbers meaningful for communication and inter-instrument agreement."

ABSTRACT

1. Color Scale
2. CIE Illuminant
3. CIE Standard Observer
4. Instrument Geometry and mode
5. Sample Preparation
6. Sample Presentation

These parameters are based on the CIE system of tristimulus color measurement and are applied world-wide to measure the color of any product or material.

The world's true measure of color

HunterLab

While the CIE serves as the core standards body defining color measurement, further definition for various applications and product sectors is found in nearly 40 industrial standards organizations world-wide. The best collection of industrial standards defining tristimulus color measurement is found with ASTM, ISO and JIS.

- ***CIE*** *- Commission Internationale de L'Éclairage, Wien, Austria www.cie.co.at*
- ***ASTM*** *- American Society of Testing and Materials, West Conshohocken, PA USA www.astm.org*
- ***ISO*** *- International Organization for Standardization, Geneva, Switzerland www.iso.ch*
- ***JIS*** *- Japanese Industrial Standards available from JSA Japanese Standards Association, Tokyo, Japan www.webstore.jsa.or.jp/webstore/JIS*

Listed below are key ASTM industrial standards that define tristimulus color measurement.

COLOR MEASUREMENT SCALES, ILLUMINANTS AND STANDARD OBSERVERS

ASTM E308 **Practice for Computing the Color of Objects by Using the CIE System** provides a full description of calculation of CIE tristimulus color scales along with definition of CIE illuminant and observer tables

ASTM D2244 **Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates** describes the calculation of rectangular, polar and elliptical color differences.

ASTM E313 **Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates** defines the two most popular whiteness and yellowness metrics.

INSTRUMENT GEOMETRIES AND STANDARDS

ASTM E1164 **Standard Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation** covers sensor conformance issues including instrument geometry.

ASTM E1331 **Standard Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry** defines colorimetric measurement using a diffuse geometry instrument.

ASTM E1349 **Standard Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional Geometry** defines colorimetric measurement using a directional 45°/0° or 0°/45° geometry instrument.

SAMPLE PREPARATION AND PRESENTATION

ASTM E179 **Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission** describes the appropriate selection of instrument geometry to match sample types.

ASTM E1345 **Practice for Reducing the Effect of Variability of Color Measurement by Use of Multiple Measurements** describes averaging as a technique to minimize sample variation.

ASTM E805 **Standard Practice for Identification of Instrumental Methods of Color or Color-Difference Measurement of Materials** describes identification of measurement methods for effective communication of color values.

ESTABLISHING PRODUCT TOLERANCES

ASTM D3134 **Standard Practice for Establishing Color and Gloss Tolerances** describes general techniques for establishing product tolerances.

FURTHER INFORMATION

See "How to effectively communicate color values" at MeasureTrueColor.com.

See application note - AN 1031 Identification of Measurement Parameters.

For relevant ISO methods, see HunterLab's AN 1036 ISO Industrial Methods for Color Measurement.

For JIS methods, see HunterLab's AN 1037 JIS Industrial Methods for Color Measurement.

More Information about Color Measurement on our HunterLab Blog

measuretruecolor.com

ABOUT HUNTERLAB

HunterLab, the first name in color measurement, provides ruggedly dependable, consistently accurate, and cost effective color measurement solutions. With over 6 decades of experience in more than 65 countries, HunterLab applies leading edge technology to measure and communicate color simply and effectively. The company offers both diffuse/8° and a complete line of true 45°/0° optical geometry instruments in portable, bench-top and production in-line configurations. HunterLab, the world's true measure of color.

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