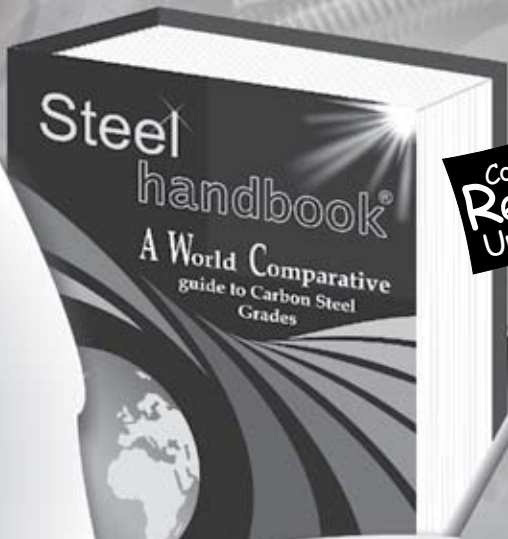


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All About the book

This edition contains similar alloys from around the world listed together. The Alloys are grouped on the basis of Chemical Composition. This provides the reader with a starting point for further investigation of equivalency. Equivalency could be judged by any or all methods of classifying carbon steels by Compositions, Manufacturing Method, Finishing Method, Product Shape, Microstructure, Deoxidation Method, Mechanical Equivalents, Corrosion and Heat Resistance, Quality and Cost. It is important to recognise that a definitive judgement on the equivalency of two steels require the study of specification by a qualified individual. Most specifications are complex documents that cannot be condensed into a single line of text.

Because specifications are dynamic documents that change with time, obsolete or inactive specifications and former alloy designation are also included to aid those who need to locate alloys cited in older documents.

Every carbon steel has been dealt separately which enables one to conveniently locate the relevant information of any steel under reference. This edition is ASTM based which is the common standard used and accepted worldwide. Every carbon steel is compared with Worldwide Standards like INDIAN (IS), BRITISH (BS), AMERICAN (AISI, ASTM, SAE), GERMAN (DIN), EURONORM (EN), CHINESE (GB), ITALIAN (UNI), FRENCH (AFNOR), JAPANESE (JIS), RUSSIAN (GOST), INTERNATIONAL (ISO) STANDARDS. This edition also includes Heat Treatment, Uses, Characteristics for every carbon steel and its field of application.

In addition to the above, this handbook includes Composition, Mechanical Properties, Tensile Properties, Physical Properties, Summary of Heating, Quenching and Tempering Process.

Each entry in this book contains the following information as application and available:

Specification Column lists standards, specifications, norms, schedules, recommended practices, registry numbers that provide the designation, name or grade of a specific alloy. The book is usually as acronym of the issuing Standards Organisation with a specific document number, revision indication and date.

Designation is a numeric or alphanumeric symbol for a particular alloy, strength or form of the metal. It shows how the alloys is identified in the specification. In some cases a specification defines a unique alloy. In this case the specification number is the designation.

Notes are properties, uses, available forms, processing information, size and status. Abbreviations are used extensively to pack condense the information. The key to the abbreviations is found in the last section.

Chemical Composition are given as the specification lists them. They are given in conventional weight percent. The elements common to a material family are listed in columnar fashion. Others are listed in a group under "other elements". A maximum, minimum, range or nominal value is given. Incidental elements are not given. Because of space limitations, not all specified functional relationships between chemicals can be presented. Inequality expressions have been used to define the chemical elements: $10x\text{C}\leq\text{Nb}+\text{Tb}\leq 1.10$ means some of Niobium and Tantalum is greater than or equal to 1.10%. It is beyond the scope of this handbook to differentiate between mandatory compositions and those offered in a specification as typical "for information only". The latter is true in case of specifications based on mechanical properties rather than compositions. Specifications offer alloy compositions as agreed upon contractually between buyer and seller. When a choice was offered in a specification, the ladle analysis compositions was preferred.

Properties are Ultimate Tensile Strength (UTS) and Yield Strength (YS) is given in SI Units (MPa) ($1\text{ MPa} = 1\text{ N/mm}^2 = 0.1450377\text{ ksi}$). Elongation is expressed in percent (of gauge length). It is longitudinal elongation unless a T (transverse) follows the number. The Hardness Units are listed in the individual records. These mechanical values are often functions of product thickness or diameter. A representative size is often listed in the notes. This size is in no way a limit on the size available for the products define by the specification. Room Temperature values are given unless noted otherwise.

This guide is arranged with similar Chemical Compositions grouped together headed by common United States name (ASTM). These similar alloys are grouped into material families based on common alloying elements being in a prescribed range. The Classification follows the SAE - AISI system for Carbon Steels.

Various organisations have struggled with the equivalency of designations. Reaching a consensus on the definition of terms such as similarity, equivalency and interchangeability is itself difficult. The groupings of designation serve as useful guide to materials having similar compositions. The grouping is therefore not intended to be use for design interchangeability, nor is functional equivalency implied. Substitution of one material for another is solely the responsibility of the reader.

CARBON STEEL GRADES

• Carbon Steel - Low and HSLA, ASTM 1005/1006 • Carbon Steel - Low and HSLA, ASTM 1008/1009 • Carbon Steel - Low and HSLA, ASTM 1010/1011 • Carbon Steel - Low and HSLA, ASTM 1012/1013 • Carbon Steel - Low and HSLA, ASTM 1015/1016 • Carbon Steel - Low and HSLA, ASTM 1017 • Carbon Steel - Low and HSLA, ASTM 1018 • Carbon Steel - Low and HSLA, ASTM 1019 • Carbon Steel - Low and HSLA, ASTM 1020 • Carbon Steel - Low and HSLA, ASTM 1021 • Carbon Steel - Low and HSLA, ASTM 1022 • Carbon Steel - Low and HSLA, ASTM 1023 • Carbon Steel - Low and HSLA, ASTM 1025/1026 • Carbon Steel - Low and HSLA, ASTM 1029 • Carbon Steel - Medium, ASTM 1030 • Carbon Steel - Medium, ASTM 1033 • Carbon Steel - Medium, ASTM 1035 • Carbon Steel - Medium, ASTM 1037 • Carbon Steel - Medium, ASTM 1038/1038H • Carbon Steel - Medium, ASTM 1039 • Carbon Steel - Medium, ASTM 1040 • Carbon Steel - Medium, ASTM 1042 • Carbon Steel - Medium, ASTM 1043 • Carbon Steel - Medium, ASTM 1044 • Carbon Steel - Medium, ASTM 1045/1045H • Carbon Steel - Medium, ASTM 1046 • Carbon Steel - Medium, ASTM 1049 • Carbon Steel - Medium, ASTM 1050 • Carbon Steel - Medium, ASTM 1053 • Carbon Steel - Medium, ASTM 1055 • Carbon Steel - High, ASTM 1059 • Carbon Steel - High, ASTM 1060 • Carbon Steel - High, ASTM 1064/1065 • Carbon Steel - High, ASTM 1069/1070 • Carbon Steel - High, ASTM 1074/1075 • Carbon Steel - High, ASTM 1078 • Carbon Steel - High, ASTM 1080 • Carbon Steel - High, ASTM 1084 • Carbon Steel - High, ASTM 1085 • Carbon Steel - High, ASTM 1086 • Carbon Steel - High, ASTM 1090 • Carbon Steel - High, ASTM 1095 • Carbon Steel - Low and HSLA, ASTM 1108/1109 • Carbon Steel - Low and HSLA, ASTM 1110 • Carbon Steel - Low and HSLA, ASTM 1116 • Carbon Steel - Low and HSLA, ASTM 1117 • Carbon Steel - Low and HSLA, ASTM 1118 • Carbon Steel - Low and HSLA, ASTM 1119 • Carbon Steel - Low and HSLA, ASTM 1123 • Carbon Steel - Low and HSLA, ASTM 1132 • Carbon Steel - Low and HSLA, ASTM 1137 • Carbon Steel - Low and HSLA, ASTM 1139/1140 • Carbon Steel - Low and HSLA, ASTM 1141 • Carbon Steel - Low and HSLA, ASTM 1144 • Carbon Steel - Low and HSLA, ASTM 1145/1146 • Carbon Steel - Low and HSLA, ASTM 1151 • Carbon Steel - Low and HSLA, ASTM 1211/1212 • Carbon Steel - Low and HSLA, ASTM 1213 • Carbon Steel - Low and HSLA, ASTM 1215 • Carbon Steel - Low and HSLA, ASTM 12L14 • Carbon Steel - Low and HSLA, ASTM 1513 • Carbon Steel - Low and HSLA, ASTM 1518 • Carbon Steel - Low and HSLA, ASTM 1522/1522H • Carbon Steel - Low and HSLA, ASTM 1524/1524H • Carbon Steel - Low and HSLA, ASTM 1526/1526H • Carbon Steel - Low and HSLA, ASTM 1527 • Carbon Steel - Low and HSLA, ASTM 1533 • Carbon Steel - High-Manganese, ASTM 1534 • Carbon Steel - High-Manganese, ASTM 1536 • Carbon Steel, High-Manganese, ASTM 1541/1541H • Carbon Steel, High-Manganese, ASTM 1547 • Carbon Steel, High-Manganese, ASTM 1548 • Carbon Steel, High-Manganese, ASTM 1551 • Carbon Steel, High-Manganese, ASTM 1552 • Carbon Steel, High-Manganese, ASTM 1561 • 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ASTM A284 (D) • Carbon Steel, Nonresulfurized, ASTM A285 (A) • Carbon Steel, Nonresulfurized, ASTM A285 (B) • Carbon Steel, Nonresulfurized, ASTM A285 (C) • Carbon Steel, Nonresulfurized, ASTM A288 (1) • Carbon Steel, Nonresulfurized, ASTM A291 (1) • Carbon Steel, Nonresulfurized, ASTM A291 (2) • Carbon Steel, High-Manganese, ASTM A299 • Carbon Steel, Nonresulfurized, ASTM A321 • Carbon Steel, High-Manganese, ASTM A350(LF2) • Carbon Steel, Nonresulfurized, ASTM A372 (I) • Carbon Steel, Nonresulfurized, ASTM A372 Type (II) / (III) • Carbon Steel, High-Manganese, ASTM A381 • Carbon Steel, Nonresulfurized, ASTM A414 (C) • Carbon Steel, High-Manganese, ASTM A414(F) • Carbon Steel, High-Manganese, ASTM A442(55) • Carbon Steel, Nonresulfurized, ASTM A442 (60) • Carbon Steel, High-Manganese, ASTM A455(I) • Carbon Steel, High-Manganese, ASTM A500(C) • Carbon Steel, Nonresulfurized, ASTM A504(C) • Carbon Steel, Nonresulfurized, ASTM A515(55) • Carbon Steel, Nonresulfurized, ASTM A515(65) • Carbon Steel, Nonresulfurized, ASTM A515(70) • Carbon Steel, High-Manganese, ASTM A516(65) • Carbon Steel, High-Manganese, ASTM A516(70) • Carbon Steel, High-Manganese, ASTM A529 • Carbon Steel, High-Manganese, ASTM A570(45) • Carbon Steel, High-Manganese, ASTM A573(65) • Carbon Steel, High-Manganese, ASTM A573(70) • Carbon Steel, High-Manganese, ASTM A595(B) • Carbon Steel, High-Manganese, ASTM A612 • Carbon Steel, High-Manganese, ASTM A618(1a,1b) • Carbon Steel, High-Manganese, ASTM A633 • Carbon Steel, High-Manganese, ASTM A633(A) • Carbon Steel, High-Manganese, ASTM A648(II) • Carbon Steel, High-Manganese, ASTM A648(III) • Carbon Steel, High-Manganese, ASTM A662(A) • Carbon Steel, High-Manganese, ASTM A662(B) • Carbon Steel, High-Manganese, ASTM A662(C) • Carbon Steel, High-Manganese, ASTM A678(A) • Carbon Steel, High-Manganese, ASTM A678(C) • Carbon Steel, High-Manganese, ASTM A679 • Carbon Steel, High-Manganese, ASTM A687(B) • Carbon Steel, High-Manganese, ASTM A694 • Carbon 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CARBON STEEL GRADES

• Carbon Steel, High-Manganese, ASTM A729 • Carbon Steel, High-Manganese, ASTM A758 (60,70) • Carbon Steel, High-Manganese, ASTM A765(I) • Carbon Steel, High-Manganese, ASTM A765(II) • Carbon Steel, Common Low HSLA, Special Purpose Steel • Carbon Steel, Common Medium, Special Purpose Steel • Carbon Steel, Common Special Purpose Steel

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