AS 2506—1990

Australian Standard®

Wrought alloy steels—Hardened and tempered to designated mechanical properties

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STANDARDS AUSTRALIA

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The following interests are represented on Committee MT/1:

Australian Foundry Institute

Australian Institute of Steel Construction

Bureau of Steel Manufacturers of Australia

Confederation of Australian Industry

Department of Defence

Metal Trades Industry Association of Australia

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PREFACE

This draft was prepared by the Standards Australia Committee on Iron and Steel, to supersede AS 2506—1981, Wrought alloy steels—En series. It is proposed to discontinue the use of the En designation system in Australia, and replace it with the system developed by the American Iron and Steel Institute (AISI) and the Society of Automotive Engineers (SAE), which is used in other Australian Standards dealing with wrought alloy steels.

During 1941 the En series of steels were introduced by the United Kingdom in BS 970, *Wrought steels for general engineering purposes*, to provide a comprehensive schedule of steels for general use in the engineering industries, and which would meet the stringent material requirements of the armed services and the motor industry. The alloy steel grades were subsequently adopted in Australia to supplement the alloy steel grades supplied to AISI-SAE standards.

When the 1955 edition of BS 970 was revised by the British Standards Institution, the En designation system was abandoned since it did not possess sufficient flexibility to permit the inclusion of new steels. A new six-digit designation system was introduced to replace the En series grades. The Australian industry did not favour the introduction of another steel designation system into Australia and opted for the AISI-SAE system to designate the former En series grades. Additional grades have been added, and details on these are given in the Foreword.

CONTENTS

FOREWORD

The alloy steels included in this Standard represent some of the former BS 970 En series steels, which are now obsolete. Other steels have been added to meet requirements for Australian quenched and tempered grades.

In this Standard, the various grades of steel are identified basically in the manner used by the American Iron and Steel Institute (AISI) and the Society of Automotive Engineers (SAE). Although the individual chemical compositions may not be identical in all respects, they are so closely related in all essential features that they may be considered interchangeable. Where a major deviation in chemical composition occurs, the prefix letter 'X' is added to the grade designation.

Apart from grades X4036, X4150, X7039, X7232, X9931 and X9940, requirements for the steels specified herein are technically identical with those for the AISI-SAE steels with the same basic identification number, except for the following changes:

(a) Maximum phosphorus limits lower than 0.040 percent have been increased to this value in all cases.

(b) Where a silicon content range of 0.15 percent to 0.30 percent is specified, this range has been increased to 0.10 percent to 0.35 percent.

(c) The specified range for one or more of the principal alloying elements has been widened for steels 4130, 4140, 4340, 5132 and 8740.

(d) Limits for residual elements given in Clause 3.3.3 of this Standard differ from American practice.

In some cases it was necessary to deviate from this system and to interpolate numbers for some carbon ranges and for variations in manganese, sulfur, chromium and other elements. Examples of these deviations are as follows:

(i) Grade X4036 has been included to cover the former En 16 grade.

(ii) The 70XX series is not listed in the current AISI-SAE series, but has been introduced into this Standard to cover the former En 41B grade.

(iii) The 72XX series is not listed in the current AISI-SAE series, but has been introduced into this Standard to cover former grades En 29B and En 40B.

(iv) The 99XX series is not listed in the current AISI-SAE series, but has been introduced into this Standard to cover former grades En 25 and En 26.

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE. This Standard specifies requirements for wrought alloy steels heat treated to designated mechanical property ranges for general engineering purposes. The steels may be either in the hardened and tempered condition or be capable of being hardened and tempered or nitrided. It applies to hot-rolled and cold-finished (cold-sized or bright) bars for machining, to bars, blooms, billets and slabs for forging, and to forgings.

NOTES:

1. Advice and recommendations on information to be supplied by the purchaser at the time of enquiry and order are contained in Appendix A.
2. Information on the determination of the compliance of a batch is given in Appendix B.
3. Information on alloy steel designations which are specified by other related Standards is given in Appendix C.

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

AS
1050 Methods for the analysis of iron and steel
1199 Sampling procedures and tables for inspection by attributes
1213 Iron and steel—Methods of sampling
1391 Methods for tensile testing of metals
1399 Guide to AS 1199, Sampling procedures and tables for inspection by attributes
1444 Wrought alloy steels—Standard and hardenability (H) series
1544 Methods for impact tests on metals
1544.1 Part 1: Izod
1816 Method for Brinell hardness test
1817 Method for Vickers hardness test
1821 Suppliers quality systems for design, development, production and installation
1822 Suppliers quality systems for production and installation
1823 Suppliers quality inspection systems
2000 Guide to AS 1821-23—Suppliers quality systems
2338 Preferred dimensions of wrought metal products
2490 Sampling procedures and charts for inspection by variables for percent defective
2706 Numerical values—Rounding and interpretation of limiting values
3900 Quality systems—Guide to selection and use
3901 Quality systems for design/development, production, installation and servicing
3902 Quality systems for production and installation
3903 Quality systems for final inspection and test
3904 Quality systems—Guide to quality management and quality system elements
K1 Methods for the sampling and analysis of iron and steel

ISO
2566/1 Steel—Conversion of elongation values
Part 1: Carbon and low alloy steels

4964 Steel—Hardness conversions

BS
970 Specification for wrought steels for mechanical and allied engineering purposes
Part 1: General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels

5046 Methods for the estimation of equivalent diameters in the heat treatment of steel

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

1.3.1 Bars—finished products of solid section which may have rectangular, square, round or hexagonal cross-section, defined as follows:

(a) *Flat bars (flats)*—bars of rectangular cross-section, with edges of controlled contour and of thickness greater than or equal to 3 mm, width less than 600 mm, and supplied in straight lengths.

(b) *Round bars (rounds)*—bars of circular cross-section supplied in straight lengths or coils.

(c) *Square bars (squares)*—bars of square cross-section supplied in straight lengths or coils.