

Australian Standard[®]

**Carbon and low alloy steel—
Measurement of decarburization**

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The following interests are represented on Committee MT/8:

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

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PREFACE

This Standard was prepared by the Standards Australia Committee on Metallography, to supersede AS 2003—1977, *Methods for the measurement of decarburization in carbon and low alloy steels*.

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

AS

1982 *Methods for the measurement of case depth in steels.*

2028 *Methods for the measurement of the depth of hardening in flame and induction hardened steel products.*

This Standard has been revised to include minor alterations to the micrographic and the hardness traverse test procedures to clarify the criteria for determining the limit of decarburization. An appendix has been added giving advice on the grinding and polishing of test specimens.

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STANDARDS AUSTRALIA

Australian Standard

Carbon and low alloy steel—Measurement of decarburization

1 SCOPE This Standard describes methods for the measurement of the depth of decarburization in carbon and low alloy steel products.

NOTE: The Standard does not set limits for decarburization; such limits are normally set in product specifications.

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 Method for Vickers hardness test
 1817.1 Part 1: Testing of metals
 2025 Method for Rockwell superficial hardness test
 2025.1 Part 1: Testing of metals, N and T scales
 2243 Safety in laboratories
 2243.2 Part 2: Chemical

ASTM

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

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

3.1 Decarburization—loss of carbon from the surface layer of steel.

3.2 Complete decarburization—complete loss of carbon from the surface of steel leaving a single-phase ferritic structure.

3.3 Partial decarburization—any measureable loss of carbon that is less than complete, from the surface of steel.

3.4 Total decarburization—the sum of the depths of complete and partial decarburization.

NOTE: For many purposes, the above definitions are replaced by a functional definition of decarburization, e.g. effective decarburization is the depth of the layer in which 10% of carbon has a significant effect on the properties of the final product.

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

4 PRINCIPLE OF METHODS The loss of carbon from the surface of steel products alters the chemistry, the microstructure, and the mechanical properties of the surface layer. It is thus possible to use micrographic, chemical, or hardness traverse methods, or combinations of these methods, for the measurement of decarburization.

The measured depth of decarburization depends on the method of measurement, which in turn depends on such factors as the composition of the product and the heat treatment conditions. Each method has its own application and no single method can be recommended for all purposes.

NOTE: Appendix A gives guidance on the choice of methods for determining the extent of decarburization.

5 PREPARATION OF TEST PIECES

5.1 General Test pieces shall be in the condition specified in the relevant product specification.

When it is necessary to heat-treat test pieces, the heat-treatment process (see Clause 5.3) shall be carried out in a neutral atmosphere, such as argon or nitrogen, or in a neutral salt bath. If so specified, test pieces may be copper-coated, or coated with a suitable anti-oxidant or anti-carburizing compound, prior to heating.

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 or examination.