

Australian/New Zealand Standard®

**Aluminium and aluminium alloys—
Drawn wire, rod, bar and strip**

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee MT/3, Aluminium and Aluminium Alloys. It was approved on behalf of the Council of Standards Australia on 9 May 1997 and on behalf of the Council of Standards New Zealand on 29 April 1997. It was published on 5 August 1997.

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Australasian Railway Association
Australian Aluminium Council
Australian Chamber of Commerce and Industry
New Zealand Manufacturers Federation
Residential Window Association — Australia
Society of Automotive Engineers — Australasia

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Australian/New Zealand Standard[®]

Aluminium and aluminium alloys— Drawn wire, rod, bar and strip

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee MT/3, Aluminium and Aluminium Alloys, to supersede AS 1865—1986.

The objective of this revision is to upgrade the requirements for aluminium and aluminium alloy drawn or cold-finished wire, rod, bar and strip for general use.

During the preparation of this Standard cognizance was taken of the publication, *Aluminium Standards, Data and Design—Wrought products*, published in 1994 by the Aluminium Development Council of Australia. Cognizance was also taken of the following International Standards, which partly cover drawn wire, rod, bar and strip:

ISO

- 209 Wrought aluminium and aluminium alloys—Chemical composition and forms of products
- 209-1 Part 1: Chemical composition
- 209-2 Part 2: Forms of products
- 5193 Wrought aluminium and aluminium alloys—Drawn round bars—Tolerances on shape and dimensions (symmetric plus and minus tolerances on diameter)
- 6363 Wrought aluminium and aluminium alloy cold-drawn rods/bars and tubes
- 6363-1 Part 1: Technical conditions for inspection and delivery
- 6363-2 Part 2: Mechanical properties
- 6363-4 Part 4: Drawn rectangular bars—Tolerances on form and dimensions
- 6363-5 Part 5: Drawn square and hexagonal bars—Tolerances on form and dimensions
- 6365 Wrought aluminium and aluminium alloy cold-drawn wire
- 6365.1 Part 1: Technical conditions for inspection and delivery
- 7274 Wrought aluminium and aluminium alloys—Drawn round bars—Tolerances on shape and dimensions (all minus tolerances on diameter)

These International Standards were not considered appropriate replacements for AS 1865 because the preference of Australian/New Zealand industry is to contain the requirements for drawn aluminium and aluminium alloy wire, rod, bar and strip in the one Standard.

The term 'informative' has been used in this Standard to define the application of the appendix to which it applies. An 'informative' appendix is only for information and guidance.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Aluminium and aluminium alloys—Drawn wire, rod,
bar and strip**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard specifies requirements for wrought aluminium and aluminium alloy drawn or cold-finished wire, rod, bar and strip products for general engineering purposes.

NOTE: Advice and recommendations on information to be supplied by the purchaser at the time of enquiry or order are contained in Appendix A.

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

AS

- 1391 Methods for tensile testing of metals
- 2338 Preferred dimensions of wrought metal products
- 2612 Aluminium and aluminium alloys—Sampling and preparation of solid samples for optical emission spectrometry
- 2706 Numerical values—Rounding and interpretation of limiting values
- 2848 Aluminium and aluminium alloys —Compositions and designations
- 2848.1 Part 1: Wrought products
- 3719 Aluminium and aluminium alloys
- 3719.1 Part 1: Determination of iron content—Spectrophotometric method
- 3719.2 Part 2: Determination of silicon—Gravimetric method

BS

- 1728 Methods for the analysis of aluminium and aluminium alloys (all parts)

ASTM

- E 34 Test methods for chemical analysis of aluminium and aluminium-base alloys
- E 227 Test method for optical emission spectrometric analysis of aluminium and aluminium alloys by the point-to-plane technique

1.3 DEFINITIONS For the purpose of this Standard the definitions below apply.

1.3.1 Alclad wire—wire having on its surface a metallurgically bonded aluminium or aluminium alloy coating cathodic to the core alloy to which it is bonded, thus electrolytically protecting the core alloy against corrosion.

1.3.2 Bar—a solid section long in relation to its cross-sectional dimensions, having a symmetrical cross-section which may be square, rectangular (excluding flattened wire), hexagonal or octagonal, and whose width or distance between parallel faces is at least 10 mm.

1.3.3 Batch—all product of the same section, size, alloy, temper and finish in a shipment. For heat-treated product (annealed, solution heat treated, aged and stress relieved), a batch also consists of product from the same furnace load.

1.3.4 Rod—a solid round section of 10 mm, or greater, in diameter, whose length is greater than its diameter.

1.3.5 Strip—wire (or bar) of rectangular or square cross-section with rounded edges or corners and with a maximum width of 16 mm.

NOTE: Strip may be supplied coiled or in straight lengths.

1.3.6 Wire—a solid section long in relation to its cross-sectional dimensions, having a square or rectangular symmetrical cross-section (excluding flattened wire), with sharp or rounded corners or edges, or which is round, hexagonal or octagonal, and whose diameter, width or greatest distance between parallel faces is less than 10 mm.

1.4 DESIGNATION

1.4.1 General The product designation shall comprise the number of this Australian/New Zealand Standard, i.e. AS/NZS 1865, followed by a slash and characters to indicate the alloy and temper designations, in accordance with Clauses 1.4.2 and 1.4.3 respectively.

1.4.2 Alloy designation The alloy designation shall comprise a four-digit number, the first of which indicates the major alloying element(s) present in accordance with the following system:

1XXX	aluminium 99.00% min.
2XXX	aluminium-copper alloys
3XXX	aluminium-manganese alloys
4XXX	aluminium-silicon alloys
5XXX	aluminium-magnesium alloys
6XXX	aluminium-magnesium-silicon alloys
7XXX	aluminium-zinc alloys
8XXX	other aluminium alloy types

A suffix letter 'A' indicates a nationally derived variation in chemical composition from the registered standard chemical composition.

1.4.3 Temper designation The temper designation shall comprise one of the following letters:

O	annealed
H	strain hardened
T	thermally treated

NOTE: The H designation is always followed by two or more digits to indicate the straining operations and the degree of strain hardening. The T designation is always followed by one or two digits, the first to indicate the manufacturing process involving heat treatment and the second to indicate response to heat treatment.

A more detailed description of these tempers is given in AS 2848.1.

Examples of complete designation: AS/NZS 1865/1200-O, AS/NZS 1865/5251-H34, AS/NZS 1865/6061-T6.

1.5 ROUNDING OF TEST RESULT VALUES With the exception of the results of the determination of dimensions, which shall not be rounded, the observed or calculated values obtained for chemical and mechanical properties shall be rounded to the same number of figures as in the specified values and then compared with the specified values.

For example, for specified maximum or minimum values of 2.5, 2.50 and 2.500, the observed or calculated value would be rounded to the nearest 0.1, 0.01 and 0.001 respectively (see also AS 2706).

1.6 PACKAGING The supplier shall be responsible for the method of packaging, which shall ensure protection of the product during transit and facilitate handling by the purchaser.

1.7 MARKING Product supplied by the manufacturer shall be legibly and durably marked by appropriate means to—

- (a) identify the manufacturer;
- (b) indicate the designation, size and mass; and
- (c) enable it to be identified with this Standard, i.e. AS/NZS 1865.

NOTE: Manufacturers making a statement of compliance with this Australian/New Zealand Standard on a product, packaging or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

1.8 TRACEABILITY If traceability of the product back to the cast number of the billet used in the manufacturing process is required, this requirement shall be stated and agreed to at the time of enquiry or order.

SECTION 2 MANUFACTURING REQUIREMENTS

2.1 SCOPE This Section specifies requirements for chemical and physical properties for products manufactured to this Standard.

2.2 CHEMICAL COMPOSITION

2.2.1 General The method of sampling for chemical analysis shall be in accordance with AS 2612. Chemical composition shall be determined by any procedures which are not less accurate than those given in AS 3719.1, AS 3719.2, any of the relevant parts of BS 1728, ASTM E 34 or ASTM E 227.

2.2.2 Chemical analysis Chemical analysis shall be determined on samples taken at the time the ingots are poured, or on samples taken from the finished or semi-finished product, and shall comply with the chemical composition limits specified in Table 2.1.

If the supplier has determined the chemical composition of the product during the course of manufacture, it is not required to sample and analyse the finished product.

NOTES:

- 1 Standard chemical composition limits for wrought materials are also given in AS 2848.1.
- 2 Related composition specifications are given in Appendix B.

2.3 SURFACE FINISH Product shall be supplied with a mill finish.

2.4 FREEDOM FROM DEFECTS Product shall be free from defects and contaminants detrimental to its subsequent processing and end use. If, after acceptance of the product and provided that it has been properly treated after delivery, subsequent processing reveals that it contains defects found to be detrimental, the product shall be deemed not to comply with this Standard.

NOTE: Defects referred to in this Clause cannot be completely quantified. Where the presence, size or frequency of any defect is considered to be of concern, arrangements should be made between the purchaser and the manufacturer. This may be achieved by acceptable type samples or methods of test.

2.5 MECHANICAL PROPERTIES When tested in accordance with Clause 2.6, the tensile strength, 0.2% proof stress and elongation shall comply with the requirements of Table 2.2.

NOTE: Determinations of elongation and 0.2% proof stress are not required for wire of less than 3 mm in diameter or 3 mm in thickness.

2.6 TENSILE TEST

2.6.1 Sampling Product shall be grouped in batches. One or more samples of sufficient size to allow the preparation of the necessary tensile test pieces should be selected in accordance with the following guidelines:

- (a) *Product having a nominal mass of less than 1.5 kg per linear metre* One sample from the first 500 kg or fraction thereof, and an additional sample from each additional 1000 kg or fraction thereof should be taken.
- (b) *Product having a nominal mass of 1.5 kg or more per linear metre* One sample from the first 300 m or fraction thereof, and an additional sample from each additional 600 m or fraction thereof should be taken.

The sample shall not, except for the necessary straightening, be further mechanically worked or further heat treated before testing.

2.6.2 Location and preparation of test pieces Test pieces shall be cut parallel to the direction of drawing. Where the size of product makes it impracticable to use a full section test piece, test pieces shall be prepared as follows and in accordance with AS 1391:

- (a) *Rectangular bars less than 12.5 mm thick*—use a test piece of rectangular cross-section.
- (b) *Rod and bar up to and including 30 mm in diameter or thickness*—use a proportional test piece machined axially.
- (c) *Rod and bar with nominal cross-sectional dimensions greater than 30 mm and up to and including 75 mm*—use a proportional test piece with the longitudinal axis parallel to and not less than 15 mm from the surface of the sample.
- (d) *Rod and bar with diameter or nominal cross-sectional dimensions greater than 75 mm*—use a proportional test piece with its longitudinal axis located midway between the surface and the centre of the sample.

2.6.3 Method of test The tensile test shall be carried out in accordance with AS 1391 using a test piece having a gauge length of $L_0 = 5.65\sqrt{S_0}$, where S_0 is the cross-sectional area of the test piece before testing, or using a non-proportional rectangular test piece having a 50 mm gauge length.

2.7 RETESTING If a retest is required, one or more of the following procedures shall be adopted:

- (a) Take two further test samples from the remainder of the batch from non-adjoining lengths. The remainder of the batch shall be deemed to comply with this Standard if the test pieces from both of these additional samples comply with the requirements of Clause 2.5.
If one of these additional samples fail, the batch shall be deemed not to comply with this Standard.
- (b) Take test samples from each unit of product and test them individually in accordance with this Standard. Each unit of product shall be deemed to comply with this Standard only if the test sample from that unit complies with the requirements of Clause 2.5.
- (c) Carry out two additional tests on test pieces from samples taken from a position as near as practical to the failed sample. Should both these additional test pieces comply with the requirements of Clause 2.5, the unit shall be deemed to comply with this Standard.
- (d) Reprocess the unit which failed and retest in accordance with Clause 2.6. This unit shall be deemed to comply with this Standard only if the reprocessed test pieces comply with the requirements of Clause 2.5.