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MILITARY HANDBOOK

METALLIC MATERIALS FOR LOW MAGNETIC APPLICATIONS, MAGNETIC PERMEABILITY AND ELECTRICAL CONDUCTIVITY, CHARACTERISTICS OF (METRIC)

AMSC N/A

FSC 95GP

FOREWORD

1. This handbook is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

3. This document provides basic and fundamental information on the magnetic permeability and electrical conductivity characteristics of metals and alloys. The handbook is not intended to be referenced in purchase specifications except for informational purposes, nor shall it supersede any specification requirements.

4. Every effort has been made to reflect the latest information on the magnetic permeability and electrical conductivity characteristics of the metals and alloys listed. It is the intent to review this handbook periodically to ensure its completeness and accuracy.

5. This handbook provides design engineers and equipment manufacturers with general information on magnetic permeability and electrical conductivity characteristics of metals and alloys used in the manufacture of equipment that will be used in magnetic sensitive areas aboard Naval ships. The metals and alloys included are primarily those having low (less than 2.0) relative magnetic permeability in the mill annealed condition. However, other metals and alloys with higher magnetic permeability are also included because their use in equipment is dictated by consideration of other properties that are not always available in low magnetic permeability materials.

6. The values given herein should be considered as "typical". They are intended to show the relative effect of cold-working operations on the characteristics cited.

7. The numeric values for properties listed in this handbook, that were derived from specifications, standards, handbooks, and other publications, reflect the values in issues in effect on the date of the approval of this handbook. Because of the revisions of or amendments to these documents after publication, the handbook values may differ from those shown in the current specifications, standards and handbooks. When used in acquisition, it should be understood that the governing requirements are those of the documents of the issue in effect on the date of invitation for bids or request for proposal.

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1. SCOPE

1.1 Scope. This handbook provides the following technical data and information for metals and alloys (in particular, aluminum, copper, nickel, and titanium alloys, and corrosion-resisting stainless steel):

(a) Common name.
(b) Commercial designation.
(c) UNS (unified numbering system) number.
(d) Chemical composition.
(e) Applicable Government and commercial specifications.
(f) Normal and other magnetic permeabilities at selected percentages of cold-working.
(g) Electrical conductivity.
(h) Magnetic permeability and electrical conductivity data source.

1.1.1 Application. This document does not relieve the equipment manufacturers from meeting magnetic permeability requirements after fabrication regardless of any materials that were selected because of conclusions drawn from this handbook.

1.1.2 Arrangement of handbook. Tables I through V contain data and information on non-ferrous alloys. Tables VI through IX contain data and information on iron alloys. Table X contains high strength steels (HY 80 and HY 100). Table XI lists magnetic permeability and electrical conductivity data sources. Each source has been assigned a number that relates to the numeric part of the code in the data sources column of tables I through IX (see 3.1.7(i)). Tables XII, XIII, and XIV contain cross references of Government specifications to UNS numbers, commercial specifications to UNS numbers, and UNS numbers to Government specifications, respectively. For further cross-indexing of metals and alloys, refer to ASTM DS-56. Table XV contains an index of common names.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

QQ-A-200 - Aluminum Alloy, Bar, Rod, Shapes, Structural Shapes, Tube, and Wire, Extruded: General Specification for.

QQ-A-225 - Aluminum and Aluminum Alloy Bar, Rod, Wire, or Special Shapes; Rolled, Drawn, or Cold Finished; General Specification for.

QQ-A-250 - Aluminum and Aluminum Alloy Plate and Sheet: General Specification for.

QQ-A-367 - Aluminum Alloy Forgings.

QQ-A-430 - Aluminum Alloy Rod and Wire; for Rivets and Cold Heading.

QQ-A-596 - Aluminum Alloy Permanent and Semipermanent Mold Castings.

QQ-A-601 - Aluminum Alloy Sand Castings.

QQ-A-1876 - Aluminum Foil.

QQ-B-626 - Brass, Leaded and Nonleaded: Rod, Shapes, Forgings, and Flat Products with Finished Edges (Bar and Strip).

QQ-B-637 - Brass, Naval: Rod, Wire, Shapes, Forgings, and Flat Products with Finished Edges (Bar, Flat Wire, and Strip).

QQ-B-639 - Brass, Naval: Flat Products (Plate, Bar, Sheet, and Strip).

QQ-B-675 - Bronze, Aluminum; Ingots.

QQ-B-728 - Bronze Manganese; Rod, Shapes, Forgings and Flat Products (Flat Wire, Strip, Sheet, Bar and Plate).

QQ-C-390 - Copper Alloy Castings (Including Cast Bar).

QQ-C-450 - Copper-Aluminum Alloy (Aluminum Bronze) Plate, Sheet, Strip, and Bar (Copper Alloy Numbers 606, 610, 613, 614, and 630).

QQ-C-502 - Copper Rods and Shapes; and Flat Products with Finished Edges (Flat Wire, Strips, and Bar).

QQ-C-523 - Copper Alloy Ingots; Brass (Yellow, High Strength) Manganese and Manganese-Aluminum Bronze (for Remelting).

QQ-C-525 - Copper Alloy Ingots, (Leaded and Nonleaded Tin Bronze, Red Brass, and Semi-red Brass).

FEDERAL (Continued)

QQ-C-576 - Copper Flat Products with Slit, Slit and Edge-Rolled, Sheared, Sawed, or Machined Edges, (Plate, Bar, Sheet, and Strip).

QQ-C-591 - Copper-Silicon, Copper-Zinc-Silicon, and Copper-Nickel-Silicon Alloys: Rod, Wire, Shapes, Forgings, and Flat Products (Flat Wire, Strip, Sheet, Bar, and Plate).

QQ-L-171 - Lead Pig.

QQ-N-281 - Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections.

QQ-N-286 - Nickel-Copper-Aluminum Alloy, Wrought (UNS N05500).

QQ-N-288 - Nickel-Copper Alloy and Nickel-Copper-Silicon Alloy Castings.

QQ-S-763 - Steel Bars, Wire, Shapes, and Forgings, Corrosion Resisting.

QQ-S-766 - Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet and Strip.

QQ-W-343 - Wire, Electrical, Copper (Uninsulated).

QQ-W-390 - Wire, Nickel-Chromium-Iron Alloy.

WW-T-700 - Tube, Aluminum and Aluminum Alloy, Drawn, Seamless, General Specification for.

MILITARY

MIL-W-85 - Waveguides, Rigid, Rectangular General Specification for.

MIL-T-1368 - Tube and Pipe, Nickel-Copper Alloy, Seamless and Welded.

MIL-W-3318 - Wire, Copper; and Wire, Steel, Copperclad (W-154 and WS-24/U).

MIL-F-3922 - Flanges, Waveguide, General Purpose, General Specification for.

MIL-S-5059 - Steel, Corrosion-Resistant (18-8), Plate, Sheet and Strip.

MIL-F-5509 - Fittings, Flared Tube, Fluid Connection.

MIL-R-5674 - Rivets, Structural, Aluminum Alloy, Titanium Columbium Alloy, General Specification for.

MIL-T-5695 - Tubing, Steel, Corrosion-Resistant (304), Cold Drawn.

MIL-W-6712 - Wire; Metallizing.

MILITARY (Continued)

MIL-B-6812 - Bolts, Aircraft.
MIL-T-7081 - Tube, Aluminum Alloy, Seamless, Round, Drawn, 6061, Aircraft Hydraulic Quality.
MIL-S-7720 - Steel, Corrosion-Resistant (18-8) Bars, Wire and Forging Stock (Aircraft Quality).
MIL-T-8231 - Tubes: Copper-Silicon-Bronze, Seamless, for Aircraft.
MIL-T-8504 - Tubing Steel, Corrosion-Resistant (304), Aerospace Vehicle Hydraulic Systems, Annealed, Seamless and Welded.
MIL-T-8506 - Tubing, Steel, Corrosion-Resistant, (304), Annealed, Seamless and Welded.
MIL-R-8814 - Rivets, Blind, Nonstructural Type.
MIL-T-9046 - Titanium and Titanium Alloy, Sheet, Strip, and Plate.
MIL-T-9047 - Titanium and Titanium Alloy Bars (Rolled or Forged) and Reforging Stock, Aircraft Quality.
MIL-C-10387 - Couplings, Clamp, Pipe; with Bolts and Synthetic-Rubber Gaskets for Grooved-End Pipe.
MIL-T-10794 - Tubes, Aluminum Alloy, Extruded Pipeline Section, With Grooved Nipple Welded on Each End.
MIL-C-11866 - Castings, Precision, Nonferrous.
MIL-A-12545 - Aluminum Alloy Impacts.
MIL-S-12875 - Sheets, Perforated, Metal.
MIL-T-15005 - Tubes, Condenser and Heat Exchanger, Copper-Nickel Alloys (UNS C70600 & C71500).
MIL-T-15089 - Tubing, Aluminum Alloy, Round, Seamless (for Rocket Motors).
MIL-E-15597 - Electrodes, Welding, Covered, Coated Aluminum and Aluminum Alloy.
MIL-C-15726 - Copper-Nickel Alloy, Sheet, Plate, Strip, Bar, Rod and Wire.
MIL-B-16166 - Bronze, Aluminum: Forgings, Heat-Treated.
MIL-S-16216 - Steel Plate, Alloy, Structural, High Yield Strength (HY-80 and HY-100).
MIL-T-16420 - Tube, Copper-Nickel Alloy, Seamless and Welded (Copper Alloy Numbers 715 and 706).
MIL-B-16541 - Bronze, Valve: Castings.

MILITARY (Continued)

MIL-A-18001 - Anodes, Corrosion Preventive, Zinc; Slab Disc and Rod Shaped.
MIL-G-18014 - Gratings, Metal, Bar Type Flooring, Naval Shipboard.
MIL-G-18015 - Gratings, Metal, Other Than Bar Type (Shipboard Use).
MIL-F-18280 - Fittings, Flareless Tube, Fluid Connection.
MIL-B-18907 - Bands, Projectile Rotating.
MIL-E-21562 - Electrodes and Rods - Welding, Bare, Nickel Alloy.
MIL-C-22087 - Copper Alloy Investment Castings.
MIL-T-22214 - Tube, Condenser and Heat Exchanger with Integral Fins (UNS Alloy Nos. C71500, C70600, C12200).
MIL-C-22229 - Copper Base Alloy Castings (For Pressure Tight Applications).
MIL-A-22771 - Aluminum Alloy Forgings, Heat Treated.
MIL-W-23068 - Waveguides, Rigid, Circular.
MIL-W-23351 - Waveguides, Single Ridge and Double Ridge, General Specification for.
MIL-E-23765 - Electrodes and Rods - Welding, Bare, Solid and Alloyed Cored, General Specification for.
MIL-S-24149 - Studs, Welding, and Arc Shields (Ferrules), General Specification for.
MIL-B-24480 - Bronze, Nickel-Aluminum (UNS No. C95800) Castings for Seawater Service.
DOD-F-24669/5-Forgings and Forgings Stock, Steel Bars, Billets and Wire (Chromium-Nikel-Phosphorus and Chromium Nickel-Manganese-Phosphorous) Low Magnetic Permeability (Metric).
DOD-F-24669/6-Forgings and Forging Stock, Steel Bars and Billets, Corrosion Resisting; for Reforging (Metric).
MIL-C-24707/3-Casting, Ferrous.
MIL-S-25043 - Steel Plate, Sheet, and Strip, 17-7 PH, Corrosion-Resistant, Precipitation Hardening.
MIL-P-25995 - Pipe, Aluminum Alloy, Drawn or Extruded.
MIL-C-26094 - Can, Hermetic Sealing, Aluminum, Two-Piece.
MIL-S-27419 - Steel Billets, Corrosion Resistant, Annealed, Premium Quality.

MILITARY (Continued)

MIL-F-39000 - Flanges, Waveguide, Ridge, General Specification for.
MIL-A-45225 - Aluminum Alloy Armor, Forged.
MIL-A-46027 - Armor Plate, Aluminum Alloy, Weldable 5083 and 5456.
MIL-A-46083 - Aluminum Alloy Armor, Extruded, Weldable.
MIL-A-46104 - Aluminum Alloy Bar, Rod, Shapes, and Tube, Extruded, 6070.
MIL-A-46118 - Aluminum Alloy Armor, 2219, Rolled Plate and Die Forged Shapes.
MIL-T-50777 - Tube, Aluminum Alloy, 2024, Seamless (For Propellant Actuated Devices).
MIL-A-52174 - Aluminum Alloy Duct Sheet.
MIL-T-81556 - Titanium and Titanium Alloys, Extruded Bars and Shapes, Aircraft Quality.
MIL-S-81591 - Steel, Investment Castings, Carbon and Corrosion-Resisting.
MIL-A-81596 - Aluminum Foil for Sandwich Construction.
MIL-T-81915 - Titanium and Titanium-Alloy Castings, Investment.
MIL-F-83142 - Forging, Titanium Alloys, Premium Quality.

STANDARDS

MILITARY

MIL-STD-288 - Inspection Procedure for Determining the Magnetic Permeability of Wrought Austenitic Steels.
DOD-STD-2141 - Definitions and Systems of Units, Magnetic Silencing (Metric).

HANDBOOKS

MILITARY

MIL-HDBK-694 - Aluminum and Aluminum Alloys.
MIL-HDBK-698 - Copper and Copper Alloys.
MIL-HDBK-723 - Steel and Iron Wrought Products.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, BLDG. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip. (DoD adopted)

A 182 - Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service. (DoD adopted)

A 193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service. (DoD adopted)

A 194 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service. (DoD adopted)

A 213 - Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes.

A 240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels. (DoD adopted)

A 249 - Standard Specification for Welded Austenitic Steel Boiler, Superheater, Heat-Exchanger, and Condenser Tubes.

A 268 - Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service.

A 269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service. (DoD adopted)

A 270 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Sanitary Tubing. (DoD adopted)

A 271 - Standard Specification for Seamless Austenitic Chromium-Nickel Steel Still Tubes for Refinery Service.

ASTM (Continued)

A 276 - Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.

A 289 - Standard Specification for Alloy Steel Forgings for Nonmagnetic Retaining Rings for Generators.

A 297 - Standard Specification for Steel Castings, Iron-Chromium and Iron-Chromium-Nickel, Heat Resistant, for General Application.

A 312 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes. (DoD adopted)

A 313 - Standard Specification for Chromium-Nickel Stainless and Heat-Resisting Steel Spring Wire. (DoD adopted)

A 314 - Standard Specification for Stainless and Heat-Resisting Steel Billets and Bars for Forging.

A 320 - Standard Specification for Alloy Steel Bolting Materials for Low-Temperature Service. (DoD adopted)

A 351 - Standard Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts.

A 358 - Standard Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Alloy Steel Pipe for High-Temperature Service.

A 368 - Standard Specification for Stainless and Heat-Resisting Steel Wire Strand.

A 376 - Standard Specification for Seamless Austenitic Steel Pipe for High-Temperature Central-Station Service.

A 403 - Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings. (DoD adopted)

A 409 - Standard Specification for Welded Large Diameter Austenitic Steel Pipe for Corrosive or High-Temperature Service.

A 430 - Standard Specification for Austenitic Steel Forged and Bored Pipe for High-Temperature Service.

A 451 - Standard Specification for Centrifugally Cast Austenitic Steel Pipe for High-Temperature Service.

A 453 - Standard Specification for Bolting Materials, High-Temperature, 50 to 120 KSI (345 to 827 MPa) Yield Strength, with Expansion Coefficients Comparable to Austenitic Steels.

A 457 - Standard Specification for Hot-Worked, Hot-Cold-Worked, and Cold-Worked Alloy Steel Plate, Sheet, and Strip for High Strength at Elevated Temperatures.

A 458 - Standard Specification for Hot-Worked, Hot-Cold-Worked and Cold-Worked Alloy Steel Bars for High Strength at Elevated Temperatures.

A 473 - Standard Specification for Stainless and Heat-Resisting Steel Forgings. (DoD adopted)

ASTM (Continued)

A 477 - Standard Specification for Hot-Worked, Hot-Cold-Worked and Cold-Worked Alloy Steel Forgings and Forging Billets for High Strength at Elevated Temperatures.

A 478 - Standard Specification for Chromium-Nickel Stainless and Heat-Resisting Steel Weaving Wire.

A 479 - Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels. (DoD adopted)

A 492 - Standard Specification for Stainless and Heat-Resisting Steel Rope Wire. (DoD adopted)

A 493 - Standard Specification for Stainless and Heat-Resisting Steel for Cold Heading and Cold Forging Wire. (DoD adopted)

A 511 - Standard Specification for Seamless Stainless Steel Mechanical Tubing. (DoD adopted)

A 530 - Standard Specification for General Requirements for Specialized Carbon and Alloy Steel Pipe. (DoD adopted)

A 554 - Standard Specification for Welded Stainless Steel Mechanical Tubing. (DoD adopted)

A 564 - Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless and Heat-Resisting Steel Bars and Shapes.

A 579 - Standard Specification for Superstrength Alloy Steel Forgings.

A 580 - Standard Specification for Stainless and Heat-Resisting Steel Wire. (DoD adopted)

A 581 - Standard Specification for Free-Machining Stainless and Heat-Resisting Steel Wire and Wire Rods.

A 582 - Standard Specification for Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled or Cold-Finished.

A 632 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service.

A 638 - Standard Specification for Precipitation Hardening Iron Base Superalloy Bars, Forgings, and Forging Stock for High-Temperature Service.

A 666 - Standard Specification for Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar.

A 688 - Standard Specification for Welded Austenitic Stainless Steel Feedwater Heater Tubes.

A 693 - Standard Specification for Precipitation-Hardening Stainless and Heat-Resisting Steel Plate, Sheet, and Strip. (DoD adopted)

A 705 - Standard Specification for Age-Hardening Stainless and Heat-Resisting Steel Forgings.

ASTM (Continued)

A 743 - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application. (DoD adopted)

A 744 - Standard Specification for Castings, Iron-Chromium-Nickel, Corrosion Resistant, for Severe Service. (DoD adopted)

B 1 - Standard Specification for Hard-Drawn Copper Wire. (DoD adopted)

B 2 - Standard Specification for Medium-Hard-Drawn Copper Wire.

B 3 - Standard Specification for Soft or Annealed Copper Wire. (DoD adopted)

B 16 - Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines. (DoD adopted)

B 21 - Standard Specification for Naval Brass Rod, Bar and Shapes. (DoD adopted)

B 22 - Standard Specification for Bronze Castings for Bridges and Turntables.

B 26 - Standard Specification for Aluminum-Alloy Sand Castings. (DoD adopted)

B 30 - Standard Specification for Copper-Base Alloys in Ingot Form. (DoD adopted)

B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes. (DoD adopted)

B 48 - Standard Specification for Soft Rectangular and Square Bare Copper Wire for Electrical Conductors.

B 61 - Standard Specification for Steam or Valve Bronze Castings. (DoD adopted)

B 62 - Standard Specification for Composition Bronze or Ounce Metal Castings. (DoD adopted)

B 68 - Standard Specification for Seamless Copper Tube, Bright Annealed. (DoD adopted)

B 69 - Standard Specification for Rolled Zinc.

B 75 - Standard Specification for Seamless Copper Tube. (DoD adopted)

B 88 - Standard Specification for Seamless Copper Water Tube. (DoD adopted)

B 96 - Standard Specification for Copper-Silicon Alloy Plate, Sheet, Strip, and Rolled Bar for General Purposes and Pressure Vessels.

B 98 - Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes. (DoD adopted)

B 100 - Standard Specification for Rolled Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and other Structural Uses.

B 105 - Standard Specification for Hard-Drawn Copper Alloy Wires for Electric Conductors.

B 108 - Standard Specification for Aluminum Alloy Permanent Mold Castings. (DoD adopted)

ASTM (Continued)

B 111 - Standard Specification for Copper and Copper-Alloy Seamless Condenser Tubes and Ferrule Stock. (DoD adopted)

B 122 - Standard Specification for Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver), and Copper Nickel Alloy Plate, Sheet, Strip, and Rolled Bar. (DoD adopted)

B 124 - Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes. (DoD adopted)

B 127 - Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip. (DoD adopted)

B 133 - Standard Specification for Copper Rod, Bar, and Shapes. (DoD adopted)

B 138 - Standard Specification for Manganese Bronze Rod, Bar, and Shapes. (DoD adopted)

B 148 - Standard Specification for Aluminum-Bronze Sand Castings.

B 150 - Standard Specification for Aluminum Bronze Rod, Bar, and Shapes. (DoD adopted)

B 151 - Standard Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar. (DoD adopted)

B 152 - Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar. (DoD adopted)

B 163 - Standard Specification for Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes. (DoD adopted)

B 164 - Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire. (DoD adopted)

B 166 - Standard Specification for Nickel-Chromium-Iron Alloy (UNS N06600-N06690) Rod, Bar, and Wire. (DoD adopted)

B 168 - Standard Specification for Nickel-Chromium-Iron Alloy (UNS N06600-N06690) Plate, Sheet, and Strip. (DoD adopted)

B 171 - Standard Specification for Copper-Alloy Plate and Sheet for Pressure Vessels, Condensers, and Heat Exchangers.

B 176 - Standard Specification for Copper Alloy Die Castings.

B 187 - Standard Specification for Copper Bus Bar, Rod and Shapes. (DoD adopted)

B 188 - Standard Specifiction for Seamless Copper Bus Pipe and Tube. (DoD adopted)

B 193 - Standard Test Method for Resistivity of Electrical Conductor Materials. (DoD adopted)

B 206 - Standard Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) Wire and Copper-Nickel Alloy Wire. (DoD adopted)

B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate. (DoD adopted)

ASTM (Continued)

B 210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes. (DoD adopted)

B 211 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire. (DoD adopted)

B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes. (DoD adopted)

B 230 - Standard Specificaiton for Aluminum 1350-H19 Wire for Electrical Purposes. (DoD adopted)

B 231 - Standard Specification for Concentric-Lay-Stranded Aluminum 1350 Conductors. (DoD adopted)

B 233 - Standard Specification for Aluminum 1350 Drawing Stock for Electrical Purposes.

B 234 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes for Condensers and Heat Exchangers.

B 236 - Standard Specification for Aluminum Bars for Electrical Purposes (Bus Bars). (DoD adopted)

B 241 - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube. (DoD adopted)

B 246 - Standard Specification for Tinned Hard-Drawn and Medium-Hard-Drawn Copper Wire for Electrical Purposes. (DoD adopted)

B 247 - Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings. (DoD adopted)

B 265 - Standard Specification for Titanium and Titanium Alloy Strip, Sheet, and Plate.

B 271 - Standard Specification for Copper-Base Alloy Centrifugal Castings.

B 272 - Standard Specification for Copper Flat Products with Finished (Rolled or Drawn) Edges (Flat Wire and Strip). (DoD adopted)

B 280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service. (DoD adopted)

B 283 - Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed). (DoD adopted)

B 298 - Standard Specification for Silver-Coated Soft or Annealed Copper Wire. (DoD adopted)

B 302 - Standard Specification for Threadless Copper Pipe.

B 306 - Standard Specification for Copper Drainage Tube (DWV). (DoD adopted)

B 308 - Standard Specification for Aluminum Alloy 6061-T6 Standard Structural Shapes, Rolled or extruded. (DoD adopted)

B 313 - Standard Specification for Aluminum and Aluminum Alloy Round Welded Tubes. (DoD adopted)

ASTM (Continued)

B 315 - Standard Specification for Seamless Copper Alloy Pipe and Tube. (DoD adopted)

B 316 - Standard Specification for Aluminum and Aluminum Alloy Rivet and Cold Heading Wire and Rods. (DoD adopted)

B 324 - Standard Specification for Aluminum Rectangular and Square Wire for Electrical Purposes.

B 337 - Standard Specification for Seamless and Welded Titanium and Titanium Alloy Pipe. (DoD adopted)

B 338 - Standard Specification for Seamless and Welded Titanium and Titanium Alloy Tubes for Condensers and Heat Exchangers. (DoD adopted)

B 345 - Standard Specification for Aluminum and Aluminum Alloy Seamless Pipe and Seamless Extruded Tube for Gas and Oil Transmission and Distribution Piping Systems. (DoD adopted)

B 348 - Standard Specification for Titanium and Titanium Alloy Bars and Billets.

B 355 - Standard Specification for Nickel-Coated Soft or Annealed Copper Wire. (DoD adopted)

B 359 - Standard Specification for Copper and Copper-Alloy Seamless Condenser and Heat Exchanger Tubes with Integral Fins.

B 361 - Standard Specification for Factory-Made Wrought Aluminum and Aluminum-Alloy Welding Fittings. (DoD adopted)

B 366 - Standard Specification for Factory-Made Wrought Nickel and Nickel Alloy Welding Fittings.

B 367 - Standard Specification for Titanium and Titanium Alloy Castings.

B 372 - Standard Specification for Seamless Copper and Copper-Alloy Rectangular Waveguide Tube.

B 373 - Standard Specification for Aluminum Foil for Capacitors. (DoD adopted)

B 379 - Standard Specification for Phosphorized Coppers - Refinery Shapes.

B 381 - Standard Specification for Titanium and Titanium Alloy Forgings.

B 395 - Standard Specification for U-Bend Seamless Copper and Copper Alloy Heat Exchanger and Condenser Tubes. (DoD adopted)

B 396 - Standard Specification for Aluminum Alloy 5005-H19 Wire for Electrical Purposes.

B 397 - Standard Specification for Concentric-Lay-Stranded Aluminum Alloy 5005-H19 Conductors. (DoD adopted)

B 404 - Standard Specification for Aluminum and Aluminum Alloy Seamless Condenser and Heat-Exchanger Tubes with Integral Fins.

ASTM (Continued)

B 423 - Standard Specification for Nickel-Iron-Chromium-Molybdenum-Copper Alloy (UNS N08825 and N08221) Seamless Pipe and Tube.

B 424 - Standard Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221) Plate, Sheet, and Strip.

B 425 - Standard Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221) Rod and Bar.

B 429 - Standard Specification for Aluminum Alloy Extruded Structural Pipe and Tube. (DoD adopted)

B 443 - Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) Plate, Sheet, and Strip.

B 444 - Standard Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625) Pipe and Tube.

B 446 - Standard Specification for Nickel-Chromium Molybdenum-Columbium Alloy (UNS N06625) Rod and Bar.

B 447 - Standard Specification for Welded Copper Tube. (DoD adopted)

B 451 - Standard Specification for Copper Foil, Strip, and Sheet for Printed Circuits and Carrier Tapes.

B 466 - Standard Specification for Seamless Copper-Nickel Pipe and Tube.

B 467 - Standard Specification for Welded Copper-Nickel Pipe.

B 483 - Standard Specification for Aluminum and Aluminum Alloy Drawn Tubes for General Purpose Applications. (DoD adopted)

B 491 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Round Tubes for General Purpose Applications. (DoD adopted)

B 505 - Standard Specification for Copper-Base Alloy Continuous Castings.

B 511 - Standard Specification for Nickel-Iron-Chromium-Silicon Alloy Bars and Shapes.

B 512 - Standard Specification for Nickel-Chromium-Silicon Alloy (UNS N08330) Billets and Bars.

B 516 - Standard Specification for Welded Nickel-Chromium Iron Alloy (UNS N06600) Tubes.

B 517 - Standard Specification for Welded Nickel-Chromium-Iron Alloy (UNS N06600) Pipe.

B 531 - Standard Specification for Aluminum-Alloy 5005 Drawing Stock for Electrical Purposes.

B 535 - Standard Specification for Nickel-Iron Chromium-Silicon Alloys (UNS N08330 and UNS N08332) Seamless Pipe.

B 536 - Standard Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Plate, Sheet, and Strip.

B 543 - Standard Specification for Welded Copper and Copper Alloy Heat Exchanger Tube. (DoD adopted)

ASTM (Continued)

B 546 - Standard Specification for Electric Fusion-Welded Ni-Fe-Cr-S, Alloys (UNS N08330 and UNS N08332) Pipe. (DoD adopted)

B 547 - Standard Specification for Aluminum and Aluminum-Alloy Formed and Arc-Welded Round Tube. (DoD adopted)

B 548 - Standard Method and Specification for Ultrasonic Inspection of Aluminum-Alloy Plate for Pressure Vessels.

B 552 - Standard Specification for Seamless and Welded Copper/Nickel Tubes for Water Desalting Plants.

B 564 - Standard Specification for Nickel Alloy Forgings. (DoD adopted)

B 584 - Standard Specification for Copper Alloy Sand Castings for General Applications. (DoD adopted)

B 592 - Standard Specification for Copper-Zinc-Aluminum-Cobalt or Nickel-Alloy Plate, Sheet, Strip, and Rolled Bar.

B 609 - Standard Specification for Aluminum 1350 Round Wire, Annealed and Intermediate Tempers, for Electrical Purposes. (DoD adopted)

B 632 - Standard Specification for Aluminum-Alloy Rolled Tread Plate. (DoD adopted)

B 637 - Standard Specification for Precipitation-Hardening Nickel Alloy Bars, Forgings, and Forging Stock for High-Temperature Service.

B 670 - Standard Specification for Precipitation-Hardening Nickel Alloy (UNS N07718) Plate, Sheet, and Strip for High-Temperature Service.

B 704 - Standard Specification for Nickel-Alloy (UNS N06625 and N08825) Welded Tube.

B 705 - Standard Specification for Nickel-Alloy (UNS N06625 and N08825) Welded Pipe.

B 710 - Standard Specification for Nickel-Iron-Chromium-Silicon Alloy Welded Pipe.

E 527 - Standard Practice for Numbering Metals and Alloys (UNS). (DoD adopted)

F 68 - Standard Specification for Oxygen-Free Copper in Wrought Forms for Electron Devices.

F 96 - Standard Specification for Electronic Grade Alloys of Copper and Nickel in Wrought Forms.

F 467 - Standard Specification for Nonferrous Nuts for General Use. (DoD adopted)

F 468 - Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

AMERICAN WELDING SOCIETY (AWS)
A5.8 - Metals, Brazing, Filter for.
A5.16 - Specification for Titanium and Titanium Alloy Bare Welding Rods and Electrodes.

(Application for copies should be addressed to the American Welding Society, 550 N.W. LeJeune Rd., P.O. Box 351040, Miami, FL 33135.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 General. The general magnetic terms used in this handbook are defined in DoD-STD-2141. The following definitions apply specifically to the use of the terms in this handbook.

3.1.1 Cold work. Cold work refers to the metalworking operations carried out at or near room (ambient) temperature, resulting in plastic deformation of the metal. It may be applied to most of the common metals. Since, in most cases, no recovery occurs at this temperature, the properties of the metal are altered in the direction of increasing strength and brittleness throughout the working process. Depending upon the chemical composition of the metal and the heat treatment used, the magnetic permeability of the metal may increase significantly through cold-working. Consequently, a nonmagnetic metal with no cold-work may become magnetic after cold-working.

3.1.1.1 Percent cold work. Percent cold work refers to the percentage reduction in metal thickness when cold worked.

3.1.2 Normal magnetic permeability. Normal magnetic permeability refers to the relative magnetic permeability of a metal subjected to a field strength equal to the earth's magnetic field (approximately 50,000 nanotesla). Unless otherwise specified, all normal magnetic permeabilities are measured at room temperature (approximately 24 degrees Celsius (°C)).

3.1.3 Other magnetic permeability. Other magnetic permeability refers to a value of magnetic permeability obtained at a magnetic field strength greater than that due to the earth's field. As a general rule, if the permeability is measured at a field strength greater than 50,000 nanotesla then the other permeability will be greater than the normal permeability.

3.1.4 Unified numbering system (UNS). UNS refers to an alphanumeric code established by the American Society for Testing and Materials and the Society of Automotive Engineers (see ASTM E 527) used to identify metals and alloys. The alphanumeric code is a simple expansion of the former standard designation system by the addition of a prefix (letter) and a suffix (numerals). The prefix of the code is a letter that identifies the family of metals and alloys to which the sample belongs. The suffix is a numeric code that identifies the individual alloy within a family.

3.1.5 Acronyms. Acronyms used in the handbook are defined as follows:

AA - Aluminum Association
AMS - Aerospace Material Specification
ASTM - American Society for Testing and Materials
DTRC - David Taylor Research Center
EES - Engineering Experiment Station (now DTRC-Annapolis)
IACS - International Annealed Copper Standard
SAE - Society of Automotive Engineers

3.1.6 Atomic symbols. Atomic symbols used in defining the chemical composition of the various materials are as follows:

Ag - silver	Nb - niobium (columbium)
Al - aluminum	Ni - nickel
As - arsenic	O - oxygen
B - boron	P - phosphorus
Bi - bismuth	Pb - lead
C - carbon	Pd - palladium
Cd - cadmium	S - sulphur
Co - cobalt	Sb - antimony
Cr - chromium	Se - selenium
Cu - copper	Si - silicon
Fe - iron	Sn - tin
Ga - gallium	Ta - tantalum
H - hydrogen	Te - tellurium
Hg - mercury	Ti - titanium
Mg - magnesium	V - vanadium
Mn - manganese	W - tungsten
Mo - molybdenum	Zn - zinc
N - nitrogen	Zr - zirconium

3.1.7 Column headings in tables I through IX. Column headings in tables I through IX are as follows:

(a) Common name - the common name(s) by which the material is generally known.
(b) Commercial designation - the official designation(s) used by industry and Government.
(c) UNS No. - the unified numbering system code identifier (see 3.1.4).

(d) Chemical composition - the chemical composition of the material according to referenced Government and/or commercial specifications.

(e) Specifications -

(1) Government - federal and military specifications covering the material.

(2) Commercial - technical society specifications covering the material.

(f) Percent cold-work - the amount (in percent) of cold-working applied to the material (see 3.1.1 and 3.1.1.1). If unknown, the abbreviation "UNK" is used.

(g) Magnetic permeability -

(1) Normal - the normal relative magnetic permeability (see 3.1.2), in dimensionless numbers, associated with the amount of cold-work in (f) above.

(2) Other - other relative magnetic permeability (see 3.1.3), in dimensionless numbers, associated with the amount of cold-work in (f) above.

(h) Electrical conductivity - the electrical conductivity in percent of the international annealed copper standard (IACS), relative to the amount of cold-work in (f) above.

(i) Data sources - the sources of magnetic and electrical data are identified by an alphanumeric code. The alphabetical notation, in parentheses, identifies the type of data: (e) for electrical data; (m) for magnetic data. The numeric notation refers to the source of the data, which is identified in table X by a corresponding numeric entry. For example, 2(e) identifies the type of data as electrical and the data source as the entry corresponding to number "2" in table X. The absence of a parenthetical expression after a number indicates that the data source supplied both the electrical and magnetic data.

(j) Remarks.

4. GENERAL REQUIREMENTS

4.1 Metals.

4.1.1 Chemical composition. The chemical compositions shown in the tables conform to the referenced Government specifications. The composition may vary slightly from those in the commercial specifications and Government

specifications where multiple listings are shown. When no Government specifications are listed, the composition is the referenced commercial specification.

4.1.2 Magnetic permeability and electrical conductivity. The relative magnetic permeability and electrical conductivity for a given metal or alloy will vary depending upon the mechanical and heat treatments to which it is subjected. Even though some of these treatments are identified, the magnetic permeabilities and electrical conductivities listed are to be considered as being typical for the metal or alloy. For some metals and alloys, multiple sets of data for percentages of cold-working are provided to illustrate the relative effects that the different cold-working operations have on the magnetic permeability of the metal when subjected to different heat treatments.

5. DETAILED REQUIREMENTS

5.1 Aluminum alloys. Table I contains the technical data and information on aluminum alloys. Further data and information on aluminum alloys may be found in MIL-HDBK-694.

5.2 Copper alloys. Table II contains technical data and information on copper alloys. Further data and information on copper alloys may be found in MIL-HDBK-698.

5.3 Nickel alloys. Table III contains technical data and information on nickel alloys. The ferromagnetic properties of nickel alloys are highly susceptible to change due to variations in chemical composition or to mechanical and heat treatments.

5.4 Titanium alloys. Table IV contains technical data and information on titanium alloys.

5.5 Miscellaneous metals. Table V contains technical data and information on miscellaneous metals.

5.6 Iron alloys.

5.6.1 Corrosion resistant (stainless) steels.

5.6.1.1 Wrought austenitic corrosion resistant steels. Table VI contains technical data and information on wrought austenitic corrosion resistant steels. Further data and information on wrought steel products may be found in MIL-HDBK-723 and in MIL-STD-288, which classifies wrought austenitic steels. Where these steels are listed in table VI, their classifications are noted.

5.6.1.2 Precipitation hardenable corrosion resistant steels. Table VII contains technical data and information on precipitation hardenable corrosion resistant steels.

5.6.1.3 Cast austenitic corrosion resistant steels. Table VIII contains technical data and information on cast austenitic corrosion resistant steels, cast irons and welds.

5.6.1.4 Austenitic manganese steels. Table IX contains technical data and information on austenitic manganese steels.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The technical data and information contained herein are intended to be used as a guideline relating to the effects of fabrication methods on the magnetic permeability and electrical conductivity of materials.

6.2 Issue of DODISS. When this handbook is used in acquisition, the applicable issue of the DODISS must be cited in the solicitation (see 2.1.1 and 2.2).

6.3 Subject term (key word) listing.
Aluminum alloy
Chemical composition
Copper alloy
Corrosion-resisting steel
Nickel alloy
Titanium alloy

6.4 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Preparing activity:
Navy - SH
(Project 95GP-N012)

TABLE I. Aluminum alloys.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum	213 (formerly 113) SAE 33	A02130	Cu 6.0-8.0 Fe 1.2 Mg 0.10 Mn 0.6 Ni 0.35 Si 1.0-4.0 Ti 0.25 Zn 2.5 others total 0.50 Al rem	QQ-A-596 alloy 213	ASTM B 26 grade CS72A	0	1.02		30	1(m) 3(e)	
Aluminum	5 percent silicon copper-magnesium alloy AA 355.0	A03550	Cr 0.25 Cu 1.0-1.5 Fe 0.60 Mg 0.40-0.60 Mn 0.50 Si 4.5-5.5 Ti 0.25 Zn 0.35 others each 0.05 total 0.15 Al rem	QQ-A-596 alloy 355 QQ-A-601 alloy 355.0 des T_7 MIL-C-11866 MIL-F-39000	ASTM B 26 B 108 grade SC51A	0	1.02		36-43 4/	1(m) 3(e)	
Aluminum	1050	A91050	Cu 0.05 Fe 0.40 Mg 0.05 Mn 0.05 Si 0.25 Ti 0.03 V 0.03 Zn 0.05 others each 0.03 Al 99.50 min		ASTM B 491	0			61.3	7(e)	
Aluminum	1060	A91060	Cu 0.05 Fe 0.35 Mg 0.03 Mn 0.03 Si 0.25 Ti 0.03 V 0.05 Zn 0.05 others each 0.03 Al 99.60 min		ASTM B 209 B 210 B 211 B 221 B 234 B 241 B 345 B 361 B 404 B 483	0			62	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum	1100	A91100	Cu 0.05-0.20 Mn 0.05 Zn 0.10 others each 0.05 Al 99.00 min	QQ-A-225 QQ-A-250 QQ-A-430 QQ-A-1876 WW-T-700 MIL-W-85 MIL-R-5674 MIL-W-6712 MIL-A-12545 MIL-E-15597 MIL-S-24149 MIL-C-26094 MIL-A-52174	ASTM B 209 B 210 B 211 B 221 B 241 B 247 B 313 B 316 B 361 B 483 B 491 B 547	0			59	7(e)	
Aluminum	1145	A91145	Cu 0.05 Mg 0.05 Mn 0.05 Ti 0.03 Zn 0.03 Si + Fe 0.55 others each 0.03 Al 99.45 min	QQ-A-1876	ASTM B 373	0			61	7(e)	
Refined aluminum	1199	A91199	Cu 0.006 Fe 0.006 Ga 0.005 Mg 0.006 Mn 0.002 Si 0.006 Ti 0.002 V 0.002 Zn 0.006 others each 0.02 Al 99.99 min			0			65	7(e)	
Aluminum	1350	A91350	B 0.05 Cr 0.01 Cu 0.05 Fe 0.40 Mn 0.01 Si 0.01 Ti + V 0.02 Zn 0.05		ASTM B 230 B 231 B 233 B 236 B 324 B 609	0			61.8	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum (cont)	1350		others each 0.03 total 0.10 Al 99.50 min								
Aluminum alloy, wrought	2011	A92011	Bi 0.20-0.6 Cu 5.0-6.0 Fe 0.7 Pb 0.20-0.6 Si 0.40 Zn 0.30 others each 0.05 total 0.15 Al rem	QQ-A-225	ASTM B 210 B 211	0			39-45 4/	7(e)	
Aluminum alloy, wrought	2014	A92014	Cr 0.10 Cu 3.9-5.0 Fe 0.7 Mg 0.20-0.8 Mn 0.40-1.2 Si 0.50-1.2 Ti 0.15 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-200 QQ-A-225 QQ-A-367 MIL-F-5509 MIL-A-12545 MIL-T-15089 MIL-F-18280 MIL-A-22771	ASTM B 209 B 210 B 211 B 221 B 241 B 247				40-50 4/	11(e)	
Aluminum alloy, wrought	2024	A92024	Cr 0.10 Cu 3.8-4.9 Fe 0.50 Mg 1.2-1.8 Mn 0.30-0.9 Si 0.50 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-200 QQ-A-225 QQ-A-250 WW-T-700 MIL-F-5509 MIL-R-5674 MIL-B-6812 MIL-T-15089 MIL-F-18280 MIL-T-50777 MIL-A-81596	ASTM B 209 B 210 B 211 B 221 B 241 B 316 F 467 F 468	0			30-50 4/	7(e)	
Aluminum alloy, wrought	2036	A92036	Cr 0.10 Cu 2.2-3.0 Fe 0.50 Mg 0.30-0.6			0			41-52 4/	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum alloy, wrought (cont)	2036		Mn 0.10-0.40 Si 0.50 Ti 0.10 Zn 0.25 others each 0.05 total 0.15 Al rem								
Aluminum alloy, wrought	2048	A92048	Cu 2.8-3.8 Fe 0.20 Mg 1.2-1.8 Mn 0.20-0.6 Si 0.15 Ti 0.10 Zn 0.25 others each 0.05 total 0.15 Al rem			0			42	7(e)	
Aluminum alloy, wrought	2124	A92124	Cr 0.10 Cu 3.8-4.9 Fe 0.30 Mg 1.2-1.8 Mn 0.30-0.90 Si 0.20 Ti 0.15 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-250	ASTM B 209	0			39-50 4/	7(e)	
Aluminum alloy, wrought	2218	A92218	Cr 0.10 Cu 3.5-4.5 Fe 0.10 Mg 1.2-1.8 Mn 0.20 Ni 1.7-2.3 Si 0.9 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-367	ASTM B 247	0			38-40 4/	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum alloy, wrought	2219	A92219	Cu 5.8-6.8 Fe 0.30 Mg 0.02 Mn 0.20-0.40 Si 0.20 Ti 0.02-0.10 V 0.05-0.15 Zn 0.10 Zr 0.10-0.25 others each 0.05 total 0.15 Al rem	QQ-A-250 QQ-A-367 QQ-A-430 MIL-A-22771 MIL-A-46118	ASTM B 209 B 211 B 221 B 241 B 247 B 316	0			28-44 4/	7(e)	
Aluminum alloy, wrought	2319	A92319	Cu 5.8-6.8 Fe 0.30 Mg 0.02 Mn 0.20-0.40 Si 0.20 Ti 0.10-0.20 V 0.05-0.15 Zn 0.10 Zr 0.10-0.25 others each 0.05 total 0.15 Al rem			0			44	7(e)	
Aluminum alloy, wrought	3003	A93003	Cu 0.05-0.20 Fe 0.7 Mn 1.0-1.5 Si 0.6 Zn 0.10 others each 0.05 total 0.15 Al rem	QQ-A-200 QQ-A-225 QQ-A-250 QQ-A-430 WW-T-700 MIL-S-12875 MIL-E-15597 MIL-A-52174 MIL-A-81596	ASTM B 209 B 210 B 211 B 221 B 234 B 241 B 247 B 313 B 316 B 345 B 404 B 483 B 491 B 547	0			40-50 4/	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum alloy, wrought	3004	A93004	Cu 0.25 Fe 0.7 Mg 0.8-1.3 Mn 1.0-1.5 Si 0.30 Zn 0.25 others each 0.05 total 0.15 Al rem		ASTM B209 B221 B313	0			42	7(e)	
Aluminum alloy, wrought	3105	A93105	Cr 0.20 Cu 0.30 Fe 0.7 Mg 0.20-0.8 Mn 0.30-0.8 Si 0.6 Ti 0.10 Zn 0.40 others each 0.05 total 0.15 Al rem		ASTM B209	0			45	7(e)	
Aluminum alloy, wrought	4032	A94032	Cr 0.10 Cu 0.50-1.3 Fe 1.0 Mg 0.8-1.3 Mn 0.50-1.3 Si 11.0-13.5 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-367	ASTM B247	0			36-40 4/	7(e)	
Aluminum alloy, wrought	4043	A94043	Cu 0.30 Fe 0.8 Mg 0.05 Mn 0.05 Si 4.5-6.0 Ti 0.20 Zn 0.10 others each 0.05 total 0.15 Al rem	QQ-B-655 MIL-W-6712 MIL-E-15597		0			42	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum alloy, wrought	5005	A95005	Cr 0.10 Cu 0.20 Fe 0.7 Mg 0.50-1.1 Mn 0.20 Si 0.40 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-430 MIL-C-26094	ASTM B 209 B 210 B 316 B 396 B 397 B 483 B 531	0			52	7(e)	
Aluminum alloy, wrought	5050	A95050	Cr 0.10 Cu 0.20 Fe 0.7 Mg 1.1-1.8 Mn 0.10 Si 0.40 Zn 0.25 others each 0.05 total 0.15 Al rem		ASTM B 209 B 210 B 313 B 483 B 547 B 548	0			50	7(e)	
Aluminum alloy, wrought	5052	A95052	Cr 0.15-0.35 Cu 0.10 Mg 2.2-2.8 Mn 0.10 Zn 0.10 others each 0.05 total 0.15 Al rem	QQ-A-225 QQ-A-250 QQ-A-430 WW-T-700 MIL-S-12875 MIL-G-18014 MIL-G-18015 MIL-C-26094 MIL-A-81596	ASTM B 209 B 210 B 211 B 221 B 234 B 241 B 313 B 316 B 404 B 483 B 547	0			35	7(e)	
Aluminum alloy, wrought	5056	A95056	Cr 0.05-0.20 Cu 0.10 Fe 0.40 Mg 4.5-5.6 Mn 0.05-0.20 Si 0.30 Zn 0.10 other each 0.05 total 0.15 Al rem	QQ-A-430 MIL-R-5674 MIL-R-8814 MIL-A-81596	ASTM B 211 B 316	0			27-29 4/	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum alloy, wrought	5083	A95083	Cr 0.05-0.25 Cu 0.10 Fe 0.40 Mg 4.0-4.9 Mn 0.40-1.0 Si 0.40 Ti 0.15 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-200 QQ-A-250 QQ-A-367 MIL-P-25995 MIL-A-45225 MIL-A-46027 MIL-A-46083	ASTM B 209 B 210 B 221 B 241 B 247 B 345 B 361 B 547	0			29	7(e)	
Aluminum alloy, wrought	5086	A95086	Cr 0.05-0.25 Cu 0.10 Fe 0.50 Mg 3.5-4.5 Mn 0.20-0.7 Si 0.40 Ti 0.15 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-200 QQ-A-250 WW-T-700 MIL-G-18014 MIL-S-24149 MIL-C-26094	ASTM B 209 B 210 B 221 B 241 B 313 B 345 B 361 B 547	0			31	7(e)	
Aluminum alloy, wrought	5154	A95154	Cr 0.15-0.35 Cu 0.10 Fe 0.40 Mg 3.1-3.9 Mn 0.10 Si 0.25 Ti 0.20 Zn 0.20 others each 0.05 total 0.15 Al rem	MIL-C-26094	ASTM B209 B210 B211 B221 B313 B361 B547	0			32	7(e)	
Aluminum alloy, wrought	5182	A95182	Cr 0.10 Cu 0.15 Fe 0.35 Mg 4.0-5.0 Mn 0.20-0.50 Si 0.20 Ti 0.10			0			31	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum alloy, wrought (cont)	5182		Zn 0.25 others each 0.05 total 0.15 Al rem								
Aluminum alloy, wrought	5252	A95252	Cu 0.10 Fe 0.10 Mg 2.2-2.8 Mn 0.10 Si 0.08 others each 0.03 total 0.10 Al rem		ASTM B 209	0			35	7(e)	
Aluminum alloy, wrought	5254	A95254	Cr 0.15-0.35 Cu 0.05 Fe 0.40 Mg 3.1-3.9 Mn 0.01 Si 0.25 Ti 0.05 Zn 0.20 others each 0.05 total 0.15 Al rem		ASTM B 209 B 241	0			32	7(e)	
Aluminum alloy, wrought	5356	A95356	Cr 0.05-0.20 Cu 0.10 Fe 0.40 Mg 4.5-5.5 Mn 0.05-0.20 Si 0.25 Ti 0.06-0.20 Zn 0.10 others each 0.05 total 0.15 Al rem	MIL-S-24149		0			29	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum alloy, wrought	5454	A95454	Cr 0.05-0.20 Cu 0.10 Mg 2.4-3.0 Mn 0.50-1.0 Ti 0.20 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-200 QQ-A-250	ASTM B 209 B 221 B 234 B 241 B 404 B 547	0			34	7(e)	
Aluminum alloy, wrought	5456	A95456	Cr 0.05-0.20 Cu 0.10 Fe 0.40 Mg 4.7-5.5 Mn 0.50-1.0 Si 0.25 Ti 0.20 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-200 QQ-A-250 MIL-G-18014 MIL-S-24149 MIL-P-25995 MIL-A-45225 MIL-A-46027 MIL-A-46083	ASTM B 209 B 210 B 221 B 241 B 247	0			29	7(e)	
Aluminum alloy, wrought	5457	A95457	Cu 0.20 Fe 0.10 Mg 0.8-1.2 Mn 0.15-0.45 Si 0.08 Zn 0.03 others each 0.03 total 0.10 Al rem		ASTM B 209	0			46	7(e)	
Aluminum alloy, wrought	5652	A95652	Cr 0.15-0.35 Cu 0.04 Mg 2.2-2.8 Mn 0.01 Zn 0.10 others each 0.05 total 0.15 Al rem		ASTM B 209 B 241	0			35	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum alloy, wrought	6061	A96061	Cr 0.04-0.35 Cu 0.15-0.40 Fe 0.7 Mg 0.8-1.2 Mn 0.15 Si 0.40-0.8 Ti 0.15 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-200 QQ-A-225 QQ-A-250 QQ-A-367 QQ-A-430 WW-T-700 MIL-W-85 MIL-F-3922 MIL-T-7081 MIL-T-10794 MIL-A-12545 MIL-G-18014 MIL-F-18280 MIL-A-22771 MIL-W-23351 MIL-F-39000	ASTM B 209 B 210 B 211 B 234 B 241 B 247 B 308 B 313 B 316 B 345 B 361 B 404 B 429 B 483 B 547 B 632 F 467 F 468	0			40-47 4/	7(e)	
Aluminum alloy, wrought	6063	A96063	Cr 0.10 Cu 0.10 Fe 0.35 Mg 0.45-0.9 Mn 0.10 Si 0.20-0.6 Ti 0.10 Zn 0.10 others each 0.05 total 0.15 Al rem	QQ-A-200 MIL-W-85 MIL-G-18014 MIL-G-18015	ASTM B 210 B 221 B 241 B 345 B 361 B 429 B 483 B 491	0			50-58 4/	7(e)	
Aluminum alloy, wrought	6066	A96066	Cr 0.40 Cu 0.7-1.2 Mg 0.8-1.4 Mn 0.6-1.1 Pb 0.50 Si 0.9-1.8 Ti 0.20 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-200 QQ-A-367	ASTM B 221	0			37-40 4/	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum alloy, wrought	6070	A96070	Cr 0.10 Cu 0.15-0.40 Fe 0.50 Mg 0.50-1.2 Mn 0.4-1.0 Si 1.0-1.7 Ti 0.15 Zn 0.25 others each 0.05 total 0.15 Al rem	MIL-A-12545 MIL-A-46104	ASTM B 345	0			44	7(e)	
Aluminum alloy, wrought	6151	A96151	Cr 0.15-0.35 Cu 0.35 Fe 1.0 Mg 0.45-0.8 Mn 0.20 Si 0.6-1.2 Ti 0.15 Zn 0.25 others each 0.05 total 0.15 Al rem	QQ-A-367 MIL-C-10387 MIL-A-22771		0			42-54 4/	7(e)	
Aluminum alloy, wrought	7005	A97005	Cr 0.06-0.20 Cu 0.10 Fe 0.40 Mg 1.0-2.0 Mn 0.20-0.7 Si 0.35 Ti 0.01-0.06 Zn 4.0-5.0 others each 0.05 total 0.15 Al rem		ASTM B 221	0			35-43 4/	7(e)	
Aluminum alloy, wrought	7050	A97050	Cr 0.04 Cu 2.0-2.6 Fe 0.15 Mg 1.9-2.6 Mn 0.10 Si 0.12 Ti 0.06 Zn 5.7-6.7	QQ-A-430	ASTM B 247	0			39-47 4/	7(e)	

See footnotes at end of table.

TABLE I. Aluminum alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum alloy, wrought (cont)	7050		Zr 0.08-0.15 others each 0.05 total 0.15 Al rem								
Aluminum alloy, wrought	7072	A97072	Cu 0.10 Mg 0.10 Mn 0.10 Zn 0.8-1.3 others each 0.05 total 0.15 Al rem		ASTM B 209 B 221 B 234 B 241 B 313 B 345 B 404 B 547	0			60	7(e)	
Aluminum alloy, wrought	7175	A97175	Cr 0.18-0.28 Cu 1.2-2.0 Fe 0.20 Mg 2.1-2.9 Mn 0.10 Si 0.15 Ti 0.10 Zn 5.1-6.1 others each 0.05 total 0.15 Al rem		ASTM B 247	0			36-46 4/	7(e)	
Aluminum alloy, wrought	7475	A97475	Cr 0.18-0.25 Cu 1.2-1.9 Fe 0.12 Mg 1.9-2.6 Mn 0.06 Si 0.10 Ti 0.06 Zn 5.2-6.2 others each 0.05 total 0.15 Al rem			0			36-46 4/	7(e)	

1/ Unless otherwise indicated, values shown are maximum permitted.
2/ Percent IACS calculated on a volume basis in accordance with ASTM B 193 from data provided in the indicated data sources.
3/ See 3.1.7(i) for explanation of code.
4/ Conductivity depends on temper.

TABLE II. Copper alloys.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Copper, oxygen-free, electronic	OFE	C10100	Bi 0.0010 Cd 0.0001 Hg 0.0001 O 0.0010 P 0.0003 Pb 0.0010 S 0.0018 Se 0.0010 Te 0.0010 Zn 0.0001 Cu 99.99 min	QQ-C-502 QQ-C-576 QQ-W-343 MIL-W-85 MIL-W-3318 MIL-W-23068	ASTM B 1 B 2 B 3 B 48 B 75 B 133 B 152 B 187 B 246 B 272 B 298 B 355 B 451 F 68	0			101	7(e)	Used in bus bars and wave-guides
Copper, oxygen-free, extra low phosphorus	OF XLP	C10300	P0.001-0.005 Cu 99.95 min (Ag and P included in Cu)	MIL-W-23068	ASTM B 42 B 68 B 75 B 88 B 111 B 152 B 187 B 188 B 280 B 302 B 306 B 359 B 372 B 379 B 395 B 447	0			99	7(e)	Used in bus bars
Brass, free cutting	SAE CA360	C36000	Fe 0.35 Pb 2.5-3.7 Zn rem Cu 60.0-63.0	QQ-B-626 alloy 360	ASTM B 16 alloy 360	0	1.04		26	1(m) 4(e)	
Naval brass, uninhibited	SAE CA464	C46400	Fe 0.10 Pb 0.20 Sn 0.50-1.0 Zn rem Cu 59.0-62.0	QQ-B-637 QQ-B-639 alloy 464 4/	ASTM B 21 B 124 B 171 B 283 alloy 464	UNK	1.004		26	1(m) 4(e)	

See footnotes at end of table.

TABLE II. Copper alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum bronze	SAE CA630	C63000	Al 9.0-11.0 Fe 2.0-4.0 Mn 1.5 Ni 4.0-5.5 Si 0.25 Sn 0.20 Zn 0.30 Cu 78.0-85.0	QQ-C-450 QQ-C-465 MIL-B-16166 alloy 630 4/	ASTM B 124 B 150 B 171 B 283 alloy 630 4/	0	1.04	1.05 at 15.9 kA/m	9	1(m) 4(e)	
High silicon bronze A	SAE CA655	C65500	Fe 0.8 Mn 0.50-1.3 Ni 0.6 Pb 0.05 Si 2.8-3.8 Zn 1.5 *Cu rem	QQ-C-591 MIL-T-8231 MIL-E-23765 alloy 655 4/	ASTM B 96 B 98 B 100 B 105 B 124 B 283 B 315 alloy 655 4/	0	1.02		7.00	1(m) 4(e)	* Ag included in Cu
Manganese bronze A	SAE CA675	C67500	Al 0.25 Fe 0.8-2.0 Mn 0.05-0.50 Pb 0.20 Sn 0.50-1.5 Zn rem Cu 57.0-60.0	QQ-B-728 alloy 675	ASTM B 124 B 138 B 283	0	1.09		24	1(m) 4(e)	
Copper alloy	Alcoly SAE CA688	C68800	Al 3.0-8.0 Co 0.25-0.55 Fe 0.20 Pb 0.05 Zn 21.3-24.1 Al + Zn 25.1-27.1 Cu rem (includes Ag)		ASTM B 592 alloy 688	0	1.003		16.6-18.0 7		
Copper-nickel 90-10	SAE CA706	C70600	Fe 1.0-1.8 Mn 1.0 Ni 9.0-11.0 Pb 0.05 Zn 1.0 *Cu 99.5 min	MIL-T-15005 MIL-C-15726 MIL-T-16420 MIL-T-22214	ASTM B 111 B 122 B 151 B 171 B 359 B 395 B 402 B 466	0			9.1	7(e)	*All named elements included in Cu

See footnotes at end of table.

TABLE II. Copper alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Copper-nickel 90-10 (cont)	SAE CA706				B 467 B 543 B 552						
Copper-nickel 80-20	SAE CA710	C71000	Fe 1.0 Mn 1.0 Ni 19.0-23.0 Pb 0.05 Zn 1.0 *Cu 99.5 min		ASTM B 111 B 122 B 206 B 359 B 395 B 466 B 467 alloy 710 4/	0	1.84-1.97		6.5	1(m) 9(e)	*All named elements included in Cu 99.5 min
Copper-nickel, 70-30	SAE CA715	C71500	Fe 0.40-1.0 Mn 1.0 Ni 29.0-33.0 Pb 0.05 Zn 1.0 *Cu 99.50 min	MIL-T-15005 MIL-C-15726 MIL-T-16420 MIL-T-22214 alloy 715 4/	ASTM B 111 B 122 B 151 B 171 B 359 B 395 B 402 B 466 B 467 B 543 B 552 alloy 715 4/	0		1.00 at 15.9 kA/m	4.6	1(m) 9(e)	*All named elements included in Cu 99.50 min
Red brass, leaded	85-5-5-5 or # 1 composition SAE CA836	C83600	Al 0.005 Fe 0.30 Ni 1.0 P 0.05 Pb 4.0-6.0 S 0.08 Sb 0.25 Si 0.005 Sn 4.0-6.0 Zn 4.0-6.0 Cu 84.0-86.0	QQ-C-390 QQ-C-525 MIL-C-11866 MIL-C-15345 MIL-C-22087 MIL-C-22229 alloy 836 4/	ASTM B 30 B 62 B 271 B 505 B 584 alloy 836 4/	UNK	1.02		15	1(m) 4(e)	
Red brass, cast, leaded	SAE CA838	C83800	Al 0.005 Fe 0.30 Ni 1.0 P 0.03 Pb 5.0-7.0 S 0.08	QQ-C-390	ASTM B 30 B 271 B 505 B 584 alloy 838	0	1.0		15.0	7	

See footnotes at end of table.

TABLE II. Copper alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Red brass cast, leaded (cont)	SAE CA838		Sb 0.25 Si 0.005 Sn 3.3-4.2 Zn 5.0-8.0 Cu 82.0-83.8		4/						
Semi-red brass, cast	SAE CA844	C84400	Al 0.005 Fe 0.40 Ni 1.0 P 0.02 Pb 6.0-8.0 S 0.08 Sb 0.25 Si 0.005 Sn 2.3-3.5 Zn 7.0-10.0 Cu 78.0-82.0	QQ-C-390 QQ-C-525	ASTM B 30 B 271 B 505 B 584 alloy 844 4/	0	1.0		16.4	7	
Semi-red brass, cast	SAE CA848	C84800	Al 0.005 Fe 0.40 Ni 1.0 P 0.02 Pb 5.5-7.0 S 0.08 Sb 0.25 Si 0.005 Sn 2.0-3.0 Zn 13.0-17.0 Cu 75.0-77.0	QQ-C-390	ASTM B 30 B 271 B 505 B 584 alloy 848 4/	0	1.0		16.4	7	
Yellow brass, cast, leaded	SAE CA854	C85400	Al 0.35 Fe 0.7 Ni 1.0 Pb 1.5-3.8 Si 0.05 Sn 0.50-1.5 Zn 24.0-32.0 Cu 65.0-70.0	QQ-C-390	ASTM B 30 B 271 B 584 alloy 854 4/	0	1.0		19.6	7	
Yellow brass, cast, leaded	SAE CA857	C85700	Al 0.80 Fe 0.70 Ni 1.0 Pb 0.8-1.5 Si 0.05 Sn 0.50-1.5 Zn 32.0-40.0 Cu 58.0-64.0	QQ-C-390 MIL-C-15345	ASTM B 30 B 271 B 584 alloy 857 4/	0	1.0		22.0	7	

See footnotes at end of table.

TABLE II. Copper alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Yellow brass, cast, leaded	SAE CA858	C85800	Al 0.50 As 0.05 Fe 0.50 Mn 0.25 Ni 0.50 P 0.01 Pb 1.5 S 0.05 Sb 0.05 Si 0.25 Sn 1.5 Zn 31.0-41.0 Cu 57.0 min	MIL-B-15894	ASTM B 30 B 176 alloy 858 4/	0	1.0		22.0	7	
Manganese bronze	SAE CA862	C86200	Al 3.0-4.9 Fe 2.0-4.0 Mn 2.5-5.0 Ni 1.0 Pb 0.20 Sn 0.20 Zn 22.0-28.0 Cu 60.0-66.0	QQ-C-390 QQ-C-523 MIL-C-11866 MIL-C-22087 MIL-C-22229 alloy 862 4/	ASTM B 30 B 271 B 505 B 584 alloy 862 4/	UNK	1.27		7.5	1(m) 4(e)	
Manganese bronze, cast	SAE CA863	C86300	Al 5.0-7.5 Fe 2.0-4.0 Mn 2.5-5.0 Ni 1.0 Pb 0.20 Sn 0.20 Zn 22.0-28.0 Cu 60.0-66.0	QQ-C-390 QQ-C-523 MIL-C-11866 MIL-C-15345 MIL-C-22087 MIL-C-22229 alloy 863 4/	ASTM B 22 B 30 B 271 B 505 B 584 alloy 863 4/	0		1.09 at 15.9 kA/m	9	7	
Manganese bronze	SAE CA865	C86500	Al 0.50-1.5 Fe 0.40-2.0 Mn 0.10-1.5 Ni 1.0 Pb 0.40 Sn 1.0 Zn 36.0-42.0 Cu 55.0-60.0	QQ-C-390 QQ-C-523 MIL-C-15345 MIL-C-22087 MIL-C-22229 alloy 865 4/	ASTM B 30 B 271 B 505 B 584 alloy 865 4/	UNK	1.10		22	1(m) 4(e)	
Silicon brass	SAE CA874	C87400	Al 0.8 Pb 1.0 Si 2.5-4.0 Zn 12.0-16.0 others total 0.5 Cu 79.0 min	QQ-C-390 alloy 874	ASTM B 30 B 271 B 584 alloy 874 4/	0		1.10 at 15.9 kA/m	6.7	1(m) 4(e)	

See footnotes at end of table.

TABLE II. Copper alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Tin bronze	SAE CA903	C90300	Al 0.005 Fe 0.20 Ni 1.0 P 0.05 Pb 0.30 S 0.05 Sb 0.20 Si 0.005 Sn 7.5-9.0 Zn 3.0-5.0 Cu 86.0-89.0	QQ-C-390 QQ-C-525 MIL-C-11866 MIL-C-15345 MIL-C-22087 MIL-C-22229 alloy 903 4/	ASTM B 30 B 271 B 505 B 584 alloy 903 4/	UNK	1.004		12	1(m) 4(e)	
Leaded tin bronze	SAE CA922	C92200	Al 0.005 Fe 0.25 Ni 1.0 P 0.005 Pb 1.0-2.0 S 0.05 Sb 0.25 Si 0.005 Sn 5.5-6.5 Zn 3.0-5.0 Cu 86.0-90.0	QQ-C-390 QQ-C-525 MIL-C-15345 MIL-B-16541 alloy 922 4/	ASTM B 30 B 61 B 271 B 505 B 584 alloy 922 4/	0	1.02		14.3	1(m) 4(e)	
Nickel-tin bronze	SAE CA947	C94700	Al 0.005 Fe 0.25 Mn 0.20 Ni 4.5-6.0 Pb 0.10 S 0.05 Sb 0.15 Si 0.005 Sn 4.5-6.0 Zn 1.0-2.5 Cu 85.0-89.0	QQ-C-390 alloy 947	ASTM B 30 B 505 B 584 alloy 947 4/	0		1.00 at 15.9 kA/m		1(m)	
Nickel-tin bronze	SAE CA948	C94800	Al 0.005 Fe 0.25 Mn 0.20 Ni 4.5-6.0 P 0.05 Pb 0.03-1.0 S 0.05 Sb 0.15 Si 0.005 Sn 4.5-6.0 Zn 1.0-2.5 Cu 84.0-89.0	QQ-C-390 alloy 948	ASTM B 30 B 505 B 584 alloy 948 4/	0		1.00 at 15.9 kA/m	12	1(m) 4(e)	

See footnotes at end of table.

TABLE II. Copper alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Aluminum bronze	SAE CA952	C95200	Al 8.5-9.5 Fe 2.5-4.0 Cu 86.0 min others total 1.0	QQ-B-675 QQ-C-390 MIL-C-22229 alloy 952 4/	ASTM B 30 B 148 B 271 B 505 alloy 952 4/	0	1.19		11	1(m) 4(e)	
Aluminum bronze	SAE CA954	C95400	Al 10.0-11.5 Fe 3.0-5.0 Mn 0.50 Ni 1.5 Cu 83.0	QQ-B-675 QQ-C-390 MIL-C-15345 alloy 954 4/	ASTM B 30 B 148 B 271 B 505 alloy 954 4/	UNK	1.15	1.52 at 15.9 kA/m	13	1(m) 4(e)	
Aluminum bronze	SAE CA957	C95700	Al 7.0-8.5 Fe 2.0-4.0 Mn 11.0-14.0 Ni 1.5-3.0 Pb 0.03 Si 0.10 others total 0.5 Cu 71.0 min	QQ-C-390 alloy 957	ASTM B 30 B 148 alloy 957 4/	0	1.22		3.1	1(m) 4(e)	
Aluminum bronze	SAE CA958	C95800	Al 8.5-9.5 Fe 3.5-4.5 Mn 0.8-1.5 Ni 4.0-5.0 Pb 0.03 Si 0.10 others total 0.5 Cu 79.0 min	QQ-B-675 QQ-C-390 MIL-C-15345 MIL-B-24480 alloy 958 4/	ASTM B 30 B 148 B 271 B 505 alloy 958 4/	0	1.22		7.1	1(m) 4(e)	

1/ Unless otherwise indicated, values shown are maximum permitted.
2/ Percent IACS calculated on a volume basis in accordance with ASTM B 193 from data provided in the indicated data sources.
3/ See 3.1.7(i) for explanation of code.
4/ Alloy number pertains to all specifications listed in heading.

TABLE III. Nickel alloys.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Nickel base castings	S-Monel	N04019	C 0.25 Cu 27.0-31.0 Fe 2.50 Mn 1.50 S 0.015 Si 3.50-4.50 Ni 60.0 min	QQ-N-288 composition D		0	1.02		2.72	1(m) 5(e)	
Nickel-copper alloy	Monel 400	N04400	C 0.3 Cu rem Fe 2.50 Mn 2.00 S 0.024 Si 0.50 Ni 63.00-70.00	QQ-N-281 MIL-T-1368	ASTM B 127 B 163 B 164 B 366 B 564	0			3.4	7(e)	
Nickel-copper alloy	Monel 401	N04401	C 0.10 Co 0.25 Cu rem Fe 0.75 Mn 2.25 S 0.015 Si 0.25 Ni 40.0-45.0			0			3.5	7(e)	
Nickel-copper alloy	Monel 404	N04404	Al 0.05 C 0.15 Cu rem Fe 0.50 Mn 0.10 S 0.024 Si 0.10 Ni 52.0-57.0		ASTM F 96	0		1.0047 at 15.9 kA/m 1.0017 at 15.9 kA/m	3.5	10	as forged annealed and furnace cooled
Nickel-copper alloy	Monel R-405	N04405	C 0.30 Cu rem Fe 2.5 Mn 2.0 S 0.025 -0.060 Si 0.50 Ni 63.0-70.0	QQ-N-281 class B	ASTM B 164	0	16.8		3.6	1(m) 8(e)	
Nickel-copper alloy	Monel K-500	N05500	Al 2.30-3.15 C 0.25 Cu rem Fe 2.00 Mn 1.50 S 0.01	QQ-N-286		0 0 20		1.0011 1.0018 1.0011	2.8 2.8 2.8	10	all μ at 15.9 kA/m age hardened

See footnotes at end of table.

TABLE III. Nickel alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Nickel-copper alloy (cont)	Monel K-500		Si 0.50 Ti 0.35-0.85 Ni 63.0-70.0			20 50 50		1.0019 1.0010 1.0019	2.8 2.8 2.8		age hardened age hardened
Nickel-copper alloy	Monel 502	N05502	Al 2.50-3.50 C 0.10 Cu rem Fe 2.00 Mn 1.50 S 0.010 Si 0.5 Ti 0.50 Ni 63.0-70.0			0		1.02 at 15.9 kA/m	2.8	1(m) 5(e)	
Nickel-chromium alloy	Inconel alloy 600	N06600	C 0.15 Cr 14.00-17.00 Cu 0.50 Fe 6.00-10.00 Mn 1.00 S 0.015 Si 0.50 Ni 72.0	QQ-W-390	ASTM B 163 B 166 B 168 B 366 B 516 B 517 B 564	0		1.010 at 15.9 kA/m	1.7	10	
Nickel-chromium alloy	Inconel alloy 625	N06625	Al 0.40 C 0.10 Cr 20.0-23.0 Fe 5.00-23.0 Mn 0.05 Mo 8.0-10.0 Nb 3.15-4.15 P 0.015 S 0.015 Si 0.50 Ti 0.40 Ni rem	MIL-E-21562 EN625 RN625	ASTM B 366 B 443 B 444 B 446 B 704 B 705	0		1.0006 at 15.9 kA/m	1.6	10	
Nickel-chromium alloy	Inconel alloy 718	N07718	Al 0.20-0.80 B 0.0006 C 0.08 Co 1.00 Cr 17.0-21.0 Cu 0.30 Fe rem Mn 0.35 Mo 2.80-3.30 Nb 4.75-5.50		ASTM B 637 B 670	0 0	1.0013 1.0011		1.4 1.4	10	 aged

See footnotes at end of table.

TABLE III. Nickel alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Nickel-chromium alloy (cont)	Inconel alloy 718		P 0.015 S 0.015 Si 0.35 Ti 0.65-1.15 Ni 50.0-55.0								
Nickel-iron-chromium alloy	RA-330	N08330	C 0.08 Cr 17.0-20.0 Cu 1.00 Mn 2.00 Ni 34.0-37.0 P 0.03 Pb 0.005 S 0.03 Si 0.75-1.50 Sn 0.025 Fe rem		ASTM B 366 B 511 B 512 B 535 B 536 B 546 B 710	0	1.02		16.9	7	
Nickel-chromium alloy	Incoloy alloy 825	N08825	Al 0.2 C 0.05 Cr 19.5-23.5 Cu 1.5-3.0 Fe rem Mn 1.0 Mo 2.5-3.5 S 0.03 Si 0.5 Ti 0.6-1.2 Ni 38.0-46.0		ASTM B 163 B 423 B 424 B 425 B 704 B 705	0		1.005 at 15.9 kA/m	1.6	10	

1/ Unless otherwise indicated, values shown are maximum permitted.
2/ Percent IACS calculated on a volume basis in accordance with ASTM B 193 from data provided in the indicated data sources.
3/ See 3.1.7(i) for explanation of code.

TABLE IV. Titanium alloys.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Titanium un-alloyed grade 1	RMI-30 Ti-35A	R50250	C 0.10 Fe 0.20 H 0.015 N 0.03 O 0.18 Ti rem	MIL-T-81556 MIL-T-81915	ASTM B 265 B 337 B 338 B 348 B 367 B 381 F 467 F 468 grade 1 4/	0	1.00	1.00005 at 1.6 kA/m	3.6	7	
Titanium un-alloyed grade 2	A-40 RMI-40 Ti-50A	R50400	C 0.10 Fe 0.30 H 0.015 N 0.03 O 0.25 Ti rem	MIL-T-9046 MIL-T-81556	ASTM B 265 B 337 B 338 B 348 B 367 B 381 F 467 F 468 grade 2 4/	0	1.00	1.00005 at 1.6 kA/m	3.6	7	
Titanium un-alloyed grade 3	A-55 RMI-55 Ti-65A	R50550	C 0.10 Fe 0.30 H 0.015 N 0.05 O 0.35 others each 0.1 total 0.4 Ti rem	MIL-T-9046 MIL-T-81556	ASTM B 265 B 337 B 338 B 348 B 381 F 467 F 468 grade 3 4/	0	1.00	1.00005 at 1.6 kA/m	3.6	7	
Titanium un-alloyed grade 4	A-70 RMI-70 Ti-75A	R50700	C 0.10 Fe 0.50 H 0.015 N 0.05 O 0.40 others each 0.1 total 0.4 Ti rem	MIL-T-9046 MIL-T-9047 MIL-T-81556	ASTM B 265 B 348 B 367 B 381 F 467 F 468 grade 4 4/	0	1.00	1.00005 at 1.6 kA/m	1.0	7	

See footnotes at end of table.

TABLE IV. Titanium alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Titanium low alloyed	RMI-0.2Pd	R52250	C 0.10 Fe 0.20 H 0.015 N 0.03 O 0.18 Pd 0.12-0.25 Ti rem		ASTM B 265 B 337 B 338 B 348 B 367 B 381 grade 11 4/	0	1.00	1.00005 at 1.6 kA/m	3.0	11	
Titanium low alloyed		R52400	C 0.10 Fe 0.30 H 0.015 N 0.03 O 0.25 Pd 0.12-0.25 Ti rem		ASTM B 265 B 337 B 338 B 348 B 367 B 381 F 467 F 468 grade 7 4/	0	1.00	1.00005 at 1.6 kA/m	3.0	11	
Titanium alloy, a alloy	110 AT RMI 5Al-2.5Sn	R54520	Al 4.0-6.0 C 0.10 Fe 0.50 H 0.020 N 0.05 O 0.20 Sn 2.0-3.0 Ti rem	MIL-T-9046 MIL-T-9047 MIL-T-81556 MIL-T-81915 MIL-F-83142	ASTM B 265 B 348 B 367 B 381 grade 6 4/	0	1.00	1.00005 at 1.6 kA/m	2.5	7	
Titanium alloy, Ti 8-1-1	RMI 8Al-1Mo-1V HA 8116	R54810	Al 8 Mo 1 V 1 Ti rem	MIL-T-9046 MIL-T-9047 MIL-T-81556 MIL-F-83142	AWS A5.16	0			0.9	7	
Titanium alloy, Ti-8Mn	C-110M	R56080	Mn 8 Ti rem	MIL-T-9046		0	1.00	1.00005 at 1.6 kA/m	1.9	7	
Titanium alloy, Ti-6Al-2Nb-1Ta-1Mo		R56210	Al 6 Nb 2 Mo 0.8 Ta 1 Ti rem	MIL-T-9046 MIL-T-9047	AWS A5.16	0	1.00	1.00005 at 1.6 kA/m			

See footnotes at end of table.

TABLE IV. Titanium alloys - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Titanium alloy, Ti-6Al-4V	C-120-AV	R56401	Al 6 V 4 Ti rem	MIL-T-9046 MIL-T-9047 MIL-T-81556 MIL-F-83142		0	1.00	1.00005 at 1.6 kA/m	1.0	7	
Titanium alloy, Ti-7Al-4Mo	RMI-7Al-4Mo	R56740	Al 7 Mo 4 Ti rem	MIL-T-9046 MIL-T-81556 MIL-F-83142		0			1.0	7	

1/ Unless otherwise indicated, values shown are maximum permitted.
2/ Percent IACS calculated on a volume basis in accordance with ASTM B 193 from data provided in the indicated data sources.
3/ See 3.1.7(i) for explanation of code.
4/ Alloy number pertains to all specifications listed in heading.

TABLE V. Miscellaneous metals.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Lead	Grade A lead	L50050	Pb 99.90 min others total 0.10	QQ-L-171		UNK			8.3	7(e)	Used in batteries and as ballast
Zinc, pure	Commercial rolled zinc	Z21210	Cd 0.005 Cu 0.001 Fe 0.010 Pd 0.05 Zn rem		ASTM B 69	UNK			28	7(e)	
Zinc	Type III zinc anode	Z32121	Al 0.1-0.5 Cd 0.025-0.15 Cu 0.005 Fe 0.005 Pb 0.006 Si 0.125 Zn Rem	MIL-A-18001					26	7(e)	cathodic protection

1/ Unless otherwise indicated, values shown are maximum permitted.
2/ Percent IACS calculated on a volume basis in accordance with ASTM B 193 from data provided in the indicated data source.
3/ See 3.1.7(i) for explanation of code.

TABLE VI. Wrought austenitic corrosion resistant steels.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-manganese-nickel stainless steel	Type 201	S20100	C 0.05 Cr 16.0-18.0 Mn 5.50-7.50 N 0.25 Ni 3.50-5.50 P 0.060 S 0.030 Si 1.00 Fe rem	QQ-S-766 class 201	ASTM A 412 A 666	0 10 30 50 65 0 10 30 50 65		1.005 1.047 5.886 11.72 19.20 1.035 1.501 16.76 27.44 29.78	2.1-2.5 2.0	2	μ at 15.9kA/m magnetic after moderate cold-work see 4.1.2
Chromium-manganese-nickel stainless steel	Type 202	S20200	C 0.15 Cr 17.00-19.00 Mn 7.50-10.00 N 0.25 Ni 4.00-6.00 P 0.060 S 0.030 Si 1.00 Fe rem	QQ-S-763 QQ-S-766 class 201 4/	ASTM A 314 A 412 A 473 A 666	0 10 30 50 65 0 10 30 50 65		1.020 1.037 1.132 5.493 3.404 1.002 1.002 1.021 1.226 1.707	2.3-2.5 2.2-2.5	2	μ at 15.9kA/m magnetic after heavy cold-work see 4.1.2
Chromium-manganese-nickel stainless steel	Type 205	S20500	C 0.12-0.25 Cr 16.00-18.00 Mn 14.00-15.50 N 0.32-0.40 Ni 1.00-1.75 P 0.060 S 0.030 Si 1.00 Fe rem			0 10 30 50 65		1.002 1.002 1.003 1.003 1.004	2.2-2.3	2	
Chromium-nickel-manganese-molybdenum stainless steel	Nitronic 50	S20910	C 0.06 Cr 20.50-23.50 N 0.25 Nb 0.10-0.30 Ni 4.00-6.00 P 0.040 S 0.030 Si 1.00 V 0.10-0.30 Fe rem		ASTM A 182 A 240 A 249 A 412 A 479 A 580	0 27 56 75	1.004 1.004 1.004 1.004	1.004 1.004 1.004 1.004	2.1	2	other μ at 15.9 kA/m

See footnotes at end of table.

TABLE VI. Wrought austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-nickel-manganese stainless steel	Nitronic 60	S21800	C 0.10 Cr 16.00-18.00 Mn 7.00-9.00 N 0.08-0.18 Ni 8.00-9.00 P 0.040 S 0.030 Si 3.50-4.50 Fe rem		ASTM A 193 A 194 A 276 A 479	0 25 50 75	1.003 1.004 1.007 1.010		1.8	2	-
Chromium-manganese-nickel stainless steel	Nitronic 40 (XM10)	S21900	C 0.08 Cr 19.00-21.50 Mn 8.00-10.00 N 0.15-0.40 Ni 5.50-7.50 P 0.060 S 0.030 Si 1.00 Fe rem		ASTM A 276 A 314 A 412 A 473 A 580	0 15 35 60 60 pickled	1.005 1.004 1.005 1.010 1.008	1.004 1.003 1.005 1.012 <1.02 1.006	2.4	2	other μ at 15.9 kA/m m at 39.7 kA/m other μ at 15.9 kA/m
Chromium-manganese-nickel stainless steel	Nitronic 40 (XM11)	S21904	C 0.04 Cr 19.00-21.50 Mn 8.00-10.00 N 0.15-0.40 Ni 5.50-7.50 P 0.060 S 0.030 Si 1.00 Fe rem		ASTM A 276 A 314 A 412 A 473 A 580	0 15 35 60 60 pickled	1.005 1.004 1.005 1.010 1.008	1.004 1.003 1.005 1.012 <1.02 1.006	2.4	2	other μ at 15.9 kA/m μ at 39.7 kA/m other μ at 15.9 kA/m
Chromium-manganese-nickel stainless steel	Nitronic 33	S24000	C 0.08 Cr 17.00-19.00 Mn 11.50-14.50 N 0.20-0.40 Ni 2.50-3.75 P 0.060 S 0.030 Si 1.00 Fe rem		ASTM A 240 A 249 A 269 A 312 A 412 A 688	0 10 20 30 40 50 60 70		1.0014 1.0013 1.0015 1.0010 1.0015 1.0011 1.0012 1.0009	2.5	2	μ at 15.9kA/m

See footnotes at end of table.

TABLE VI. Wrought austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-manganese-nickel stainless steel	Nitronic 32	S24100	C 0.15 Cr 16.50-19.50 Mn 11.50-14.00 N 0.20-0.45 Ni 0.50-2.50 P 0.060 S 0.030 Si 1.00 Fe rem		ASTM A 530	0 70	1.009 1.018	1.009 1.018		7(m)	other μ at 15.9 kA/m
Chromium-nickel stainless steel	Type 301	S30100	C 0.15 Cr 16.00-18.00 Mn 2.00 Ni 6.00-8.00 P 0.045 S 0.030 Si 1.00 Fe rem	QQ-S-766 MIL-S-5059 class 301 4/	ASTM A 167 A 177 A 554 A 666	0 10 30 50 65		1.011 1.015 1.698 5.721 12.29	1.7-2.5	2	μ at 15.9kA/m magnetic after moderate cold-work
						0 10 30 50 65		1.036 1.717 16.05 37.16 45.11	2.2-2.5		see 4.1.2
						0 10 30 50 65		1.029 1.630 17.85 37.89 40.77	1.9-2.6		see 4.1.2
Chromium-nickel stainless steel	Type 302	S30200	C 0.15 Cr 17.00-19.00 Mn 2.00 Ni 8.00-10.00 P 0.045 S 0.030 Si 1.00 Fe rem	QQ-S-763 QQ-S-766 DOD-F-24469/6 MIL-S-5059 MIL-S-7720 4/	ASTM A 167 A 240 A 276 A 313 A 314 A 368 A 473 A 478 A 479 A 492 A 493 A 511 A 554 A 666	0 10 30 50 65		1.005 1.079 1.144 5.520 11.77	2.2-2.5	2	μ at 15.9kA/m magnetic after heavy cold-work
						0 10 30 50 65		1.004 1.039 1.414 3.214 7.205	2.2-2.4		class 1 MIL-STD-288 see 4.1.2

See footnotes at end of table.

TABLE VI. Wrought austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-nickel stainless steel, low permeability		S30260	C 0.15 Cr 16.0-18.0 Mn 1.00 Ni 9.5-12.0 P 0.20-0.40 S 0.040 Si 1.00 Fe rem	DOD-F-24669/5 5/		UNK	1.02			1(m)	
Chromium-nickel stainless steel	Type 303	S30300	C 0.15 Cr 17.00-19.00 Mn 2.00 Mo 0.60 Ni 8.00-10.00 P 0.20 S 0.15 Si 1.00 Fe rem	DOD-F-24669/6	ASTM A 194 A 314 A 320 A 473 A 581 A 582	0 UNK	1.01 1.10			1(m)	
Chromium-nickel stainless steel	Type 304	S30400	C 0.08 Cr 18.00-20.00 Mn 2.00 Ni 8.00-10.50 P 0.045 S 0.030 Si 1.00 Fe rem	QQ-S-763 QQ-S-766 DOD-F-24669/6 MIL-S-5059 MIL-T-5695 MIL-T-8504 MIL-T-8506 MIL-S-27419 4/	ASTM A 167 A 182 A 193 A 194 A 213 A 240 A 249 A 269 A 270 A 271 A 276 A 312 A 313 A 314 A 320 A 358 A 368 A 376 A 409 A 430 A 473 A 478 A 479 A 492 A 493 A 511 A 554 A 580	0 10 30 50 65 0 10 30 50 65		1.083 1.638 4.762 10.01 19.35 1.015 1.064 3.235 8.480 14.41	2.2-2.4 2.3-2.5	2	μ at 15.9kA/m magnetic after heavy cold-work class 1 MIL-STD-288 see 4.1.2

See footnotes at end of table.

TABLE VI. Wrought austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-nickel stainless steel (cont)	Type 304				A 632 A 666 A 688						
Chromium-nickel stainless steel	Type 305	S30500	C 0.12 Cr 17.00-19.00 Mn 2.00 Ni 10.00-13.00 P 0.045 S 0.030 Si 1.00 Fe rem	QQ-S-763 QQ-S-766 class 305 4/	ASTM A 167 A 240 A 249 A 276 A 313 A 314 A 368 A 473 A 478 A 492 A 493 A 511 A 554 A 580	0 10 30 50 65		1.002 1.003 1.004 1.008 1.032	2.3	2	may be slightly magnetic after heavy cold-work
Chromium-nickel heat resisting steel	Type 308	S30800	C 0.08 Cr 19.00-21.00 Mn 2.00 Ni 10.00-12.00 P 0.045 S 0.030 Si 1.00 Fe rem		ASTM A 167 A 276 A 314 A 473 A 580	0			23.9	7	
Chromium-nickel heat resisting steel	Type 309	S30900	C 0.20 Cr 22.00-24.00 Mn 2.00 Ni 12.00-15.00 P 0.045 S 0.030 Si 1.00 Fe rem	QQ-S-763 QQ-S-766 DOD-F- 24669/6 class 309 4/	ASTM A 167 A 249 A 276 A 312 A 314 A 358 A 403 A 409 A 473 A 511 A 554 A 580	UNK	3.70		2.2	1(m) 2(e)	

See footnotes at end of table.

TABLE VI. Wrought austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-nickel heat resisting steel	Type 310	S31000	C 0.25 Cr 24.00-26.00 Mn 2.00 Ni 19.00-22.00 P 0.045 S 0.030 Si 1.50 Fe rem	QQ-S-763 QQ-S-766 DOD-F-24669/6	ASTM A 167 A 182 A 213 A 249 A 276 A 312 A 314 A 358 A 403 A 409 A 473 A 511 A 554 A 632	0 10 30 50 65		1.014 1.009 1.012 1.018 1.022	2.0	2	μ at 15.9kA/m class 1 MIL-STD-288
Chromium-nickel heat resisting steel	Type 314	S31400	C 0.25 Cr 23.00-26.00 Mn 2.00 Ni 19.00-22.00 P 0.045 S 0.030 Si 1.50-3.00 Fe rem		ASTM A 276 A 314 A 473 A 580	0	1.02		23.4	7	
Chromium-nickel-molybdenum stainless steel	Type 316	S31600	C 0.08 Cr 16.00-18.00 Mn 2.00 Mo 2.00-3.00 Ni 10.00-14.00 P 0.045 S 0.030 Si 1.00 Fe rem	QQ-S-763 QQ-S-766 DOD-F-24669/6 MIL-S-5059 MIL-S-7720 class 316 4/	ASTM A 167 A 182 A 193 A 194 A 213 A 240 A 249 A 269 A 276 A 312 A 313 A 314 A 320 A 358 A 368 A 376 A 403 A 409 A 430 A 473 A 478	0 10 30 50 65		1.010 1.003 1.003 1.004 1.006	2.2-2.3	2	μ at 15.9kA/m may be magnetic after heavy cold-work class 2 MIL-STD-288

See footnotes at end of table.

TABLE VI. Wrought austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-nickel-molybdenum stainless steel (cont)	Type 316				A 479 A 511 A 554						
Chromium-nickel stainless steel	Type 317	S31700	C 0.08 Cr 17.00-19.00 Mn 2.00 Ni 9.00-12.00 P 0.045 S 0.030 Si 1.00 Ti (5xC min) Fe rem	QQ-S-763 QQ-S-766 DOD-F-24669/6 MIL-S-27419	ASTM A 167 A 240 A 249 A 269 A 276 A 312 A 314 A 403 A 409 A 473 A 478 A 511 A 554 A 580 A 632	0	1.02		23.4	7	
Chromium-nickel stainless steel	Type 321	S32100	C 0.04-0.10 Cr 17.00-20.00 Mn 2.00 Ni 9.00-12.00 P 0.040 S 0.030 Si 1.00 Ti (4xC-0.60) Fe rem	QQ-S-763 QQ-S-766 DOD-F-24669/6 MIL-S-27419	ASTM A 167 A 182 A 193 A 194 A 213 A 240 A 249 A 269 A 271 A 276 A 312 A 314 A 320 A 358 A 376 A 403 A 409 A 430 A 473 A 479 A 493 A 511 A 554 A 632	0 10 30 50 65		1.006 1.008 1.033 1.380 2.493	2.3-2.4	2	μ at 15.9kA/m slightly magnetic after heavy cold-work

See footnotes at end of table.

TABLE VI. Wrought austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-nickel stainless steel	Type 329	S32900	C 0.20 Cr 23.00-28.00 Mn 1.00 Mo 1.00-2.00 Ni 2.50-5.00 P 0.040 S 0.030 Si 0.75 Fe rem		ASTM A 268 A 511	0			23.0	7(e)	
Chromium-nickel stainless steel	Type 347	S34700	C 0.08 Cr 17.00-19.00 Mn 2.00 Nb (10xC min) Ni 9.00-13.00 P 0.045 S 0.030 Si 1.00 Fe rem	QQ-S-763 QQ-S-766 DOD-F-24669/6 class 347	ASTM A 167 A 182 A 193 A 194 A 213 A 249 A 269 A 271 A 276 A 312 A 314 A 320 A 358 A 376 A 403 A 409 A 430 A 473 A 479 A 493 A 511 A 554 A 580 A 632	0 10 30 50 65		1.006 1.011 1.500 3.040 9.243	2.3-2.5	2	μ at 15.9kA/m slightly magnetic after heavy cold-work class 2 MIL-STD-288
Chromium-nickel stainless steel	Type 348	S34800	C 0.08 Co 0.20 Cr 17.00-19.00 Mn 2.00 Nb (10xC min) Ni 9.00-13.00 P 0.045 S 0.30 Si 1.00 Ta 0.10 Fe rem	QQ-S-766 class 348 4/	ASTM A 167 A 182 A 213 A 240 A 249 A 269 A 276 A 312 A 314 A 358	0	1.02		23.6	7	

See footnotes at end of table.

TABLE VI. Wrought austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-nickel stainless steel (cont)	Type 348				A 376 A 403 A 409 A 479 A 580 A 632						
Chromium-nickel stainless steel	Type 384	S38400	C 0.08 Cr 15.00-17.00 Mn 2.00 Ni 17.00-19.00 P 0.045 S 0.030 Si 1.00 Fe rem		ASTM A 493	0	1.02		21.8	7	
Stainless steel	Cyclops 19-9-DL	S63198	C 0.28-0.35 Cr 18.0-21.0 Cu 0.50 Mn 0,75-1.50 Mo 1.00-1.75 Nb 0.25-0.60 Ni 8.00-11.00 P 0.040 S 0.030 Si 0.30-0.80 Ti 0.10-0.35 W 1.00-1.75 Fe rem		ASTM A 453 A 457 A 458 A 477	25	1.04			1(m)	
Chromium-nickel-iron alloy	Discaloy	S66220	Al 0.35 B 0.0010-0.010 C 0.08 Cr 12.0-15.0 Cu 0.50 Mn 1.50 Mo 2.50-3.50 Ni 24.0-28.0 P 0.040 S 0.030 Si 1.00 Ti 1.55-2.00 Fe rem		ASTM A 453 A 638	UNK	1.02			1(m)	
	Thompson alloy		C 0.4-0.5 Cr 13-15 Mn 0.7			UNK	1.11			1(m)	

See footnotes at end of table.

TABLE VI. Wrought austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-nickel-iron alloy (cont)	Thompson alloy		Mo 0.5 W 1.75-3.0 Fe rem								
Chromium-nickel-iron alloy	Timken 16-25-6		C 0.12 Cr 15.0-17.5 Mn 2.0 Mo 5.5-7 N 0.07 Ni 24-27 Si 1.0 Fe rem			25	1.02			1(m)	
	UNILOY 888		C 0.45-0.60 Cr 6.75-8.25 Mn 8.00-10.00 Ni 7.00-8.00 P 0.05 S 0.03 Si 1.00 V 1.30-1.65 Fe rem			UNK		<1.01	22.7	7	μ at 15.9kA/m after severe cold-working

1/ Unless otherwise indicated, values shown are maximum permitted.
2/ Percent IACS calculated on a volume basis in accordance with ASTM B 193 from data provided in the indicated data sources.
3/ See 3.1.7(i) for explanation of codes.
4/ Alloy numbers pertain to all specifications listed in heading.
5/ Specifies material having a permeability less than or equal to 1.2 in the annealed condition.

TABLE VII. Precipitation hardenable corrosion resistant steels.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Chromium-nickel-aluminum-molybdenum stainless steel	PH 13-8 Mo	S13800	Al 0.09-1.35 C 0.05 Cr 12.25-13-25 Mn 0.20 Mo 2.00-2.50 N 0.01 Ni 7.50-8.50 P 0.01 S 0.008 Si 0.10 Fe rem		ASTM A 564 A 693 A 705				16.9	7	
Chromium-nickel-copper stainless steel	15-5 PH	S15500	C 0.07 Cr 14.00-15.00 Cu 2.50-4.50 Mn 1.00 Nb 0.15-0.45 Ni 3.50-5.50 P 0.040 S 0.030 Si 1.0 Fe rem		ASTM A 564 A 693 A 705	0			23.4	7	
Chromium-nickel-copper stainless steel	17-4 PH	S17400	C 0.07 Cr 15.50-17.50 Cu 3.00-5.00 Mn 1.00 Nb 0.15-0.45 Ni 3.00-5.00 P 0.040 S 0.030 Si 1.00 Fe rem	MIL-S-81591	ASTM A 564 A 693 A 705	0	29.5			1(m)	
Chromium-nickel-aluminum stainless steel	17-7 PH	S17700	Al 0.75-1.50 C 0.09 Cr 16.00-18.00 Mn 1.00 Ni 6.50-7.75 P 0.040 S 0.040 Si 1.00 Fe rem	MIL-S-25043	ASTM A 313 A 564 A 579 A 693 A 705	0	21.5			1(m)	
Steel, corrosion resistant, PH	Type 322					0	39.0			1(m)	

See footnotes at end of table.

TABLE VII. Precipitation hardened corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
	Crucible 3003		Al 3.0 C 0.60 Cr 12.5 Mn 4.5 Ni 15.0 Fe rem			UNK	1.02-1.62			1(m)	
	Rezistal 3311					UNK	1.02			1(m)	
	Rezistal 3329					UNK	1.02-14.2			1(m)	
	Armco 21-4					UNK	1.02			1(m)	

1/ Unless otherwise indicated, values shown are maximum permitted.
2/ Percent IACS calculated on a volume basis in accordance with ASTM B 193 from data provided in the indicated data sources.
3/ See 3.1.7(i) for explanation of codes.

TABLE VIII. Cast austenitic corrosion resistant steels.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Alloy steel casting	CF-8	J92600	C 0.08 Cr 18.0-21.0 Mn 1.50 Ni 8.0-11.0 P 0.04 S 0.04 Si 0.75 Fe rem	MIL-S-867 class I	ASTM A 351 A 451 A 743 A 744	0	1.00-1.30		2.3	7	
Alloy steel casting	CF-20	J92602	C 0.20 Cr 18.0-21.0 Mn 1.50 Ni 8.0-11.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 743	0	1.01		2.2	7	
Alloy steel casting	HF	J92603	C 0.20-0.40 Cr 18.0-23.0 Mn 2.00 Mo 0.50 Ni 8.0-12.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 297 alloy HF	0	1.0		2.2	11	
Alloy steel casting	Type 304	J92610	C 0.08 Cr 18.0-20.0 Mn 2.00 Ni 8.0-12.0 P 0.04 S 0.03 Si 1.00 Fe rem	MIL-S-81591		0	1.07		2.5	1(m) 7(e)	
Alloy steel casting	Type 347	J92640	C 0.08 Cr 17.0-19.5 Mn 2.00 Ni 9.0-13.0 P 0.04 S 0.03 Si 1.00 Nb + Ta (10xC min, 1.5 max) Fe rem	MIL-S-81591		0	1.03			1(m)	

See footnotes at end of table.

TABLE VIII. Cast austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Alloy steel casting	CF-3	J92700	C 0.03 Cr 17.0-21.0 Mn 1.5 Mo 2.0-3.0 Ni 8.0-12.0 P 0.04 S 0.04 Si 1.50 Fe rem			0	1.20-3.00		2.3	7	
Alloy steel casting	CF-16F	J92701	C 0.16 Cr 18.0-21.0 Mn 1.50 Ni 9.0-12.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 743	0	1.00-2.00		2.4	7	
Alloy steel casting	CF-8C	J92710	C 0.08 Cr 18.0-21.0 Mn 1.50 Ni 9.0-12.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 351 A 451 A 743 A 744	0	1.20-1.80		2.4	7	
Alloy steel casting	CF-3M	J92800	C 0.03 Cr 17.0-21.0 Mn 1.50 Mo 2.0-3.0 Ni 9.0-13.0 P 0.04 S 0.04 Si 1.50 Fe rem		ASTM A 351 A 743 A 744		1.20-3.00		2.1	7	
Alloy steel casting	Type 316	J92810	C 0.08 Cr 16.0-18.0 Mn 2.00 Mo 2.0-3.0 Ni 10.0-14.0 P 0.04 S 0.03 Si 1.00 Fe rem	MIL-S-81591		0	1.43		2.5	1(m) 7(e)	

See footnotes at end of table.

TABLE VIII. Cast austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Alloy steel casting	CF-8M	J92900	C 0.08 Cr 18.0-21.0 Mn 1.50 Mo 2.0-3.0 Ni 9.0-12.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 351 A 451 A 743 A 744	0	1.50-2.50		2.1	7	
Alloy steel casting	CH-10	J93401	C 0.10 Cr 22.0-26.0 Mn 1.50 Ni 12.0-15.0 P 0.040 S 0.040 Si 2.00 Fe rem		ASTM A 351	0	1.71*		2.1	7	* after heat treatment
Alloy steel casting	HE	J93403	C 0.20-0.50 Cr 26.0-30.0 Mn 2.00 Mo 0.50 Ni 8.0-11.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 297 alloy HE	0	1.3-2.5		2.0	11	
Alloy steel casting	CE-30	J93423	C 0.03 Cr 26.0-30.0 Mn 1.50 Ni 8.0-11.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 743	0	71.5		2.1	7	
Alloy steel casting	HH	J93503	C 0.20-0.50 Cr 24.0-28.0 Mn 2.00 Mo 0.50 Ni 11.0-14.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 297 alloy HH	0	1.0-1.9		2.0-2.3	11	

See footnotes at end of table.

TABLE VIII. Cast austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Alloy steel casting	HI	J94003	C 0.20-0.50 Cr 26.0-30.0 Mn 2.00 Mo 0.50 Ni 14.0-18.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 297 alloy HI	0	1.0-1.7		2.0	11	
Alloy steel casting	CK-20	J94202	C 0.20 Cr 23.0-27.0 Mn 2.00 Ni 19.0-22.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 351 A 451 A 743	0	1.02		1.9	7	
Alloy steel casting	HN	J94213	C 0.20-0.50 Cr 19.0-23.0 Mn 2.00 Mo 0.50 Ni 23.0-27.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 297 alloy HN	0	1.1		1.7	11	
Alloy steel casting	HK	J94224	C 0.20-0.60 Cr 24.0-28.0 Mn 2.00 Mo 0.50 Ni 18.0-22.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 297 alloy HK	0	1.02			1(m)	
Alloy steel casting	HL	J94604	C 0.20-0.60 Cr 28.0-32.0 Mn 2.00 Mo 0.50 Ni 18.0-22.0 P 0.04 S 0.04 Si 2.00 Fe rem		ASTM A 297 alloy HL	0	1.01		1.8	11	

See footnotes at end of table.

TABLE VIII. Cast austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Alloy steel casting	HT	J94605	C 0.35-0.75 Cr 15.0-19.0 Mn 2.00 Ni 33.0-37.0 P 0.04 S 0.04 Si 2.50 Fe rem		ASTM A 297 alloy HT	0	1.1-2		1.7	11	
Alloy steel casting	CN-7M	J95150	C 0.07 Cr 19.0-22.0 Cu 3.0-4.0 Mn 1.50 Mo 2.0-3.0 Ni 27.5-30.5 P 0.04 S 0.04 Si 1.50 Fe rem		ASTM A 351 A 743 A 744	0	1.01-1.10		2.5	7	
Alloy steel casting	HU	J95405	C 0.35-0.75 Cr 17.0-21.0 Mn 2.00 Mo 0.50 Ni 37.0-41.0 P 0.04 S 0.04 Si 2.50 Fe rem		ASTM A 297 alloy HU	0	1.1-2		1.6	11	
Alloy cast steel	HP	J95705	C 0.35-0.75 Cr 24.0-28.0 Mn 2.00 Mo 0.50 Ni 33.0-37.0 P 0.04 S 0.04 Si 2.50 Fe rem		ASTM A 297 alloy HP	0	1.02-1.25		1.7	11	
Cast corrosion resistant steel	18-8 Nb					0	2.14			1(m)	

See footnotes at end of table.

TABLE VIII. Cast austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Cast iron	Ductile Ni-resist type 2		C 2.0-3.0 Cr 2.0-4.0 Mn 1.0-1.5 Ni 18-22 Si 1.0-2.5 Fe rem			UNK	1.03		1.01	1(m) 7(e)	
Welding rod	19-9 weld Chromend K		C 0.07 Cr 19.0 Ni 9.0 Fe rem			0	1.15			1(m)	
Weld 18-8 corrosion resistant steel	18-8 Nb weld Stainweld A-5 Nb					0	2.06			1(m)	
Weld	19-9 Nb weld, long. weld					0	1.77			1(m)	
Weld	19-9 Nb weld, trans. weld					0	1.04			1(m)	
Weld	19-9 Ti weld					0	1.30			1(m)	
Welding electrode	18-13-2 weld Chromend KMO		C 0.08 Cr 18.0 Mo 2.0 Ni 13.0 Fe rem			0	1.05			1(m)	
Weld metal	25-12 weld Chromend H.C.		C 0.10 Cr 25.0 Ni 12.0 Fe rem			0	1.57			1(m)	
Weld	25-12 Ti weld					0	1.07			1(m)	
Weld	25-20 weld Chromend H.C.N					0	1.00			1(m)	

See footnotes at end of table.

TABLE VIII. Cast austenitic corrosion resistant steels - Continued.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Weld	25-20		C 0.10 Cr 25.0 Ni 20.0 Fe rem			0	1.02			1(m)	
Weld	Stainless 304 and weld metal 19:9 + 308					0 0	1.07 1.10			1(m)	
Welding electrodes	Frogalloy M		C 0.5-0.6 Cr 18.0-21.0 Mn 4.0 min Ni 9.0-10.5 Fe rem			0	1.00			1(m)	

1/ Unless otherwise indicated, values shown are maximum permitted.
2/ Percent IACS calculated on a volume basis in accordance with ASTM B 193 from data provided in the indicated data sources.
3/ See 3.1.7(i) for explanation of codes.

TABLE IX. Austenitic manganese steels.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data sources3/	Remarks
				Government	Commercial		Norm	Other			
Hadfield manganese steel			C 1.0-1.35 Mn 10.5-15.0 P 0.10 Si 0.1-0.30 Fe rem			0 26	1.02 1.02		1.2	1(m) 7(e)	
Manganese steel	Jessup no. 9		C 0.40 Cr 4.0 Mn 13.0 Ni 3.5 Fe rem			UNK 31.1	1.02 1.08			1(m)	
Manganese -nickel steel			C 0.70 Mn 14.0 Ni 3.0			0	1.01			1(m)	
Manganese -nickel steel			C 0.80 Mn 14.0 Ni 4.0 Fe rem			0	1.00			1(m)	
Manganese steel	Jessup no. 200		C 0.30 Mn 11.0 Ni 7.0 Fe rem			11	1.02			1(m)	
Manganese -nickel steel			C 0.3 Mn 11.0 Ni 8.0 Fe rem			0	1.00			1(m)	
	Chromanal		C 1.1 Cr 2.0 Mn 12.0 Fe rem			UNK	1.31			1(m)	
Manganese steel	Midvale Nonmagnetic		C 0.70 Cr 4.0 Mn 8.0 Ni 9.0 Fe rem			UNK	1.00			1(m)	

1/ Unless otherwise indicated, values shown are maximum permitted.
2/ Percent IACS calculated on a volume basis in accordance with ASTM B 193 from data provided in the indicated data sources.
3/ See 3.1.7(i) for explanation of codes.

TABLE X. High strength steels.

Common name	Commercial designation	UNS number	Chemical composition (percent)1/	Specifications		Percent cold-work	Magnetic permeability		Electrical conductivity (%IACS)2/	Data Sources	Remarks
				Government	Commercial		Norm	Max			
HY-80	HY-80	K31820	0.180 C 0.400 Mn 0.020 P 0.020 S 0.350 Si 3.250 Ni 1.800 Cr 0.600 Mo rem Fe	MIL-S-16216			56[a]	910[b]	5.7[b,c]	[a]Cohn, H.P., "Magnetic Characteristics of High-Strength Steels HY-80, HY-100, HY-130, and QT-35," NSRDC, 6-184, June, 1971. [b]U.S. Steel, "Properties, Characteristics, and Data Common to HY-80 and HY-100 Steels," January, 1983. [c]Hamburg, E.G., "Physical Properties of Ultraservice Steels," U.S. Steel Applied Research Laboratory Technical Report, Project No. 39.018-007(44), B-61301, February, 1971.	
HY-100	HY-100	K32045	0.180 C 0.400 Mn 0.020 P 0.020 S 0.350 Si 3.500 Ni 1.800 Cr 0.600 Mo rem Fe	MIL-S-16216			87[a] 81[d]	910[b]	5.7[b]	[a]see above [b]see above [d]Cannell, P.Y., and L.A. Olney, "Magnetization Curves for High Strength Steels HY-100 and HY-130," DTRC, DTRC-PAS-88/61, January, 1989.	
HY-130	HY-130		0.110 C 0.880 Mn 0.003 P 0.006 S 0.290 Si 9.900 Ni 2.060 Cr 1.040 Mo rem Fe				99[a] 104[d]	630[d]	4.9[c]	[a]see above [c]see above [d]see above	
QT-35	QT-35						71[a]			[a]see above	

1/ Unless otherwise indicated, values shown are maximum permitted.
2/ Percent IACS calculated on a volume basis in accordance with ASTM B 193 from data provided in the indicated data sources.

TABLE XI. Data sources.

Numeric code	Type of data electrical (e)/magnetic (m)	Source document
1	(m)	E.E.S (Engineering Experiment Station - predecessor to DTRC-Annapolis) Report 4E(2)66904, 4P(2)66918, Magnetic Characteristics of "Non-magnetic" Metallic Materials, Comparison of Properties in Strong and Weak Fields.
2	(e) (m)	Material and chemical analysis provided by ARMCO. All of the materials investigated, except the type 310 heat treatment, were annealed at 1066°C and air cooled. The type 310 heat treatment was annealed at 1149°C and air cooled.
3	(e)	MIL-HDBK-694.
4	(e)	MIL-HDBK-698.
5	(e)	National Institute of Standards and Technology Circular 592 (Nickel and its Alloys).
6	(e)	American Iron and Steel Institute (Steel Products Manual, Stainless and Heat Resisting Steels).
7	(e) (m)	ASM International, Metals Handbook, Ninth Edition.
8	(e)	SAE J470.
9	(e)	1987 SAE Handbook, Volume 1.
10	(e) (m)	Material and chemical analysis provided by INCO Alloys International, Inc.
11	(e) (m)	Materials Engineering/Materials Selector, Volume 82, Number 4.

TABLE XII. Government specification to UNS number cross index.

Government specification	UNS number	Government specification	UNS number
QQ-A-200	A92014	QQ-A-596	A03550
	A92024		A02130
	A93003		
	A95083	QQ-A-601	A03550
	A95086		
	A95454	QQ-A-596	A91100
	A95456		A91145
	A96061		
	A96063	QQ-B-626	C36000
	A96066		
		QQ-B-637	C46400
QQ-A-225	A91100		
	A92011	QQ-B-639	C46400
	A92014		
	A92024	QQ-B-655	A94043
	A93003		
	A95052	QQ-B-675	C95200
	A96061		C95400
QQ-A-250	A91100	QQ-B-728	C67500
	A92024		
	A92124	QQ-C-390	C83600
	A92219		C83800
	A93003		C84400
	A95052		C84800
	A95083		C85400
	A95086		C85700
	A95454		C86200
	A95456		C86300
	A96061		C86500
			C97400
QQ-A-367	A92014		C90300
	A92218		C92200
	A92219		C94700
	A94032		C94800
	A95083		C95200
	A96061		C95400
	A96066		C95700
	A96151		C95800
QQ-A-430	A91100	QQ-C-450	C63000
	A92219		
	A93003	QQ-C-465	C63000
	A95005		
	A95052	QQ-C-502	C10100
	A95056		
	A96061	QQ-C-523	C86200
	A97050		C86300
			C86500

TABLE XII. Government specification to UNS number cross index - continued.

Government specification	UNS number	Government specification	UNS number
QQ-C-525	C83600	WW-T-700	A91100
	C84400		A92024
	C90300		A93003
	C92200		A95052
			A95086
QQ-C-576	C10100		A96061
QQ-C-591	C65500	MIL-W-85	A91100
			A96061
QQ-L-171	L50050		A96063
			C10100
QQ-N-281	N04400		
	N04405	MIL-S-867	J92600
QQ-N-286	N05500	MIL-T-1368	N04400
QQ-N-288	N04019	MIL-W-3318	C10100
QQ-S-763	S20200	MIL-F-3922	A96061
	S30200		
	S30400	MIL-S-5059	S30100
	S30500		S30200
	S30900		S30400
	S31000		S31600
	S31600		
	S31700	MIL-F-5509	A92014
	S32100		A92024
	S34700		
		MIL-R-5674	A91100
QQ-S-766	S20100		A92024
	S20200		A95056
	S30100		
	S30200	MIL-T-5695	S30400
	S30400		
	S30500	MIL-W-6712	A91100
	S30900		A94043
	S31000		
	S31600	MIL-B-6812	A92024
	S31700		
	S32100	MIL-T-7081	A96061
	S34700		
	S34800	MIL-S-7720	S30200
			S31600
QQ-W-343	C10100		
		MIL-T-8231	C65500
QQ-W-390	N06600		
		MIL-T-8504	S30400

TABLE XII. Government specification to UNS number cross index - continued.

Government specification	UNS number	Government specification	UNS number
MIL-T-8506	S30400	MIL-C-15345	C86500
MIL-R-8814	A95056		C90300
			C92200
MIL-T-9046	R50400		C95400
	R50550		C95800
	R50700		
	R54520	MIL-C-15726	C70600
	R54810		C71500
	R56080		
	R56210	MIL-B-15894	C85800
	R56401		
	R56740	MIL-E-15597	A91100
			A93003
MIL-T-9047	R50700		A94043
	R54520		
	R54810	MIL-B-16166	C63000
	R56210		
	R56401	MIL-T-16420	C70600
			C71500
MIL-C-10387	A96151		
		MIL-B-16541	C92200
MIL-T-10794	A96061		
		MIL-A-18001	Z32121
MIL-C-11866	A03550		
	C83600	MIL-G-18014	A95052
	C86200		A95086
	C86300		A95456
	C90300		A96061
			A96063
MIL-A-12545	A91100		
	A92014	MIL-G-18015	A95052
	A96061		A96063
	A96070		
		MIL-F-18280	A92014
MIL-S-12875	A93003		A92024
	A95052		A96061
MIL-T-15005	C70600	MIL-B-18907	C10100
	C71500		
		MIL-E-21562	N06625
MIL-T-15089	A92014		
	A92024	MIL-C-22087	C83600
			C83200
MIL-C-15345	C83600		C86300
	C85700		C86500
	C86300		C90300
		MIL-T-22214	C70600
			C71500

TABLE XII. Government specification to UNS number cross index - continued.

Government specification	UNS number	Government specification	UNS number
MIL-A-22771	A92014	MIL-S-25043	S17700
	A92219		
	A96061	MIL-P-25995	A95083
	A96151		A95456
MIL-C-22229	C83600	MIL-C-26094	A91100
	C86200		A95005
	C86300		A95052
	C86500		A95086
	C90300		A95154
	X95200		
		MIL-S-27419	S30400
MIL-W-23068	C10100		S32100
	C10300		
		MIL-F-39000	A03550
			A96061
		MIL-A-45225	A95083
			A95456
MIL-W-23351	A96061	MIL-A-46027	A95083
			A95456
		MIL-A-46083	A95083
MIL-E-23765	C65500		A95456
		MIL-A-46104	A96070
		MIL-A-46118	A92219
MIL-S-24149	A91100	MIL-T-50777	A92024
	A95086		
	A95356	MIL-A-52174	A91100
	A95456		A93003
MIL-B-24480	C95800	MIL-T-81556	R50250
			R50400
DOD-F-24669/5	S30200		R50550
			R50700
DOD-F-24669/6	S30200		R54810
	S30300		R56401
	S30400		R56740
	S30900		
	S31000	MIL-L-81558	R54810
	S31600		R56210
	S31700		
	S32100		
	S34700		

TABLE XII. Government specification to UNS number cross index - continued.

Government specification	UNS number	Government specification	UNS number
MIL-S-81591	J92610		
	J92640		
	J92810		
	S17400		
MIL-A-81596	A92024		
	A93003		
	A95052		
	A95056		
MIL-T-81915	R50250		
	R54520		
MIL-T-83142	R54520		
	R54810		
	R56401		
	R56740		
MIL-HDBK-694	A02130		
	A03550		
MIL-HDBK-698	C36000		
	C46400		
	C63000		
	C65500		
	C67500		
	C83600		
	C86200		
	C86500		
	C87400		
	C90300		
	C92200		
	C94800		
	C95200		
	C95400		
	C95700		
	C95800		

TABLE XIII. Commercial specification to UNS number cross index.

Commercial specification	UNS number	Commercial specification	UNS number
ASTM		ASTM	
A 167	S30100	A 240 (cont)	S32100
	S30200		S34800
	S30400		
	S30500	A 249	S20910
	S30800		S24000
	S30900		S30400
	S31000		S30500
	S31600		S30900
	S31700		S31000
	S32100		S31600
	S34700		S31700
	S34800		S32100
			S34700
A 177	S30100		S34800
A 182	S20910	A 268	S32900
	S31000		
	S31600	A 269	S24000
	S32100		S30400
	S34700		S31600
	S34800		S31700
			S32100
A 193	S21800		S34700
	S30400		S34800
	S31600		
	S32100	A 270	S30400
	S34700		
		A 271	S30400
A 194	S21800		S32100
	S30300		S34700
	S30400		
	S31600	A 276	S21800
	S32100		S21900
	S34700		S21904
			S30200
A 213	S30400		S30400
	S31000		S30500
	S31600		S30800
	S32100		S30900
	S34700		S31000
	S34800		S31400
			S31600
A 240	S20910		S31700
	S24000		S32100
	S30200		S34700
	S30400		S34800
	S30500		
	S31600	A 289	J92603
	S31700		J93403

TABLE XIII. Commercial specification to UNS number cross index - continued.

Commercial specification	UNS number	Commercial specification	UNS number
ASTM		ASTM	
A 289 (cont)	J93503	A 351 (cont)	J92800
	J94003		J92900
	J94213		J93401
	J94224		J94204
	J94604		J95150
	J94605		
	J95405	A 358	S30400
	J95705		S30900
			S31000
A 312	S30400		S31600
	S30900		S32100
	S31000		S34700
	S31600		S34800
	S31700		
	S32100	A 368	S30200
	S34700		S30400
	S34800		S30500
			S31600
A 313	S17700		
	S30200	A 376	S30400
	S30400		S31600
	S30500		S32100
	S31600		S34700
			S34800
A 314	S20200		
	S21900	A 403	S30900
	S21904		S31000
	S30200		S31600
	S30300		S31700
	S30400		S32100
	S30500		S34700
	S30800		S34800
	S30900		
	S31000	A 409	S30400
	S31400		S30900
	S31600		S31000
	S31700		S31600
	S32100		S31700
	S34700		S32100
	S34800		S34700
			S34800
A 320	S30300		
	S30400	A 412	S20100
	S31600		S20200
	S32100		S20910
	S34700		S21900
			S21904
A 351	J92600		S24000
	J92710		

TABLE XIII. Commercial specification to UNS number cross index. Continued.

Commercial specification	UNS number	Commercial specification	UNS number
ASTM		ASTM	
A 430	S30400	A 492	S30200
	S31600		S30400
	S32100		S30500
	S34700		
		A 493	S30200
A 451	J92600		S30400
	J92710		S30500
	J92900		S32100
	J94202		S34700
			S34800
A 453	S63198		
	S66220	A 511	S30200
			S30400
A 457	S63198		S30500
			S30900
A 458	S63198		S31000
			S31600
A 473	S20200		S31700
	S21900		S32100
	S21904		S34700
	S30200		
	S30300	A 530	S24100
	S30400		
	S30500	A 554	S30100
	S30800		S30200
	S30900		S30400
	S31000		S30500
	S31400		S30900
	S31600		S31000
	S31700		S31600
	S32100		S31700
	S34700		S32100
			S34700
A 477	S63198		
		A 564	S13800
A 478	S30200		S15500
	S30400		S17400
	S30500		S17700
	S31600		
	S31700	A 579	S17700
A 479	S20910	A 580	S20910
	S21800		S21900
	S30200		S21904
	S30400		S30400
	S31600		S30500
	S32100		S30800
	S34700		S30900
	S34800		S31400

TABLE XIII. Commercial specification to UNS number cross index - Continued.

Commercial specification	UNS number	Commercial specification	UNS number
ASTM		ASTM	
A 580 (cont)	S31700	A 744	J92600
	S34700		J92710
	S34800		J92800
			J92900
A 581	S30300		J95150
A 582	S30300	B 1	C10100
A 632	S30400	B 2	C10100
	S31000		
	S31700	B 3	C10100
	S32100		
	S34700	B 16	C36000
	S34800		
		B 21	C46400
A 638	S66220		
		B 22	C86300
		B 26	A03550
			A02130
A 666	S20100		
	S20200	B 30	C83600
	S30100		C83800
	S30200		C84400
	S30400		C84800
			C85400
A 688	S24000		C85700
	S30400		C85800
			C86200
A 693	S13800		C86300
	S15500		C86500
	S17400		C87400
	S17700		C90300
			C92200
A 705	S13800		C94700
	S15500		C94800
	S17400		C95200
	S17700		C95400
			C95700
A 743	J92600		C95800
	J92602		
	J92701	B 42	C10300
	J92710		
	J92800	B 48	C10100
	J92900		
	J93423	B 61	C92200
	J94202		
	J95150	B 62	C83600

TABLE XIII. Commercial specification to UNS number cross index - Continued.

Commercial specification	UNS number	Commercial specification	UNS number
ASTM		ASTM	
B 68	C10300	B 152 (cont)	C10300
B 69	Z21210	B 163	N04400
			N06600
B 75	C10100		N08825
	C10300		
		B 164	N04400
B 88	C10300		N04405
B 96	C65500	B 166	N06600
B 98	C65500	B 168	N06600
B 100	C65500	B 171	C46400
			C63000
B 105	C65500		C70600
			C71500
B 108	A03550		
		B 176	C 85800
B 111	C10300		
	C70600	B 187	C10100
	C71000		C10300
	C71500		
		B 188	C10300
B 122	C70600		
	C71000	B 206	C71000
	C71500		
		B 209	A91060
B 124	C46400		A91100
	C63000		A92014
	C67500		A92024
			A92124
B 127	N04400		A92219
			A93003
B 133	C10100		A93004
			A93015
B 138	C67500		A95005
			A95050
B 148	C95200		A95052
	C95400		A95083
	C95700		A95086
	C95800		A95154
			A95252
B 150	C63000		A95254
			A95454
B 151	C70600		A95456
	C71500		A95457
			A95652
B 152	C10100		A96061

TABLE XIII. Commercial specification to UNS number cross index - Continued.

Commercial specification	UNS number	Commercial specification	UNS number
ASTM		ASTM	
B 209(cont)	A97072	B 231	A91350
B 210	A91060	B 233	A91350
	A91100		
	A92011	B 234	A91060
	A92014		A93003
	A92024		A95052
	A93003		A95054
	A95005		A96061
	A95050		A97072
	A95052		
	A95083	B 236	A91350
	A95086		
	A95154	B 241	A91060
	A95456		A91100
	A96061		A92014
	A96063		A92024
			A92219
B 211	A91060		A93003
	A91100		A95083
	A92011		A95086
	A92014		A95254
	A92024		A95454
	A92219		A95456
	A93003		A95652
	A95052		A96061
	A95056		A96063
	A95154		A97072
	A96061		
		B 246	C10100
B 221	A91060		
	A91100	B 247	A91100
	A92014		A92014
	A92024		A92218
	A92219		A92219
B221	A93003		A93003
	A93004		A94032
	A95052		A95083
	A95083		A95456
	A95086		A96061
	A95154		A97050
	A95454		A97175
	A95456		
	A96063	B 265	R50250
	A96066		R50400
	A97005		R50550
	A97072		R50700
			R52250
B 230	A91350		R52400

TABLE XIII. Commercial specification to UNS number cross index - continued.

Commercial specification	UNS number	Commercial specification	UNS number
ASTM		ASTM	
B 265 (cont)	R54520	B 316 (cont)	A92219
			A93003
B 271	C83600		A95005
	C83800		A95052
	C84400		A95056
	C84800		A96061
	C85400		
	C85700	B 324	A91350
	C86200		
	C86300	B 337	R50250
	C86500		R50400
	C87400		R50550
	C90300		R52250
	C92200		R52400
	C95200		
	C95400	B 338	R50250
	C95800		R50400
			R50550
B 272	C10100		R52250
			R52400
B 280	C10300		
		B 345	A91060
B 283	C46400		A93003
	C63000		A95083
	C65500		A95086
	C67500		A96061
			A96063
B 298	C10100		A96070
			A97072
B 302	C10300		
		B 348	R50250
B 306	C10300		R50400
			R50550
B 308	A96061		R50700
			R52250
B 313	A91100		R52400
	A93003		R54520
	A93004		
	A95050	B 355	C10100
	A95052		
	A95086	B 359	C10300
	A95154		C70600
	A96061		C71000
	A97072		C71500
B 315	C65500	B 361	A91060
			A91100
B 316	A91100		A95053
	A92024		A95086

TABLE XIII. Commercial specification to UNS number cross index - continued.

Commercial specification	UNS number	Commercial specification	UNS number
ASTM		ASTM	
B 361 (cont)	A95154	B 423	N08825
	A96061		
	A96063	B 424	N08825
B 366	N04400	B 425	N08825
	N06600		
	N06625	B 429	N96061
	N08330		A96063
B 367	R50250	B 443	N06625
	R50400		
	R50700	B 444	N06625
	R52250		
	R52400	B 446	N06625
	R54520		
		B 447	C10300
B 372	C10300		
		B 451	C10100
B 373	A91145		
		B 466	C70600
B 379	C10300		C71000
			C71500
B 381	R50250		
	R50400	B 467	C70600
	R50550		C71000
	R50700		C71500
	R52250		
	R52400	B 483	A91060
	R54520		A91100
			A93003
B 395	C10300		A95005
	C70600		A95050
	C71000		A95052
	C71500		A96061
			A96063
B 396	A95005		
		B 491	A91100
B 397	A95005		A93003
			A96063
B 402	C70600		
	C71500	B 505	C83600
			C83800
B 404	A91060		C84400
	A93003		C84800
	A95052		C86200
	A95454		C86300
	A96061		C86500
	A97072		C90300
			C92200

TABLE XIII. Commercial specification to UNS number cross index - continued.

Commercial specification	UNS number	Commercial specification	UNS number
ASTM		ASTM	
B 505 (cont)	C94700	B 584 (cont)	C85700
	C94800		C86200
	C95200		C86300
	C95400		C86500
	C95800		C87400
			C90300
B 511	N08330		C92200
			C94700
B 512	N08330		C94800
B 516	N06600	B 592	C68800
B 517	N06600	B 609	A91350
B 531	A95005	B 632	A96061
B 535	N08330	B 637	N07718
B 536	N08330	B 670	N07718
B 543	C70600	B 704	N06625
	C71500		N08825
B 546	N08330	B 705	N06625
			N08825
B 547	A91100		
	A93003	B 710	N08830
	A95050		
	A95052	F 68	C10100
	A95083		
	A95086	F 96	N04400
	A95154		
	A95454	F 467	A92024
	A96061		A96061
	A97072		R50250
			R50400
B 548	A95050		R50550
			R50700
B 552	C70600		R52400
	C71500		
		F 468	A92024
B 564	N04400		A96061
	N06600		R50250
			R50400
B 584	C83600		R50550
	C83800		R50700
	C84400		R52400
	C84800		
	C85400		

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UNS number	Government specification	Page number
A02130	QQ-A-596	21
A03550	QQ-A-596 QQ-A-601 MIL-C-11866 MIL-F-39000	21
A91050	(none)	21
A91060	(none)	21
A91100	QQ-A-225 QQ-A-250 QQ-A-430 QQ-A-1876 WW-T-700 MIL-W-85 MIL-R-5674 MIL-W-6712 MIL-A-12545 MIL-E-15597 MIL-S-24149 MIL-C-26094 MIL-A-52174	22
A91145	QQ-A-1876	22
A91199	(none)	22
A91350	(none)	22
A92011	QQ-A-225	23
A92014	QQ-A-200 QQ-A-225 QQ-A-367 MIL-F-5509 MIL-A-12545 MIL-T-15089 MIL-F-18280 MIL-A-22771	23
A92024	QQ-A-200 QQ-A-225 QQ-A-250 WW-T-700 MIL-F-5509 MIL-R-5674	23
A92024 (cont)	MIL-B-6812 MIL-T-15089 MIL-F-18280 MIL-T-50777 MIL-A-81596	
A92036	(none)	23
A92048	(none)	24
A92124	QQ-A-250	24
A92218	QQ-A-367	24
A92219	QQ-A-250 QQ-A-367 QQ-A-430 MIL-A-22771 MIL-A-46118	25
A92319	(none)	25
A93003	QQ-A-200 QQ-A-225 QQ-A-250 QQ-A-430 WW-T-700 MIL-S-12875 MIL-E-15597 MIL-A-52174 MIL-A-81596	25
A93004	(none)	26
A93105	(none)	26
A94032	QQ-A-367	26
A94043	QQ-B-655 MIL-W-6712 MIL-E-15597	26
A95005	QQ-A-430 MIL-C-26094	27
A95050	(none)	27

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UNS number	Government specification	Page number
A95052	QQ-A-225	27
	QQ-A-250	
	QQ-A-430	
	WW-T-700	
	MIL-S-12875	
	MIL-G-18014	
	MIL-G-18015	
	MIL-C-26094	
	MIL-A-81596	
A95056	QQ-A-430	27
	MIL-R-5674	
	MIL-R-8814	
	MIL-A-81596	
A95083	QQ-A-200	28
	QQ-A-250	
	QQ-A-367	
	MIL-P-25995	
	MIL-A-45225	
	MIL-A-46027	
	MIL-A-46083	
A95086	QQ-A-200	28
	QQ-A-250	
	WW-T-700	
	MIL-G-18014	
	MIL-S-24149	
	MIL-C-26094	
A95154	MIL-C-26094	28
A95182	(none)	28
A95252	(none)	29
A95254	(none)	29
A95356	MIL-S-24149	29
A95454	QQ-A-200	30
	QQ-A-250	
A95456	QQ-A-200	30
	QQ-A-250	
	MIL-G-18014	
	MIL-S-24149	
	MIL-P-25995	
A95456 (cont)	MIL-A-45225	
	MIL-A-46027	
	MIL-A-46083	
A95457	(none)	30
A95652	(none)	30
A96061	QQ-A-200	31
	QQ-A-225	
	QQ-A-250	
	QQ-A-367	
	QQ-A-430	
	WW-T-700	
	MIL-W-85	
	MIL-F-3922	
	MIL-T-7081	
	MIL-T-10794	
	MIL-A-12545	
	MIL-G-18014	
	MIL-F-18280	
	MIL-A-22771	
	MIL-W-23351	
	MIL-F-39000	
A96063	QQ-A-200	31
	MIL-W-85	
	MIL-G-18014	
	MIL-G-A8015	
A96066	QQ-A-200	31
	QQ-A-367	
A96070	MIL-A-12545	32
	MIL-A-46104	
A96151	QQ-A-367	32
	MIL-C-10387	
	MIL-A-22771	
A97005	(none)	32
A97050	QQ-A-430	32
A97072	(none)	33
A97175	(none)	33

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UNS number	Government specification	Page number
A97475	(none)	33
C10100	QQ-C-502 QQ-C-576 QQ-W-343 MIL-W-85 MIL-W-3318 MIL-W-23068	34
C10300	MIL-W-23068	34
C36000	QQ-B-626	34
C46400	QQ-B-637 QQ-B-639	34
C63000	QQ-C-450 QQ-C-465 MIL-B-16166	35
C65500	QQ-C-591 MIL-T-8231 MIL-E-23765	35
C67500	QQ-B-728	35
C68800	(none)	35
C70600	MIL-T-15005 MIL-C-15726 MIL-T-16420 MIL-T-22214	35
C71000	(none)	36
C71500	MIL-T-15005 MIL-C-15726 MIL-T-16420 MIL-T-22214	36
C83600	QQ-C-390 QQ-C-525 MIL-C-11866 MIL-C-15345 MIL-C-22087 MIL-C-22229	36
C83800	QQ-C-390	36
C84400	QQ-C-390 QQ-C-525	37
C84800	QQ-C-390	37
C85400	QQ-C-390	37
C85700	QQ-C-390	37
C85800	MIL-B-15894	38
C86200	QQ-C-390 QQ-C-523 MIL-C-11866 MIL-C-22087 MIL-C-22229	38
C86300	QQ-C-390 QQ-C-523 MIL-C-11866 MIL-C-15345 MIL-C-22087 MIL-C-22229	38
C86500	QQ-C-390 QQ-C-523 MIL-C-15345 MIL-C-22087 MIL-C-22229	38
C87400	QQ-C-390	38
C90300	QQ-C-390 QQ-C-525 MIL-C-11866 MIL-C-15345 MIL-C-22087 MIL-C-22229	39
C92200	QQ-C-390 QQ-C-525 MIL-C-15345 MIL-B-16541	39
C94700	QQ-C-390	39
C94800	QQ-C-390	39

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UNS number	Government specification	Page number	UNS number	Government specification	Page number
C95200	QQ-B-675 QQ-C-390 MIL-C-22229	40	J94213	(none)	63
			J94224	(none)	63
C95400	QQ-B-675 QQ-C-390 MIL-C-15345	40	J94604	(none)	63
C95700	QQ-C-390	40	J94605	(none)	64
C95800	QQ-B-675 QQ-C-390 MIL-C-15345 MIL-B-24480	40	J95150	(none)	64
			J95405	(none)	64
			J95705	(none)	64
J92600	MIL-S-867	60	L50050	QQ-L-171	47
J92602	(none)	60	N04019	QQ-N-288	41
J92603	(none)	60	N04400	QQ-N-281 MIL-T-1368	41
J92610	MIL-S-81591	60			
J92640	MIL-S-81591	60	N04401	(none)	41
J92700	(none)	61			
J92701	(none)	61	N04404	(none)	41
J92710	(none)	61	N04405	QQ-N-281	41
J92800	(none)	61	N05500	QQ-N-286	41
J92810	MIL-S-81591	61	N05502	(none)	42
J92900	(none)	62	N06600	QQ-W-390	42
J93401	(none)	62	N06625	MIL-E-21562	42
J93403	(none)	62	N07718	(none)	42
J93423	(none)	62	N08330	(none)	43
J93503	(none)	62	N08825	(none)	43
J94003	(none)	63	R50250	MIL-T-81556 MIL-T-81915	44
J94202	(none)	63			

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R50400	MIL-T-9046 MIL-T-81556	44
R50550	MIL-T-9046 MIL-T-81556	44
R50700	MIL-T-9046 MIL-T-9047 MIL-T-81556	44
R52250	(none)	45
R52400	(none)	45
R54520	MIL-T-9046 MIL-T-9047 MIL-T-81556 MIL-T-81915 MIL-F-83142	45
R54810	MIL-T-9046 MIL-T-9047 MIL-R-81588 MIL-F-83142	45
R56080	MIL-T-9046	45
R56210	MIL-T-9046 MIL-T-9047	45
R56401	MIL-T-9046 MIL-T-9047 MIL-T-81556 MIL-F-83142	46
R56740	MIL-T-9046 MIL-T-81556 MIL-F-83142	46
S13800	(none)	58
S15500	(none)	58
S17400	MIL-S-81591	58
S17700	MIL-S-25043	58
S20100	QQ-S-766	48
S20200	QQ-S-763 QQ-S-766	48
S20500	(none)	48
S20910	(none)	48
S21800	(none)	49
S21900	(none)	49
S21904	(none)	49
S24000	(none)	49
S24100	(none)	50
S30100	QQ-S-766 MIL-S-5059	50
S30200	QQ-S-763 QQ-S-766 MIL-S-5059 MIL-S-7720 DOD-F-24669/6	50
S30260	DOD-F-24669/5	51
S30300	DOD-F-24669/6	51
S30400	QQ-S-763 QQ-S-766	51
S30500	QQ-S-763 QQ-S-766	52
S30800	(none)	52
S30900	QQ-S-763 QQ-S-766 DOD-F-24669/6	52

TABLE XIV. UNS to Government specification cross index - continued.

UNS number	Government specification	Page number
S31000	QQ-S-763 QQ-S-766 DOD-F-24669/6	53
S31400	(none)	53
S31600	QQ-S-763 QQ-S-766 MIL-S-5059 MIL-S-7720 MIL-S-27419 DOD-F-24669/6	53
S31700	QQ-S-763 QQ-S-766 MIL-S-27419 DOD-F-24669/6	54
S32100	QQ-S-763 QQ-S-766 MIL-S-862 MIL-S-27419 DOD-F-24669/6	54
S32900	(none)	55
S34700	QQ-S-763 QQ-S-766 DOD-F-24669/6	55
S34800	QQ-S-766	55
S38400	(none)	56
S63198	(none)	56
S66220	(none)	56
Z21210	(none)	47
Z32121	MIL-A-18001	47

TABLE XV. Index of common names.

Common name	UNS number	Page number	Common name	UNS number	Page number
Aluminum	A02130	18	Aluminum bronze (cont)	C95700	37
	A03550	18		C95800	37
	A91050	18			
	A91060	18	Aluminum, refined	A91199	19
	A91100	19			
	A91145	19			
	A91350	19	Armco 21-4	------	56
Aluminum alloy, wrought	A92011	20	Bronze, high silicon	C65500	32
	A92014	20			
	A92024	20			
	A92036	20	Cast iron	------	62
	A92048	21			
	A92124	21	Chromium-nickel iron alloy	S66220	53
	A92218	21		------	54
	A92219	22			
	A92319	22	Copper alloy	C68800	32
	A93003	22			
	A93004	23	Copper, oxygen-free electronic	C10101	31
	A93015	23			
	A94032	23			
	A94043	23			
	A95005	24	Copper, oxygen-free extra low phosphorus	C10300	31
	A95050	24			
	A95052	24			
	A95056	24			
	A95083	25	Copper-nickel 90-10	C70600	32
	A95086	25			
	A95154	25	Copper-nickel 80-20	C71000	33
	A95182	25			
	A95252	26			
	A95254	26	Copper-nickel 70-30	C71500	33
	A95356	26			
	A95454	27			
	A95456	27	Crucible 3003	------	56
	A95457	27			
	A95652	27	Free-cutting brass	C36000	31
	A96061	28			
	A96063	28			
	A96066	28	Hadfield manganese steel	------	64
	A96070	29			
	A96151	29			
	A97005	29	Lead	L50050	44
	A07050	29			
	A97072	30	Manganese	C67500	32
	A97175	30		C86200	35
	A97475	30		C86500	35
Aluminum bronze	C63000	32	Manganese bronze, cast	C86300	35
	C95200	37			
	C95400	37			

TABLE XV. Index of common names - continued.

Common name	UNS number	Page number
Manganese steel	------	64
Manganese-nickel steel	------	64
Naval brass, uninhibited	C46400	31
Nickel base castings	N04019	38
Nickel-chromium alloy	N06600	39
	N06625	39
	N07718	39
Nickel-copper alloy	N04400	38
	N04401	38
	N04405	38
	N05500	38
	N05502	39
Nickel-iron-chromium alloy	N08330	40
Nickel-tin bronze	C94700	36
	C94800	36
Red brass, leaded	C83600	33
Red brass, leaded, cast	C83800	33
Rezistal 3311	------	56
Rezistal 3329	------	56
Semi-red brass cast	C84400	34
	C84800	34
Silicon brass	C87400	35
Stainless steel	S63100	53
Stainless steel chromium-manganese-nickel	S20100	45
	S20200	45
	S20500	45
Stainless steel chromium-manganese-nickel-molybdenum	S20910	45
Stainless steel chromium-nickel	S30100	47
	S30200	47
	S30300	48
	S30400	48
	S30500	49
	S31700	51
	S32100	51
	S32900	52
	S34700	52
	S34800	52
	S38400	53
Stainless steel chromium-nickel-aluminum	S17700	55
Stainless steel chromium-nickel-aluminum-molybdenum	S13800	55
Stainless steel chromium-nickel-copper	S15500	55
	S17400	55
Stainless steel chromium-nickel, heat resisting	S30800	49
	S30900	49
	S31000	50
	S31400	50
Stainless steel chromium-nickel, low permeability	S30260	48
Stainless steel chromium-nickel-manganese	S21800	46
	S21900	46
	S21904	46
	S24000	46
	S24100	47

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Common name	UNS number	Page number	Common name	UNS number	Page number
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			Titanium alloy Ti-8Mn	R56080	42
Steel casting	J92600	57			
	J92602	57	Titanium alloy Ti-6Al-2Nb-1Ta 1Mo	R56210	42
	J92603	57			
	J92610	57			
	J92640	57			
	J92700	58	Titanium alloy Ti-6Al-4V	R56401	43
	J92701	58			
	J92710	58			
	J92800	58	Titanium alloy Ti-7Al-4Mo	R56740	43
	J92810	58			
	J92900	59			
	J93401	59	Titanium, grade 1 unalloyed	R50250	41
	J93403	59			
	J93423	59			
	J93503	59	Titanium, grade 2 unalloyed	R50400	41
	J94003	60			
	J94202	60			
	J94213	60	Titanium, grade 3 unalloyed	R50550	41
	J94224	60			
	J94604	60			
	J94605	61	Titanium, grade 4 unalloyed	R50700	41
	J95150	61			
	J94505	61			
	J95705	61	Titanium, low alloyed	R52250	42
				R52400	42
Steel, cast, corrosion resistant	------	61			
			Yellow brass, cast, leaded	C85400	34
				C85700	34
				C85800	35
Steel, corrosion-resistant, PH	------	55			
			Uniloy 888	------	54
			Weld	------	62
Thompson alloy	------	53			
			Weld metal	------	62
Tin bronze	C90300	36	Welding electrode	------	62
Tin bronze, leaded	C92200	36			
			Welding rod	------	62
Titanium alloy a alloy	R54520	42	Zinc, anode type III	Z32121	44
			Zinc, rolled	Z21210	44

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1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
MIL-HDBK-270A(SH)	19 March 1991

3. DOCUMENT TITLE METALLIC MATERIALS FOR LOW MAGNETIC APPLICATIONS, MAGNETIC PERMEABILITY AND ELECTRICAL CONDUCTIVITY, CHARACTERISTICS OF (METRIC)

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

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