

Australian/New Zealand Standard®

Plastics—Glass filament reinforced plastics (GRP)—Methods of test

Method 22: Method for the determination of hardness by means of a Barcol impressor

1 SCOPE This Standard describes the determination of indentation hardness of glass reinforced plastic materials using a Barcol impressor, Model No. 934-1.

NOTE: The Barcol impressor is portable and therefore suitable for testing the hardness of fabricated parts and individual test specimens for production control purposes.

2 PRINCIPLE A test specimen is supported on a hard firm surface. The Barcol impressor is held-by-hand and set on the test specimen with the indenter perpendicular to the surface being tested. Sufficient force is applied by hand to ensure firm contact with the test specimen and the highest Barcol hardness read on the dial is noted. Sufficient number of tests are performed to ensure the average result has a confidence limit of ± 4 at a 95% probability level.

3 REFERENCED DOCUMENTS The following document is referred to in this Standard.

AS

3572 Plastics—Glass filament reinforced plastics (GRP)—Methods of test

3572.1 Method 1: Preparation of glass filament reinforced plastics test specimens

4 APPARATUS The apparatus shall be a Barcol impressor (see Figure 1), Model No. 934-1, which consists of the following parts:

- (a) *Indenter* The indenter shall consist of a hardened steel truncated cone having an angle of 26° with a flat tip of diameter 0.157 mm. It shall fit into a hollow spindle and be held down by a spring-loaded plunger.
- (b) *Indicating device* The indicating dial shall have 100 divisions, each representing a penetration depth of 0.0076 mm. The dial shall read directly in Barcol hardness units; the higher the reading, the harder the material.

5 TEST SPECIMENS

5.1 Test surface The testing area shall be smooth and free from mechanical damage (such as scratches or holes).

5.2 Dimensions Test specimens shall be at least 1.5 mm thick and large enough to ensure a minimum distance of 3 mm in any direction from the indenter tip to the edge of the specimen or to another earlier test position.

6 CALIBRATION Adjust the apparatus, by means of the lower plunger guide nut in accordance with the maker's instructions, so as to obtain a dial reading of 100 when the apparatus is used on a glass surface and the hardness values stated by the maker when it is used on the aluminium calibration discs ('hard' and 'soft') supplied with the apparatus.

7 CONDITIONING OF TEST SPECIMENS Condition the test specimens in accordance with AS 3572.1.

8 PROCEDURE The procedure shall be as follows:

- (a) Support the test specimens by a hard, firm surface if they are likely to bend or deform under the pressure of the indenter. The indenter shall be perpendicular to the surface being tested. Grasp the impressor firmly between leg and point sleeve and set both on the surface to be tested. For small test specimens, it may be necessary to support the leg on a wedge. Quickly apply by hand sufficient force on the housing to ensure firm contact with the test specimen and record the highest dial reading as the hardness in Barcol hardness units. Take care to avoid sliding or scraping while the indenter is in contact with the surface being tested.

NOTES:

- 1 Curved surfaces may be more difficult to support. When the force is applied, bending and spring action in the specimen should be avoided.
 - 2 A slow fall in the reading on the indicating dial is sometimes noted for materials which are susceptible to creep. It is particularly important for such materials to record the highest instantaneous reading on the indicating dial.
- (b) Impressions should not be made within 3 mm of the edge of the specimen or of other impressions.

9 NUMBER OF READINGS Reinforced plastics materials are inherently heterogeneous and a large scatter of readings is observed. This is mainly caused by the differences in hardness between the resin and the reinforcement material in contact with the small diameter indenter. The number of measurements shall be such that the average result has a confidence limit of $\pm 4\%$ (at a 95% probability level).

10 TEST REPORT The following information shall be reported:

- (a) complete identification of the material tested;
- (b) method of preparing the test specimens;
- (c) atmospheres used for conditioning and testing;
- (d) number of readings taken;
- (e) average of the hardness values rounded to the nearest whole scale division;
- (f) date of test.
- (g) Reference to this test method i.e. AS/NZS 3572.22.