



Designation: C1649 – 14 (Reapproved 2021)

Standard Practice for Instrumental Transmittance Measurement of Color for Flat Glass, Coated and Uncoated¹

This standard is issued under the fixed designation C1649; 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 provides guidelines for the instrumental transmittance measurement of the color of coated and uncoated transparent glass. (See Terminology [E284](#).)

1.2 The practice specifically excludes fluorescent and iridescent samples.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *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

[D2244](#) Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

[E179](#) Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Materials

[E284](#) Terminology of Appearance

[E308](#) Practice for Computing the Colors of Objects by Using the CIE System

¹ This practice is under the jurisdiction of ASTM Committee [C14](#) on Glass and Glass Products and is the direct responsibility of Subcommittee [C14.11](#) on Optical Properties.

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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.

[E1164](#) Practice for Obtaining Spectrometric Data for Object-Color Evaluation

[E1348](#) Test Method for Transmittance and Color by Spectrophotometry Using Hemispherical Geometry

2.2 CIE Standard:³

[CIE 15:2004](#) Colorimetry

3. Summary of Practice

3.1 The color of transparent glass is measured in the total transmittance mode on a CIE-conforming diffuse instrument. (See Guide [E179](#) and Test Method [E1348](#).) The glass color is expressed in CIE tristimulus values based on spectral transmittance measurements over the full CIE spectral range of 350 to 780 nm with a maximum 10 nm band pass. (See [CIE 15:2004](#) and Practice [E308](#).) For color measurement, use of a truncated spectral range of 400 to 700 nm is acceptable. (See [CIE 15:2004](#).) Further information on the UV absorbing characteristics of the glass or glass coating, or both, may be determined by examining the spectral data in the 350 to 400 nm range. If the instrument allows spectral measurement above 700 nm, useful information on the IR transmittance characteristics of the glass or glass coating may also be determined. If coatings are present, they are assumed to reflect and partially transmit light.

4. Significance and Use

4.1 Color measurement quantifies the transmitted color for glass. The user defines an acceptable range of color appropriate for the end use. A typical quality concern for transmittance color measurement of glass products is verification of lot-to-lot color consistency for end-user acceptance.

4.2 If the transmitted color of a glass product is consistent from lot-to-lot and within agreed supplier-buyer acceptance criteria, the product's color is expected to be consistent and acceptable for end-use.

³ Available from U.S. National Committee of the CIE (International Commission on Illumination), C/o Alan Laird Lewis, 282 E. Riding, Carlisle, MA 01741, <http://www.cie-usnc.org>.