

AS 1982—1993

Australian Standard[®]

**Methods for the measurement
of case depth in steels**

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Australian Chamber of Manufactures
Bureau of Steel Manufacturers of Australia
Department of Defence
Railways of Australia Committee
University of Wollongong

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of case depth in steels**

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PREFACE

This Standard was prepared, under the direction of the Multitechnics Standards Policy Board, by the Standards Australia Committee on Metallography to supersede AS 1982—1977, *Methods for the measurement of case depth in steels*.

The Standard is one of a series relating to the use of micrographic, macroscopic, chemical and hardness procedures for the measurement of case depth and decarburization in steel products. Others in the series are as follows:

- AS
2003 *Carbon and low alloy steel—Measurement of decarburization*
2028 *Methods for the measurement of the depth of hardening in flame and induction hardened steel products.*

This Standard has been revised to include a minor alteration to the micrographic test procedure to clarify microstructural requirements.

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STANDARDS AUSTRALIA

Australian Standard

Methods for the measurement of case depth in steels

1 SCOPE This Standard specifies methods for the measurement of case depths of up to 3 mm produced by carburizing, nitriding, carbo-nitriding, or cyaniding heat treatment processes, in steel products.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

- 1050 Methods for the analysis of iron and steel
1050.2 Part 2: Determination of carbon content (gravimetric method)
1050.32 Part 32: Determination of carbon content (infrared method)
1817 Metallic materials—Vickers hardness test
2243 Safety in laboratories
2243.2 Part 2: Chemical aspects

ASTM

- E384 Test method for microhardness of materials
E415 Method for optical emission vacuum spectrometric analysis of carbon and low-alloy steel

3 DEFINITIONS For the purpose of this Standard, the definitions below apply.

3.1 Case—a surface layer having a different chemical composition to that of the core resulting from the diffusion of carbon or nitrogen or both, from external sources into the steel.

3.2 Core—that portion of steel which is bounded, totally or in part, by the case, and which remains chemically unchanged during the case hardening process.

3.3 Effective case depth—the distance measured along a line normal to the original surface to the point where the hardness first equals a specified hardness value.

3.4 Test piece—a prepared piece for testing, made from a test specimen by a mechanical operation.

3.5 Test sample—a portion of material or a group of items selected from a batch or consignment by a sampling procedure.

3.6 Test specimen—a portion of material or a single item taken from the test sample for the purpose of applying a particular test.

3.7 Total case depth—the distance measured along a line normal to the original surface of a hardened or unhardened case to a point where differences in chemical or physical properties of the case and core cannot be distinguished.

NOTE: 'Case depth' is normally taken to be the effective case depth.

4 PRINCIPLE OF METHODS The enrichment of the surface layer of steel with carbon or nitrogen, or both, alters the chemical composition, the micrographic structure and the mechanical properties of the surface layer. Hardness, micrographic, macroscopic, chemical and spectrometric methods are used for the measurement of case depth.

5 PREPARATION OF TEST PIECES

5.1 General Test pieces shall be in the condition specified in the relevant product specification. When products for test are being sampled it is necessary to consider that an irregular product configuration may prevent a uniform depth of hardening.

The test pieces should be of the same material and cross-sectional area as the product they represent and should be given an identical heat treatment. Where practicable, test pieces should be cut from actual components.

5.2 Surface condition Test pieces shall be capable of withstanding the conditions of the test and, if necessary, may be de-scaled by an appropriate method that does not remove any of the steel surface, prior to sectioning for examination.

5.3 Machining of test pieces

5.3.1 Prior to the hardness traverse test Test pieces for the hardness traverse test are machined either normal to, at an angle to, or in steps parallel to the original surface as follows:

- (a) *For cross-section test pieces* Where cross-section test pieces are specified, they shall be ground or otherwise machined normal to the original surface (see Figure 1(a)).

NOTE: Preparation by machining or grinding normal to the original surface to the test piece is not recommended where the total case depth is less than 0.25 mm.