



Standard Practice for Measuring Photometric Characteristics of Retroreflectors¹

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1. Scope

1.1 This practice describes the general procedures for instrumental measurement of the photometric characteristics of retroreflective materials and retroreflective devices.

1.2 This practice is a comprehensive guide to the photometry of retroreflectors but does not include geometric terms that are described in Practice E808.

1.3 This practice describes the parameters that are required when stating photometric measurements in specific tests and specifications for retroreflectors.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

E284 Terminology of Appearance

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

E808 Practice for Describing Retroreflection

2.2 CIE Documents:

CIE Publication No. 54.2 Retroreflection—Definition and Measurement³

CIE Publication DS 17.2/E:2009 International Lighting Vocabulary³

CIE Publication No. 69-1987 Methods of Characterizing Illuminance Meters and Luminance Meters³

¹ This practice is under the jurisdiction of ASTM Committee E12 on Color and Appearance and is the direct responsibility of Subcommittee E12.10 on Retroreflection.

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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.

³ Available from the CIE Webshop at <http://www.cie.co.at>.

3. Terminology

3.1 Terms and definitions in Terminology E284 and E808 are applicable to this practice. In general, the terminology in this practice agrees with that in CIE Publications DS 17.2/E:2009 and 54.2.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *annular aperture, n*—the difference between the angular diameters of the external boundary circle and the internal boundary circle.

3.2.2 *circular aperture, n*—the angular diameter of a circular aperture surface.

3.2.3 *goniometer, n*—an instrument for measuring or setting angles.

3.2.4 *photopic receiver, n*—a receiver of radiation with a spectral responsivity which conforms to the $V(\lambda)$ distribution of the CIE Photopic Standard Observer that is specified in Practice E308.

3.2.5 *receiver aperture, n*—angular dimensions from the retroreflector center to the entrance aperture or pupil of the receiver.

3.2.6 *rectangular aperture, n*—the angular height and width of a rectangular aperture surface.

3.2.6.1 *Discussion*—The orientation of the sides of the rectangular aperture surface should be supplied together with the angular height and width.

3.2.7 *reflected illuminance, E_r , n*—illuminance at the receiver measured on a plane perpendicular to the observation axis.

3.2.7.1 *Discussion*—This quantity is used in the calculation of the coefficient of luminous intensity, R_f ; $R_f = (I/E_\perp) = (E_r d^2)/E_\perp$, where d is the distance from the retroreflector to the receptor.

3.2.8 *retroreflectometer aperture angles, n*—the maximum angular diameter of the pencil of light (see Fig. 1).

3.2.8.1 *Discussion*—In practice the illumination arrives at the retroreflector center within a narrow pencil of light surrounding the illumination axis and the light reflected to the photoreceptor is contained within another narrow pencil. The distribution of light within such pencils is the “aperture” function and the maximum angular diameter of the pencil is the “aperture angle.” It is generally assumed that the aperture