



Standard Test Method for Measurement of Thickness of Nonmagnetic Materials by Means of a Digital Magnetic Intensity Instrument¹

This standard is issued under the fixed designation D 4166; 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.

^{e1} NOTE—Note 1 was added and footnote 2 was editorially corrected.

1. Scope*

1.1 This test method covers the measurement of thickness of any nonmagnetic material by means of a digital magnetic intensity instrument.

NOTE 1—The instrument on which this test method is based is no longer sold or serviced.

1.2 *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.*

1.3 There is no similar or equivalent ISO standard.

2. Summary of Test Method

2.1 In this test method, a magnetic sensing device is calibrated and placed on one side of the material to be measured. A magnet of known intensity is placed on the opposite side and the distance between the magnet and the magnetic sensing device shows as a digit that can be converted to inch-pound or metric units by reference to a table.

3. Significance and Use

3.1 This test method is useful for measuring the wall thickness of plastic vessels and other plastic structures where the geometry of the equipment does not permit direct measurement by conventional methods, such as micrometers, calipers, and rulers. This test method is not limited to plastics and can be used for all nonmagnetic materials. It provides for a rapid and accurate thickness measurement, without the need for drilling and repair of holes.

3.2 Accuracies are not affected by density variations, permitting the measurement of composites made up of a variety of materials of varying densities. By placement of the magnetic source on the mold surface, thickness measurements can be

made during and after fabrication of plastic products to verify thickness and adherence to specifications.

4. Interferences

4.1 Any instrument measuring the intensity of a magnetic field can sometimes be influenced by a strong artificial or natural magnetic field.

4.2 Any magnetic material located in the space between the magnet and the sensor will distort the measurement.

4.3 A major temperature change (+10°F, +5.6°C) will cause a slight drift in calibration, requiring a recalibration at the new temperature prior to making the measurement.

5. Apparatus

5.1 *Micro Digital Magnetic Thickness Sensor².*

6. Sampling

6.1 Two separate measurements at each location shall be taken. If a variation in excess of 0.01 in. (0.25 mm) appears, a third measurement shall be taken.

7. Procedure

7.1 *Calibration*—Calibrate the magnetic sensing device as follows:

7.1.1 Center the magnet supplied with the apparatus on the end of the sensor head and depress the “set” button. This establishes the zero measurement point.

7.2 *Measurement:*

7.2.1 Place the magnet used in the calibration procedure (7.1) on one side of the material to be measured.

7.2.2 Place the magnetic sensing device on the opposite side and move it in a criss-cross motion until the digit reaches its lowest point. This denotes that the magnetic sensing device is centered on the magnet.

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.23 on Reinforced Plastic Piping Systems and Chemical Equipment.

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² The sole source of supply of the apparatus known to the committee was the Polygauge Digital Magnetic Thickness Sensor. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee ¹, which you may attend.

*A Summary of Changes section appears at the end of this standard.

7.2.3 Depress the “set” button to lock in the measurement shown in the digital read-out.

7.2.4 To perform further measurements, repeat 7.1.1-7.2.3.

8. Report

8.1 Report the following information:

- 8.1.1 Identification of the material or item measured,
- 8.1.2 Exact location where measurement was made,
- 8.1.3 Condition of two surfaces of material measured,
- 8.1.4 Number of readings taken, and
- 8.1.5 Date of inspection.

9. Precision and Bias

9.1 In October 1981, an interlaboratory evaluation was conducted in an ASTM workshop. Persons interested in ob-

taining a copy of the research report of this evaluation may contact ASTM directly.³

9.1.1 In the workshop, 80 measurements were taken using 4 separate instruments, 4 samples of varying thicknesses, and 8 individuals. The average error experienced was 0.0062 in. (0.157 mm).

10. Keywords

10.1 plastic measurement; thickness measurement

³ Supporting data are available from ASTM Headquarters. Request RR:D20-1096.

SUMMARY OF CHANGES

Committee D20 has identified the location of selected changes to this standard since the last issue D4166-99 that may impact the use of this standard. (Approved Oct. 1, 2004)

(1) Addition of Note 1.

(2) Footnote 2 was corrected.

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