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Standard Test Method for Linear Measurement Using Precision Steel Rule¹

This standard is issued under the fixed designation F2203; 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 linear dimension of flexible packages and packaging materials. It is recommended for use with an allowable tolerance range of 3 mm ($\frac{1}{8}$ in.) or greater based on gage repeatability and reproducibility presented in the Precision and Bias section.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

2. Referenced Documents

2.1 *ASTM Standards:*²

- ~~D1898E171 Practice for Sampling of Plastics Conditioning and Testing Flexible Barrier Packaging (Withdrawn 1998)~~
- ~~D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing~~
- ~~E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method~~

3. Terminology

3.1 *Definitions:*

- 3.1.1 *linear dimension*—the measurement of length, width or relative positions.
- 3.1.2 *parallax error*—the error resulting from a change in observational relationship to a fixed position. For example, looking at a measurement gage from different angles can cause variation in the reporting of that measurement.

4. Significance and Use

4.1 This test method provides a means for measuring linear dimensions. Accurate measurement of dimensions can be critical to meeting specifications and characterizing process performance.

4.2 This test method should not be applied to tolerance ranges of less than 3 mm ($\frac{1}{8}$ in.) when it is preferable that test error does not exceed 30 % of tolerance range. See Precision and Bias Section for gage repeatability and reproducibility results.

4.3 This test method does not address acceptability criteria. These need to be jointly determined by the user and producer of the product.

5. Apparatus

5.1 *Precision Steel Rule:*

- 5.1.1 Tempered steel rule in increments of $\frac{1}{64}$ in., 100ths, or $\frac{1}{2}$ mm.
- 5.1.2 Steel rule should be of sufficient length to measure full dimension of interest.
- 5.1.3 It is recommended that a calibration be performed on the apparatus used and it is certified to a recognized industry standard.

6. Sampling

6.1 The number of samples tested should be adequate to be predictive of performance. Caution should be taken when eliminating samples with defects as this can bias results.

¹ This test method is under the jurisdiction of ASTM Committee F02 on Flexible Barrier Packaging and is the direct responsibility of Subcommittee F02.20 on Physical 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.

TABLE 1 Description of Materials Measured in Round Robin Studies

Measurement Set	Material Type	Measurement Characteristic	Ruler Scaling Applied
A	Foil Web	Web Width	in.
B	Paper Web	Web Width	in.
C	Spunbonded Olefin Web	Web Width	mm
D	Printed Foil Web	Print Repeat Length	in.
E	Printed Paper Web	Print Repeat Length	in.
F	Printed Spunbonded Olefin Web	Print Repeat Length	mm
G	Forming Film Web	Web Width	mm
H	Finished Pouch	Dimension A	in.
I	Finished Pouch	Dimension B	in.
J	Finished Pouch	Dimension C	in.
K	Finished Pouch	Dimension D	in.
L	Finished Pouch	Dimension E	in.
M	Finished Pouch	Dimension F	in.

6.2 See Practice [D1898](#) for guidance on sampling practices.

7. Conditioning

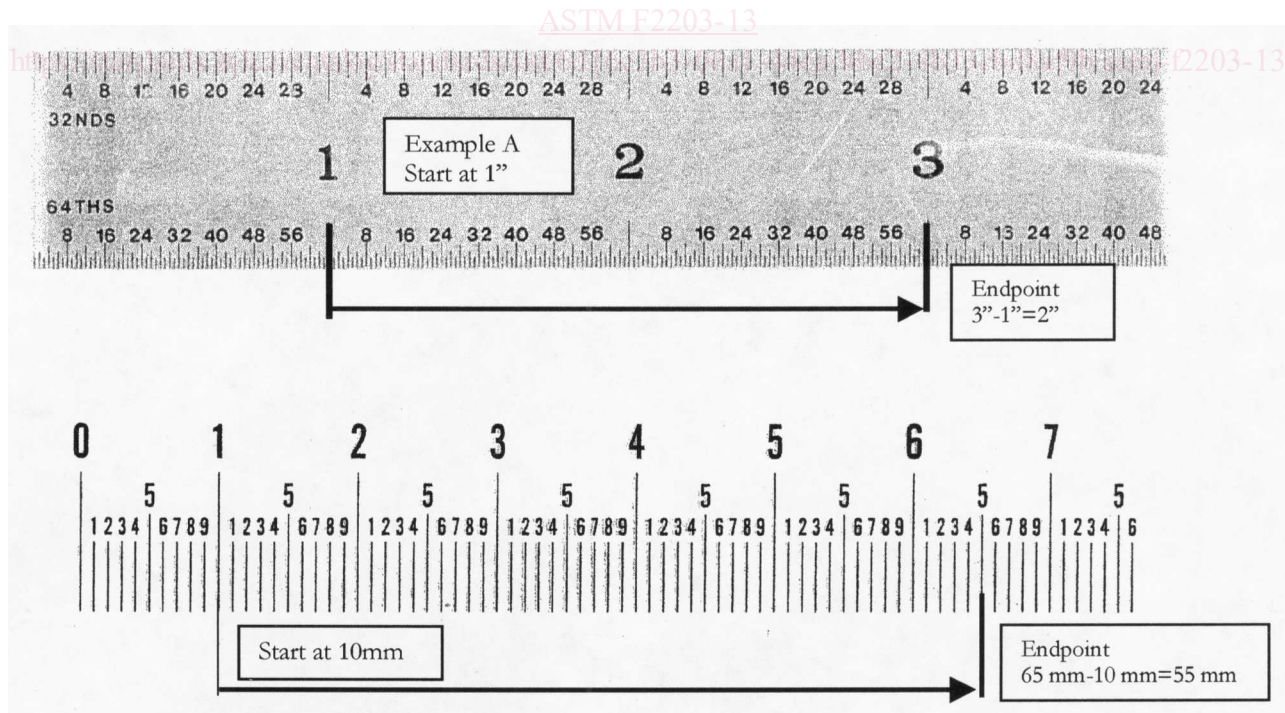
7.1 Conditioning of the samples will depend on the material under evaluation. If conditioning before testing is appropriate, normal, and desirable, then condition the test specimens at $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) and $50 \pm 5\%$ relative humidity for not less than 24 h prior to test. refer to Specification [E171](#).

7.2 See Practice [D4332](#) for guidance on conditioning practices.

8. Procedure

8.1 Review applicable specifications, drawings, or procedures. Specify unit of measure to be used and directions related to precision requirements (for example, measure to nearest 0.5 mm, round up or down to nearest 0.5 mm, to $\frac{1}{64}$ in., etc.). Depending upon the level of accuracy and visual acuity, image magnification may be an aid.

8.2 Lay sample to be measured on flat surface with sufficient color contrast to distinguish the edge of the sample. Sample should lay flat and smooth without wrinkles, creases or folds. Material should not be under tension when measured.



NOTE 1—Example A and Example B begin at the leading edge of fixed scale division on rule at a point within the scale, at 1 in. or 10 mm, for example.

FIG. 1 Proper Alignment to Ruler Scale Divisions