



Standard Test Method for Measurement of High-Visibility Retroreflective-Clothing Marking Material Using a Portable Retroreflectometer¹

This standard is issued under the fixed designation E 1809; 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 test method covers the measurement of the retroreflective properties of high visibility pedestrian garments, such as vests, using a portable retroreflectometer that can be used in the field. The portable retroreflectometer is a hand-held instrument with a defined standard geometry corresponding to United States usage that can be placed in contact with retroreflective marking material to measure the retroreflection. The measurements can be compared to minimum requirements to determine the need for replacement.

1.2 This test method is designed for measuring retroreflective marking materials that have an area equal to or greater than that of the aperture of the retroreflectometer.

1.3 This test method is intended to be used for field measurement of retroreflective marking materials, but may be used to measure the performance of materials before placing the clothing in use.

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

2. Referenced Documents

2.1 ASTM Standards:

E 284 Terminology of Appearance²

E 809 Practice for Measuring Photometric Characteristics of Retroreflectors²

E 810 Test Method for Coefficient of Retroreflection of Retroreflective Sheeting²

3. Terminology

3.1 The terminology used in this test method, in general, agrees with that used in Terminology E 284.

3.2 **Definitions**—The delimiting phrase in *retroreflection* applies to each of the following definitions when used outside the context of this or other retroreflection standards.

3.2.1 *coefficient of retroreflection, R_A , n* —of a plane retroreflecting surface, the ratio of the coefficient of luminous

intensity (R_i) of a plane retroreflecting surface to its area (A), expressed in candelas per lux per square metre ($\text{cd} \cdot \text{lx}^{-1} \cdot \text{m}^{-2}$).

$$R_A = R_i/A \quad (1)$$

3.2.2 *entrance angle, β , n* —angle between the illumination axis and the retroreflector axis.

3.2.3 *instrument standard, n* —a working standard used to standardize the portable retroreflectometer.

3.2.4 *observation angle, n* —angle between the illumination axis and the observation axis.

3.2.5 *portable retroreflectometer, n* —a hand-held instrument that can be used in the field or in the laboratory to measure retroreflection.

3.2.5.1 **Discussion**—In this test method, *portable retroreflectometer* refers to a hand-held instrument that can be placed in contact with retroreflective marking material to measure the coefficient of retroreflection in a standard geometry.

3.2.6 *presentation angle, γ , n* —angle between the observation half-plane and the half-plane that originates on the illumination axis and that contains the retroreflector axis.

3.2.7 *retroreflection, n* —reflection in which the reflected rays are preferentially returned in directions close to the opposite of the direction of the incident rays, this property being maintained over wide variations of the direction of the incident rays.

3.2.8 *rotation angle, ϵ , n* —angle indicating the orientation of the specimen when it is rotated about the retroreflector axis.

3.2.8.1 **Discussion**—The rotation angle is the dihedral angle from the half-plane originating on the retroreflector axis and containing the positive part of the second axis to the half-plane originating on the retroreflector axis and containing the datum mark. Range: $-180^\circ < \epsilon \leq 180^\circ$.

4. Summary of Test Method

4.1 This test method involves the use of commercial portable retroreflectometers for determining the retroreflectivity of retroreflective marking material(s) on garments.

4.2 Unless otherwise specified by the user, the entrance angle shall be 5.0° and the observation angle shall be 0.33° .

4.2.1 The angles specified are those currently employed in the United States and may differ from angles used in other countries.

4.3 The portable retroreflectometer uses an instrument standard for standardization.

4.4 After standardization, the retroreflectometer is placed in

¹ This test method is under the jurisdiction of ASTM Committee E-12 on Appearance and is the direct responsibility of Subcommittee E12.10 on Retroreflection.

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² *Annual Book of ASTM Standards*, Vol 06.01.