



Standard Test Methods for Polariscopic Examination of Glass Containers¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 These test methods describe the determination of relative optical retardation associated with the state of anneal of glass containers. Two alternative test methods are covered as follows:

	Sections
Test Method A—Comparison with Reference Standards Using a Polariscopes	6 to 9
Test Method B—Determination with Polarimeter	10 to 12

1.2 Test Method A is useful in determining retardations less than 150 nm, while Test Method B is useful in determining retardations less than 565 nm.

NOTE 1—The apparent temper number as determined by these test methods depends primarily on (1) the magnitude and distribution of the residual stress in the glass, (2) the thickness of the glass (optical path length at the point of grading), and (3) the composition of the glass. For all usual soda-lime silica bottle glass compositions, the effect of the composition is negligible. In an examination of the bottom of a container, the thickness of glass may be taken into account by use of the following formula, which defines a real temper number, T_R , in terms of the apparent temper number, T_A , and the bottom thickness, t :

$$T_R = T_A (0.160/t)$$

where t is in inches, or

$$T_R = T_A (4.06/t)$$

where t is in millimetres.

This thickness should be measured at the location of the maximum apparent retardation. Interpretation of either real or apparent temper number requires practical experience with the particular ware being evaluated.

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

¹ These test methods are under the jurisdiction of ASTM Committee C14 on Glass and Glass Products and are the direct responsibility of Subcommittee C14.07 on Glass Containers.

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2. Referenced Documents

2.1 ASTM Standards:

C 162 Terminology of Glass and Glass Products²

C 224 Practice for Sampling Glass Containers²

C 1426 Practices for Verification and Calibration of Polarimeters²

3. Terminology

3.1 *Definitions*—For definitions of terms used in these test methods see Terminology C 162.

4. Significance and Use

4.1 These two test methods are provided for evaluating the quality of annealing. These test methods can be used in the quality control of glass containers or other products made of similar glass compositions, where the degree of annealing must be verified to ensure quality products. These test methods apply to glass containers manufactured from commercial soda-lime-silica glass compositions.

5. Sampling

5.1 Methods of sampling a minimum lot from a group of containers of a given type are given in Practice C 224 for the various situations to which that method may apply.

TEST METHOD A—COMPARISON WITH REFERENCE STANDARDS USING A POLARISCOPE

6. Apparatus

6.1 *Polariscopes*, conforming to the following requirements:

6.1.1 The degree of polarization of the field at all points shall not be less than 99 %.

6.1.2 The field shall be a minimum of 51 mm (2 in.) in diameter greater than the diameter of the container to be measured. The distance between the polarizing and analyzing elements shall be sufficient to allow the inside bottle bottom surface to be viewed through the open container finish.

6.1.3 A sensitive tint plate, having a nominal optical retardation of 565 nm, with a variation across the field of view of less than 5 nm and with its slow axis at 45° to the plane of

² Annual Book of ASTM Standards, Vol 15.02.