AS 4291.1—2000
ISO 898-1:1999



Australian Standard™

# Mechanical properties of fasteners made of carbon steel and alloy steel

## Part 1: Bolts, screws and studs



Standards Australia

This Australian Standard was prepared by Committee ME/29, Fasteners. It was approved on behalf of the Council of Standards Australia on 15 February 2000 and published on 3 April 2000.

---

The following interests are represented on Committee ME/29:

Australian Building Codes Board

Australian Chamber of Commerce and Industry

Australian Industry Group

Bureau of Steel Manufacturers of Australia

Electricity Supply Association of Australia

Federal Chamber of Automotive Industries

Institute of Materials Engineering Australasia

Metal Building Products Manufacturers Association

New Zealand Joinery Manufacturers Federation

---

**Keeping Standards up-to-date**

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about Standards can be found by visiting the Standards Australia web site at www.standards.com.au and looking up the relevant Standard in the on-line catalogue.

Alternatively, the printed Catalogue provides information current at 1 January each year, and the monthly magazine, *The Australian Standard*, has a full listing of revisions and amendments published each month.

We also welcome suggestions for the improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.com.au, or write to the Chief Executive, Standards Australia International Ltd, PO Box 1055, Strathfield, NSW 2135.

---

*This Standard was issued in draft form for comment as DR 97081.*

Australian Standard™

# Mechanical properties of fasteners made of carbon steel and alloy steel

## Part 1: Bolts, screws and studs

First published as AS/NZS 4291.1:1995.
Revised and designated AS 4291.1—2000.



Published by Standards Australia International Ltd
PO Box 1055, Strathfield, NSW 2135, Australia

ISBN 0 7337 3312 3

# PREFACE

This Standard was prepared by the Standards Australia Committee ME/29, Fasteners, to supersede AS/NZS 4291.1:1995, *Mechanical properties of fasteners*, Part 1: *Bolts, screws and studs*.

The objective of this Standard is to provide manufacturers and users of threaded fasteners with the material requirements and mechanical properties for carbon steel and alloy steel bolts, screws and studs with ISO metric threads.

The following changes have been incorporated in this edition:

(a) Updating of references.

(b) Addition of a permissible boron content in material composition.

(c) Introduction of a torsional strength requirement for bolts and screws with property classes 8.8 to 12.9 with nominal thread diameters equal to or less than 4 mm and for short bolts and screws with nominal thread diameters greater than 4 mm and equal to and less than 10 mm.

(d) Modification of marking requirements including the clock-face system for property class.

This Standard is identical with and has been reproduced from ISO 898-1:1999, *Mechanical properties of fasteners made of carbon steel and alloy steel*, Part 1: *Bolts, screws and studs*.

Statements expressed in mandatory terms in notes to text, tables and figures are deemed to be requirements of this Standard.

As this Standard is reproduced from an international Standard, the following applies:

(i) Its number appears on the cover and title page while the International Standard number appears only on the cover.

(ii) In the source text, 'this part of ISO 898' should read 'this Australian Standard'.

(iii) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

| *Reference to International Standard* | | *Australian Standard* | |
|---|---|---|---|
| ISO | | AS | |
| 68 | ISO general purpose screw threads—Basic profile | 1721 | General purpose metric screw threads |
| 68-1 | Part 1: Metric screw threads | | |
| 83 | Steel—Charpy impact test (U-notch) | 1544 | Methods for impact tests on metals |
| | | 1544.3 | Part 3: Charpy U-notch and keyhole notch— |
| 261 | ISO general purpose metric screw threads—General plan | 1721 | General purpose metric screw threads |
| 262 | ISO general purpose metric screw threads—Selected sizes for screws, bolts and nuts | 1721 | General purpose metric screw threads |
| 273 | Fasteners—Clearance holes for bolts and screws | — | |
| 724 | ISO general purpose metric screw threads—Basic dimensions | 1721 | General purpose metric screw threads |

| ISO | | AS/NZS | |
|---|---|---|---|
| 898 | Mechanical properties of fasteners made of carbon steel and alloy steel | 4291 | Mechanical properties of fasteners |
| 898-2 | Part 2: Nuts with specified proof load values—Coarse thread | 4291.2 | Part 2: Nuts with specified proof load values—Coarse thread |
| | | AS | |
| 898-5 | Part 5: Set screws and similar fasteners not under tensile stresses | 4291.5 | Part 5: Set screws and similar fasteners not under tensile stresses |
| | | AS/NZS | |
| 898-7 | Part 7: Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm | 4291.7 | Part 7: Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm |
| | | AS | |
| 965 | ISO general purpose metric screw threads—Tolerances | 1721 | General purpose metric screw threads |
| 965-1 | Part 1: Principles and basic data | | |
| 965-2 | Part 2: Limits of sizes for general purpose bolt and nut threads—Medium quality | | |
| 6157 | Fasteners—Surface discontinuities | — | |
| 6157-1 | Part 1: Bolts, screws and studs for general requirements | — | |
| 6157-3 | Part 3: Bolts, screws and studs for special requirements | — | |
| 6506 | Metallic materials—Hardness test—Brinell test | 1816 | Metallic materials—Brinell hardness test |
| 6507 | Metallic materials—Hardness test—Vickers test | 1817 | Metallic materials—Vickers hardness test |
| 6507-1 | Part 1: Test method | | |
| 6508 | Metallic materials—Hardness test—Rockwell test (Scales A, B, C, D, E, F, G, H, K) | 1815 | Metallic materials—Rockwell hardness test |
| 6892 | Metallic materials—Tensile testing at ambient temperature | 1391 | Methods for tensile testing of metals |

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.

CONTENTS

AUSTRALIAN STANDARD

# Mechanical properties of fasteners made of carbon steel and alloy steel —

# Part 1:
Bolts, screws and studs

## 1 Scope

This part of ISO 898 specifies the mechanical properties of bolts, screws and studs made of carbon steel and alloy steel when tested at an ambient temperature range of 10 °C to 35 °C.

Products conforming to the requirements of this part of ISO 898 are evaluated only at the ambient temperature range and may not retain the specified mechanical and physical properties at higher and lower temperatures. Attention is drawn to annex A which provides examples of lower yield stress and stress at 0,2 % non-proportional elongation at elevated temperatures.

At temperatures lower than the ambient temperature range, a significant change in the properties, particularly impact strength, may occur. When fasteners are to be used above or below the ambient temperature range it is the responsibility of the user to ensure that the mechanical and physical properties are suitable for his particular service conditions.

Certain fasteners may not fulfill the tensile or torsional requirements of this part of ISO 898 because of the geometry of the head which reduces the shear area in the head as compared to the stress area in the thread such as countersunk, raised countersunk and cheese heads (see clause 8).

This part of ISO 898 applies to bolts, screws and studs

— with coarse pitch thread M1,6 to M39, and fine pitch thread M8 × 1 to M39 × 3;

— with triangular ISO thread in accordance with ISO 68-1;

— with diameter/pitch combinations in accordance with ISO 261 and ISO 262;

— with thread tolerances in accordance with ISO 965-1 and ISO 965-2;

— made of carbon steel or alloy steel.

It does not apply to set screws and similar threaded fasteners not under tensile stresses (see ISO 898-5).

It does not specify requirements for such properties as

— weldability;

— corrosion-resistance;

— ability to withstand temperatures above + 300 °C (+ 250 °C for 10.9) or below − 50 °C;

— resistance to shear stress;

— fatigue resistance.

NOTE The designation system of this part of ISO 898 may be used for sizes outside the limits laid down in this clause (e.g. $d > 39$ mm), provided that all mechanical requirements of the property classes are met.