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ISO METRIC HEXAGON COMMERCIAL BOLTS AND SCREWS

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THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

Australian Institute of Steel Construction Ltd

Bureau of Steel Manufacturers of Australia

Confederation of Australian Industry

Department of Defence

Electricity Supply Association of Australia

Fasteners Institute of Australia

Federal Chamber of Automotive Industries

Institution of Production Engineers

Metal Trades Industry Association of Australia

Petroleum Refinery Engineers Advisory Committee

Railways of Australia Committee

Telecom Australia

University of Sydney

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AUSTRALIAN STANDARD

ISO METRIC HEXAGON COMMERCIAL BOLTS AND SCREWS

AS 1111–1980

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PREFACE

This standard was prepared by the Association's Committee on Fasteners to supersede the 1972 edition. The latter was intended to cover the anticipated needs of Australian industry under the metric system for metric hexagon bolts and screws. In the interests of international trade and international standardization, the standard at the time was fully aligned with the recommendations of the International Organization for Standardization (ISO), which had emanated from its technical committee TC2.

Since 1972 there have been several important changes introduced in the international standards, also the needs of Australian industry have become more crystallized, and hence a complete revision was necessary to take all factors into account. The changes in the ISO standards have been introduced after a great deal of technical study and research within ISO/TC 2, and were to a large degree initiated by the U.S.A. which, when the metric system was first seriously proposed for adoption in that country, developed a new metric fastener system (The Optimum Metric Fastener System). This system was forwarded to ISO as a U.S.A. proposal for a revision of the relevant standards. In the original submission, a very significant number of changes were proposed for both metric fasteners and metric screw threads. The ensuing discussion within ISO/TC 2 which took place over several years were aimed at reducing the technical changes to existing ISO standards to a minimum consistent with achieving improved performance without significantly increasing product costs.

The most significant changes in ISO standards and in this standard from the user's point of view are in the across-flat hexagon sizes, and attention is drawn to Appendix F where this is fully detailed.

This standard has been based on and is in alignment with the following ISO standards, with the exception that the tolerance on overall length of js16 has been retained:

ISO 272 Fasteners — Hexagon Products — Widths Across Flats

ISO/R733 Hexagon Bolts and Nuts — Metric Series — Tolerances on Widths Across Flats, Widths Across Corners

ISO 885 General Purpose Bolts and Screws — Metric Series — Radii Under the Head

ISO 888 Bolts, Screws and Studs — Nominal Lengths and Thread Lengths for General Purpose Bolts

ISO 898 Mechanical Properties of Fasteners
- Part 1 — Bolts, Screws and Studs
- Part 3 — Marking of Bolts, Screws, Studs and Nuts

ISO 4016 Hexagon Head Bolts — Product Grade C

ISO 4018 Hexagon Head Screws — Product Grade C

ISO 4759 Tolerances for Fasteners
- Part 1 — Bolts, Screws and Nuts with Thread Diameters between 1.6 (inclusive) and 150 mm (inclusive) and Product Grades A, B and C.

This standard may require reference to the following Australian standards:

AS 1110 ISO Metric Hexagon Precision Bolts and Screws

AS 1112 ISO Metric Hexagon Nuts including Thin Nuts, Slotted Nuts and Castle Nuts

AS 1214 Hot-dip Galvanized Coatings on Threaded Fasteners (ISO Metric Coarse Thread Series)

AS 1236 Split Cotter Pins (Metric Series)

AS 1275 Metric Screw Threads for Fasteners

AS 1391 Methods for Tensile Testing of Metals

AS 1544 Methods for Impact Tests on Metals
- Part 3 — Charpy U-notch and Keyhole Notch

AS 1654 Limits and Fits for Engineering

AS 1721 General Purpose Metric Screw Threads

AS 1815 Method for Rockwell Hardness Test

AS 1816 Method for Brinell Hardness Test

AS 1817 Method for Vickers Hardness Test

AS 1897 Electroplated Coatings on Threaded Components (Metric Coarse Series)

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ISO METRIC HEXAGON COMMERCIAL BOLTS AND SCREWS

1 SCOPE. This standard specifies requirements for commercial hexagon bolts and commercial hexagon screws, with ISO metric coarse pitch series threads in diameters from 5 mm to 64 mm inclusive.

Bolts up to 200 mm length are specified with shanks of approximately the nominal diameter (full size shanks). Over 200 mm length, bolts may be supplied with a reduced shank (scant shank bolt) of diameter approximately equal to the thread pitch diameter unless otherwise specified by the purchaser.

This standard is intended primarily to apply to steel bolts and screws used within the temperature range of −50°C to +300°C, and does not make provision for products requiring special properties, such as weldability, or for corrosion-resistant materials.

NOTES:

1. The range of nominal sizes included in this standard is considered adequate for most of the applications for which this series is likely to be employed, but for the convenience of users requiring larger sizes, further information in relation to the derivation of tolerances and head dimensions is provided in Appendix A and Appendix B respectively.

   The recommended classes of nuts suitable for assembly with ISO metric hexagon commercial bolts and screws are property class 5 for normal, slotted and castle nuts, and property class 04 for thin nuts. These classes are in accordance with AS 1112.
2. Bolts and screws manufactured of free-cutting steel should not be used at a temperature in excess of +250°C.
3. Precision bolts or screws of property classes 4.6 and 5.8 (see AS 1110) may be supplied in lieu of commercial products at the option of the supplier.
4. Hexagon bolts and screws given in this standard are in complete agreement with those given in international standards for product Grade C except for the tolerance on bolt length which is unchanged from the previous edition of this standard.

   The hexagon sizes for M10 and M12 have also been changed from those given in the previous edition, reflecting changes introduced in ISO 272. Further information on this aspect is given in Appendix D.

2 DEFINITIONS. For the purpose of this standard, the following definitions apply:

2.1 Commercial bolts and screws — products made to relatively wide tolerances and having some or all surfaces, except screw threads, in the as-forged (hot or cold) condition.

2.2 Transition diameter (D_a) — the diameter of a circle formed at the transition between the fillet radius r and the bearing surface of the head.

2.3 Concentricity tolerance — of a bolt, is the allowable deviation of the shank with respect to the screw thread (see Fig. 1).

2.4 Symmetry tolerance — of a bolt or screw, is the allowable deviation of the across-flats dimension with respect to the shank of a bolt or the major diameter of a screw (see Fig. 1).

2.5 Nominal length (l) — of a bolt or screw, is the distance from the bearing surface of the head to the extreme end of the shank including any chamfer or radius (see Fig. 2).

2.6 Thread length (b) — of a bolt, is the difference between the nominal length of the bolt and the distance between the bearing surface of the head and the nearest face of a nut with no internal chamfer, screwed as far as practicable on to the bolt by hand.

2.7 Length of unthreaded shank (l_s) — of a bolt, is the distance from the bearing surface of the bolt head to the last scratch of thread, or top of the extrusion angle, whichever is closer to the head.

2.8 Grip length (l_g) — of a bolt, is the minimum thickness of materials which can be clamped, but excluding the washer thickness.

2.9 Thread runout.

2.9.1 *Bolts and screws with rolled threads* — the distance from the top of the extrusion cone to the nearest face of a nut with no internal chamfer screwed on to the bolt as far as practicable by hand.

2.9.2 *Bolts and screws with cut threads* — the distance from the last witness of thread to the nearest face of a nut with no internal chamfer, screwed on to the bolt as far as practicable by hand.

3 METHOD OF MANUFACTURE. Hexagon bolts and screws may be produced by hot or cold forging with or without secondary machining. Alternatively they may be machined from bar stock.

4 SHAPE, DIMENSIONS AND FINISH.

4.1 Length of Hexagon Bolts and Screws. Nominal lengths, maximum lengths and minimum lengths of hexagon bolts and screws are given in Tables 3 and 4 respectively.

4.2 Ends of Hexagon Bolts and Screws. The ends of hexagon bolts and screws may, at the option of the manufacturer, be finished with either a 45-degree (nominal) chamfer, to a depth slightly exceeding the depth of thread, or a radius approximately equal to 1.25 times the nominal diameter of the shank. Alternatively, when bolts are made with rolled threads, the lead formed at the end of the bolt by the rolling operation may be regarded as providing the necessary chamfer to the end, no other machining operation being necessary. The end shall be reasonably square with the shank (see Fig. 2).