

INDENTATION HARDNESS TEST FOR PLASTICS

Application

This procedure is used to determine the ball indentation hardness values of plastics, integral foam and hard rubber.

Scope

The ball indentation hardness is the quotient of the major load and the area of indentation produced by a 5 or 10 mm diameter ball after the major load has been applied for the specified time (10 and 60 seconds).

Apparatus Required

Ball Indentation Hardness Tester

With preload of	2.94 N	(0.3 kgf)
	9.81 N	(1.0 kgf)
With major load of	49.05 N	(5.0 kgf)
	132.44 N	(13.5 kgf)
	358.07 N	(36.5 kgf)
	961.38 N	(98.0 kgf)

Note:

Steel Ball: Hardened and polished steel ball with a Vickers hardness 7.85 kN/mm^2 (800 kgf/mm^2). The ball shall not exhibit any deformation or evidence of damage either before or after test.

Measuring Scale: Scale value of the measuring equipment for the depth of penetration is 0.005 mm.

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Stop Watch

Date	Action	Revisions
2001 03 28	Revised	Editorial – no technical change A. Cockman
1994 02 28		

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Conditioning and Test Conditions

All test values indicated herein are based on material conditioned in a controlled atmosphere of 23 +/- 2 °C and 50 +/- 5 % relative humidity for not less than 24 h prior to testing and tested under the same conditions unless otherwise specified.

Procedure

1. Place the test specimen perfectly flat on the support. Its test surface shall be at right angles to the direction of the applied load. Gradually apply the preload and set the dial gauge to zero.
2. Apply the major load evenly over 2 seconds. The major load is chosen so that the indentation depth is between 0.15 and 0.35 mm.
3. 10 seconds and 60 seconds after the major load has been applied, the depth of indentation is measured under load.

Note:

If the values for the indentation depth for individual test specimens or homogeneous series of specimens lie outside the specified range, so that changing to another major load would be necessary, then the major load to be applied is that for which the average value of the indentation depth after 60 seconds lies within the specified range. The number of test results lying outside the specified indentation depth range shall then be stated in the test report.

The test shall be carried out avoiding buckling of the edges or tearing of the test specimen. If several tests are carried out on one test specimen the distance between the centres of any two adjacent indentations shall be at least 5 mm.

The test surface and the bearing surface of the 4 mm thick test specimen shall be smooth, flat and parallel. If these conditions cannot be fulfilled, the deviations shall be stated in the test report.

The test surface shall be large enough to permit the test to be carried out as far away from the edge of the test specimen as possible to exclude the possibility of the test results being influenced by the edge region. No deformation shall be visible on the lower surface of the test specimen after completion of the test.

The ball diameter (5 mm or 10 mm) will be chosen according to the specification requirement.

Evaluation

The ball indentation hardness is calculated as follows:

For a 5 mm steel ball:

$$H = \frac{0.21}{0.21 - h_r + h} \times \frac{F}{5\pi h_r}$$