

AS 1391—1991

Australian Standard®

**Methods for tensile testing of
metals**

This Australian Standard was prepared by Committee MT/6, Mechanical Testing of Metals. It was approved on behalf of the Council of Standards Australia on 27 December 1990 and published on 15 April 1991.

The following interests are represented on Committee MT/6:

Aluminium Development Council
Bureau of Steel Manufacturers of Australia
Confederation of Australian Industry
CSIRO, Division of Applied Physics
Department of Defence
Federal Chamber of Automotive Industries
Metal Trades Industry Association of Australia
National Association of Testing Authorities, Australia
Railways of Australia Committee
University of Sydney
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Additional interests participating in preparation of Standard:

Calibrating organizations
Metal manufacturing industries
Testing and research organizations

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metals**

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PREFACE

This Standard was prepared by the Standards Australia Committee on Mechanical Testing of Metals to supersede AS 1391—1974.

In this edition, one strain rate is specified for the testing of all metals, and a strain rate range which corresponds to Strain rate A of the previous edition is specified for metals sensitive to strain rate. Four supplementary strain rate categories are included in an Appendix for use only with specialized testing procedures. In the previous edition, two supplementary categories were specified. The K-value method for controlling strain rate has been deleted and guidance on the means of controlling strain rate has been revised. The selection and range of test pieces have been clarified, although selection is normally covered in the relevant product Standard.

In preparing this revision, cognizance was taken of the International Standard ISO 6892—1984, *Metallic materials—Tensile testing*.

The Australian Standard is technically similar to ISO 6892 but contains more detailed requirements, especially in relation to test piece manufacture and strain rates, and gives more information for the assessment of yield stress and proof stress.

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STANDARDS AUSTRALIA

Australian Standard

Methods for tensile testing of metals

1 SCOPE This Standard sets out methods by which a test piece of metal is strained in uni-axial tension at room temperature in order to determine one or more of its tensile properties. It defines the properties to be determined and the terms used in describing tests and test pieces. The Standard also specifies the dimensions of standard test pieces and methods for tensile testing a wide range of product forms.

This Standard does not cover through thickness tensile tests, tensile tests at elevated temperature (see AS 2291), the determination of uniform elongation (see AS 2346), or the measurement of plastic strain ratio (see AS 2403).

NOTES:

- 1 The properties which are to be determined and the criteria for assessment of the results of tests are not included; they should be set out in the relevant product Standard.
- 2 Advice and recommendations on information to be supplied by the purchaser at the time of enquiry and order for the testing to be performed are contained in Appendix A.

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

AS

- | | |
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| 1545 | Methods for the calibration and grading of extensometers |
| 1855 | Methods for the determination of transverse tensile properties of round steel pipes |
| 2193 | Methods for calibration and grading of force-measuring systems of testing machines |
| 2291 | Methods for tensile testing of metals at elevated temperatures |
| 2346 | Methods for the determination of uniform elongation in sheet and strip metals |
| 2403 | Method for the measurement of the plastic strain ratio 'r' of sheet and strip metals |
| 2706 | Numerical values—Rounding and interpretation of limiting values |

ISO

- | | |
|--------|---------------------------------------|
| 2566 | Steel—Conversion of elongation values |
| 2566.1 | Part 1: Carbon and low alloy steels |
| 2566.2 | Part 2: Austenitic steels |
| 6892 | Metallic materials—Tensile testing |

BS

- | | |
|--------|---|
| 3894 | Method for converting elongation values for steel |
| 3894.1 | Part 1: Carbon and low alloy steels |

ASTM

- | | |
|----|---|
| E8 | Methods of tension testing of metallic materials. |
|----|---|

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

3.1 Elongation—extension expressed as a percentage of the original gauge length.

3.1.1 Percentage elongation after fracture (A)—the extension after fracture ($L_u - L_o$), expressed as a percentage of the original gauge length (L_o).

NOTE: Elongation after fracture (sometimes referred to as 'total elongation') includes uniform and necking elongation, but does not include elastic elongation.

3.1.2 Percentage permanent elongation—after removal of a specified stress, the permanent extension expressed as a percentage of the original gauge length (L_o). (See also Permanent set stress—Clause 3.7.)

3.1.3 Percentage total elongation at fracture (A_f)—increase in the original gauge length of the test piece at the point of fracture while still under load, expressed as a percentage of the original gauge length (L_o).

3.2 Extension—the increase of the gauge length.

3.3 Extensometer—a device used for determining extension; it comprises an element which directly senses extension, and ancillary equipment which indicates or records the measured extension.

3.4 Gauge length—the prescribed central part of the parallel portion of the test piece, i.e. the test section on which extension is measured. In particular, a distinction is made between the types of length given in Clauses 3.4.1 to 3.4.3.