SPECIFICATIONS FOR STAINLESS STEEL
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INTRODUCTION
This designer handbook has been written to provide the designer, engineer, specification writer, producer and user of STAINLESS STEEL with a listing of all the current ASTM (American Society for Testing and Materials) standards. These standards are listed by mill shape (BAR, SHEET, WIRE, etc.) and by product (bolts, fittings). Stainless types are also listed, along with a selection of applicable society and military specifications.

ACKNOWLEDGMENT
An original version was initially published by the Committee of Stainless Steel Producers, American Iron and Steel Institute (AISI), Washington, D.C., and was used, with thanks, as a basis for this updated handbook.
The 2001 Annual Book of ASTM Standards, Sections 1 and 13 were used as the reference base for listed ASTM specifications.

GENERAL INFORMATION
Stainless steel is not a single alloy, but rather the name applies to a group of iron based alloys containing a minimum of 10.5% chromium. Other elements are added and the chromium content is increased to improve corrosion resistance and/or enhance mechanical properties. There are over 50 stainless steel types originally recognized by the AISI and are detailed in a designer handbook, “Design Guidelines for the Selection and Use of Stainless Steel,” available from the Specialty Steel Industry of North America (SSINA).
The assumption is made that the reader is well aware of the various types of stainless steels including the five metallurgical classifications (austenitic, ferritic, martensitic, austenitic/ferritic-or-duplex, and precipitation hardening). Where possible, these five classifications are generally shown with austenitic first. In some cases the ASTM reference is to the content rather than the classification. In those cases the basic content is listed (i.e., iron-chromium-nickel).
Specifications by type are listed by the types generally in use and do not cover all the stainless steel types that are available.
ASTM STAINLESS STEEL STANDARDS

SPECIFICATIONS

A167 .......... Plate, sheet and strip, chromium-nickel
A176 .......... Plate, sheet and strip, chromium
A182 .......... Forged flanges, fittings and valves
A193 .......... Bolts
A194 .......... Nuts
A213 .......... Seamless ferritic and austenitic alloy boiler, superheater and heat exchanger tubes
A217 .......... Castings, martensitic stainless and alloy
glue
A240 .......... Plate, sheet and strip for pressure vessels
A249 .......... Tubes, welded boiler, superheater, heat-exchanger and condenser, austenitic
A263 .......... Clad plate, sheet and strip, chromium
A264 .......... Clad plate, sheet and strip, chromium-nickel
A268 .......... Tubing, seamless and welded, ferritic
A269 .......... Tubing, seamless and welded, austenitic
A270 .......... Sanitary tubing, austenitic
A276 .......... Bars and shapes
A297 .......... Castings, iron-chromium, iron-chromium-nickel, heat resistant, for general application
A312 .......... Pipe, austenitic
A313 .......... Spring wire, chromium-nickel
A314 .......... Bars and billets for forging
A320 .......... Bolting for low temperature service
A336 .......... Forgings for pressure and high temperature parts
A351 .......... Castings for pressure-containing parts, austenitic, austenitic-ferritic (duplex)
A352 .......... Castings for pressure-containing parts suitable for low temperature service, ferritic and martensitic
A356 .......... Heavy-walled castings for steam turbines
A368 .......... Electric fusion welded pipe, austenitic
A368 .......... Wire strand
A376 .......... Pipe for high temperature central station service, austenitic
A403 .......... Pipe fittings
A409 .......... Welded large diameter pipe, austenitic
A446 .......... Centrifugally-cast pipe, ferritic
A450 .......... General requirements for tubes, austenitic and ferritic
A451 .......... Centrifugally cast austenitic steel pipe for high temperature service
A453 .......... Bolting materials, high temperature, 50 to 120 ksi yield strength with expansion coefficients comparable to austenitic steels
A473 .......... Forging
A478 .......... Welding wire, chromium-nickel
A479 .......... Bars and shapes for use in boilers and other pressure vessels
A480 .......... General requirements for plate, sheet and strip
A484 .......... General requirements for bars, billets and forgings
A487 .......... Castings suitable for pressure service, martensitic
A492 .......... Rope wire
A493 .......... Cold heading and cold forging bar and wire
A496 .......... Seamless and welded carbon, ferritic and austenitic alloy heat exchanger tubes with integral nozzle
A511 .......... Seamless mechanical tubing
A530 .......... Specialized carbon and alloy steel pipe, general requirements
A554 .......... Welded mechanical tubing
A555 .......... General requirements for wire and wire rods
A564 .......... Bars and shapes, hot-rolled and cold-finished, age hardening
A565 .......... Bars, forgings and forging stock for high temperature service, martensitic
A579 .......... Superstrength alloy forgings
A580 .......... Wire, free-machining
A581 .......... Wire, free-machining
A582 .......... Bars, hot-rolled or cold-finished, free-machining
A608 .......... Centrifugally cast iron-chromium-nickel high alloy tubing for pressure application at high temperatures
A632 .......... Seamless and welded tubing, small diameter, for general service, austenitic
A638 .......... Iron-base superalloy bars, forgings and forging stock for high temperature service, precipitation hardening
A666 .......... Sheet, strip, plate and flat bar, for structural and architectural applications, austenitic
A688 .......... Welded feedwater heater tubes, austenitic
A693 .......... Plate, sheet and strip, precipitation hardening
A705 .......... Forgings, age hardening
A733 .......... Welded and seamless carbon steel and austenitic stainless steel pipe nipples
A743 .......... Castings, iron-chromium, iron-chromium-nickel and nickel-base, corrosion resistant, for general service
A744 .......... Castings, iron-chromium, for severe service
A747 .......... Castings, precipitation hardening
A756 .......... Anti-friction bearing steel
A757 .......... Castings, ferritic and martensitic for pressure-containing and other applications for low temperature service
A771 .......... Tubing for breeder reactor core components, austenitic
A774 .......... As-welded fittings for general corrosive service at low and moderate temperatures, austenitic
A778 .......... Welded tubular products, unannealed austenitic
A781 .......... Castings, common requirements for general industrial use
A789 .......... Seamless and welded tubing for general service, ferritic/austenitic
A790 .......... Seamless and welded pipe, ferritic/austenitic
A791 .......... Welded tubing, unannealed ferritic
A793 .......... Rolled floor plate, austenitic
A803 .......... Welded feedwater heater tubes, ferric
A813 .......... Single- or double-welded pipe, austenitic
A814 .......... Cold-worked welded pipe, austenitic
A815 .......... Pipe fittings, ferritic, ferritic/austenitic and martensitic
A826 .......... Duct tubes for breeder reactor core components, austenitic and ferritic
A831 .......... Bars, billets and forgings for use in core components
A851 .......... High-frequency, induction-welded condenser tubes, austenitic
A872 .......... Centrifugally cast pipe for corrosive environments, ferritic/austenitic
A887 .......... Borated stainless steel plate, sheet and strip for nuclear applications
A890 .......... Castings, iron-chromium-nickel-molybdenum, for general application, duplex (austenitic/ferritic)
A891 .......... Iron-base superalloy forgings for turbine rotor disks and wheels, precipitation hardening
A895 .......... Plate, sheet and strip, free machining
A908 .......... Needle tubing
A928 .......... Pipe, electric fusion welded with addition of filler metal, ferritic/austenitic (duplex)
A943 .......... Spray-formed seamless pipes, austenitic
A946 .......... Plate, sheet and strip, chromium-nickel-silicon alloy
A947M .......... Textured sheet
A949 .......... Spray-formed seamless pipe, ferritic/austenitic
A953 .......... Seamless and welded tubing, austenitic chromium-nickel-silicon alloy
A954. Seamless and welded pipe, austenitic chromium-nickel-silicon alloy
A955. Deformed and plain bars for concrete reinforcement
A957. Investment castings, steel and alloy, common requirements for general industrial use
A959. Guide for specifying harmonized standard grade compositions for wrought stainless steels
A960. Common requirements for wrought steel pipe fittings
A968. Bars and shapes, chromium-nickel-silicon alloy
A969. Forgings for pressure and high temperature parts
A980. Hot statically-pressed flanges, fittings, valves and parts
A995. Castings for pressure-containing parts, austenitic-ferric (duplex)
A999. General requirements for alloy and stainless pipe
A1010. Higher strength plate, sheet and strip, martensitic
A1012. Seamless and welded ferritic, austenitic and duplex alloy steel condenser and heat exchanger tubes with integral fins
A1016. General requirements for alloy and stainless tubes
C795. Thermal insulation for use in contact with austenitic stainless steel
E437. Industrial wire cloth and screens (square opening series)
E454. Industrial perforated plate and screens (round opening series)
F138. Surgical implants, bar and wire, special quality
F139. Surgical implants, sheet and strip, special quality
F352. Lock washers (surgical implants)
F593. Bolts, hex cap screws and studs
F594. Nuts
F597. Socket head cap screws
F642. Flexible wire for surgical fixations for soft tissue
F738M. Metric bolts, screws and studs
F740. Metric nuts
F793. Socket head cap screws
F799. Metric socket button and flat countersunk cap screws
F800. Billet, bar and wire for surgical instruments
F1079. Inserted and noninserted surgical scissors
F1314. Bar and wire for surgical implants, nitrogen-strengthened high manganese high chromium
F1390. Surgical fixation wire

PRACTICES (ASTM Volume No. follows each entry)
A262. Detecting susceptibility to attack in austenitic stainless steels 01.03, 01.05, 03.02
A380. Cleaning and descaling stainless steel parts, equipment and systems 01.03, 02.05
A609. Castings, carbon, low-alloy, and martensitic stainless steel, ultrasonic examination thereof 01.02
A700. Packaging, marketing and loading methods for steel products for domestic shipment 01.01, 01.03, 01.04, 01.05
A745. Ultrasonic examination of austenitic steel forgings 01.05
A763. Detecting susceptibility to intergranular attack in ferritic stainless steels 01.03
A799. Instrument calibration for estimating ferrite content of stainless steel castings 01.02

A700. Estimating ferrite content of austenitic alloy steel castings 01.02
A880. Criteria for use in evaluation of testing laboratories and organizations for examination of steel, stainless steel and related alloys 01.03
A967. Chemical passivation treatments for stainless steel parts 01.03
B254. Preparation of and electroplating on stainless steel 02.05
D2651. Preparation of metal surfaces for adhesive bonding 15.06
E426. Practice for electromagnetic (eddy-current) testing of seamless and welded tubular products, austenitic stainless steels and similar alloys 03.03
E527. Practice for numbering metals and alloys (UNS)
G26. Determining the susceptibility of stainless steels and related nickel-chromium-iron alloys to stress corrosion cracking in polyphosphoric acids 03.02
G46. Examination and evaluation of pitting corrosion 03.02
G58. Preparation of stress-corrosion test specimens for weldments 03.02
G78. Guide for crevice corrosion testing of iron base and nickel base stainless alloys in seawater and other chloride-containing environments 03.02

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A370. Mechanical testing of steel products 01.01, 01.02, 01.03, 01.04, 01.05
A604. Macrotensile testing bars, billets and blooms 01.03, 01.05
A751. Test methods, practices and terminology for chemical analysis of steel products 01.01, 01.02, 01.03, 01.04, 01.05, 03.05
A903. Detecting detrimental intermetallic phase in wrought ferric-austenitic (duplex) stainless steels 01.03
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E307. Optical emission spectrometric analysis of stainless type 18-8 steels by the point-to-plane technique 03.05
E572. X-ray emission spectrometric analysis of stainless steel 03.06
E1086. Optical emission vacuum spectrometric analysis of stainless steel by the point-to-plane excitation technique 03.06
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G48. Pitting and crevice corrosion resistance of stainless steels and related alloys by the use of ferric chloride solution 03.02
G98. Gallling resistance of materials 03.02
G108. Electrochemical reactivation (EPR) for detecting sensitization of AISI Type 304 and 304L stainless steels 03.02

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A479 .......... Bars and shapes for use in boilers and other pressure vessels
A484 .......... General requirements for bars, billets and forgings
A644 .......... Bars and shapes, hot-rolled and cold-finished, age hardening
A665 .......... Bars, forgings and forging stock for high temperature service, martensitic
A582 .......... Bars, hot-rolled or cold-finished, free-machining
A831 .......... Bars, billets and forgings for use in core reinforcement 01.04
A965 .......... Deformed and plain bars for concrete
A968 .......... Bars and shapes, chromium-nickel-silicon alloy

Forgings (ASTM Volume 01.05)
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A306 .......... Forgings for pressure and high temperature parts
A473 .......... Forgings
A484 .......... General requirements for bars, billets and forgings
A705 .......... Forgings, age hardening
A965 .......... Forgings for pressure and high temperature, austenitic

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A217 .......... Castings, martensitic stainless and alloy
A247 .......... Castings, iron-chromium-iron-chromium-nickel, heat resistant, for general application
A351 .......... Castings for pressure-containing parts, austenitic, austenitic-ferritic (duplex)
A352 .......... Castings for pressure-containing parts suitable for low temperature service, ferritic and martensitic
A356 .......... Heavy-walled castings for steam turbines
A447 .......... Castings for high temperature service, chromium-nickel-iron
A487 .......... Castings suitable for pressure service, martensitic
A608 .......... Centrifugally cast iron-chromium-nickel high alloy tubing for pressure application at high temperatures
A743 .......... Castings, iron-chromium, iron-chromium-nickel and nickel-base, corrosion resistant, for general service
A744 .......... Castings, iron-chromium-nickel, for severe service
A747 .......... Castings, precipitation hardening
A757 .......... Castings, ferritic and martensitic for pressure-containing and other applications for low temperature service
A781 .......... Castings, common requirements for general industrial use
A824 .......... Castings, iron-chromium-nickel-molybdenum for general application, duplex (austenitic/ferritic)
A967 .......... Investment castings, steel and alloy, common requirements for general industrial use
A996 .......... Austenitic-ferritic (duplex) castings for pressure-containing parts

Plate, Sheet and Strip (ASTM Volume 01.03)
A213 .......... Seamless ferritic and austenitic alloy boiler, superheater and heat exchanger tubes
A249 .......... Tubes, welded boiler, superheater, heat-exchanger and condenser, austenitic
A268 .......... Tubing, seamless and welded, ferritic
A269 .......... Tubing, seamless and welded, austenitic
A270 .......... Sanitary tubing, austenitic
A450 .......... General requirements for tubes, austenitic and ferritic
A498 .......... Seamless and welded carbon, ferritic and austenitic alloy heat exchanger tubes with integral fins
A511 .......... Seamless mechanical tubing
A554 .......... Welded mechanical tubing

Pipe (ASTM Volume 01.01)
A312 .......... Pipe, austenitic
A358 .......... Electric fusion welded pipe, austenitic
A376 .......... Pipe for high-temperature central station service, austenitic
A409 .......... Welded large diameter pipe, austenitic
A426 .......... Centrifugally cast pipe, ferritic
A430 .......... Forged and bored pipe, austenitic
A530 .......... Specialized carbon and alloy steel pipe, general requirements
A733 .......... Welded and seamless carbon steel and austenitic stainless steel pipe nipples
A790 .......... Seamless and welded pipe, ferritic/austenitic
A913 .......... Single- or double-welded pipe, austenitic
A914 .......... Cold-worked welded pipe, austenitic
A915 .......... Pipe fittings, ferritic, ferritic/austenitic and martensitic
A872 .......... Centrifuqally cast pipe for corrosive environments, ferritic/austenitic
A928 .......... Pipe, electric fusion welded with addition of filler metal, ferritic/austenitic (duplex)
A943 .......... Spray-formed seamless pipe, ferritic
A949 .......... Spray-formed seamless pipe, ferritic/austenitic
A954 .......... Seamless and welded pipe, austenitic chromium-nickel-silicon alloy
A960 .......... Common requirements for wrought steel pipe fittings
A999 .......... General requirements for alloy and stainless steel pipe

Tube (ASTM Volume 01.01)
A213 .......... Seamless ferritic and austenitic alloy boiler, superheater and heat exchanger tubes
A249 .......... Tubes, welded boiler, superheater, heat-exchanger and condenser, austenitic
A268 .......... Tubing, seamless and welded, ferritic
A269 .......... Tubing, seamless and welded, austenitic
A270 .......... Sanitary tubing, austenitic
A450 .......... General requirements for tubes, austenitic and ferritic
A498 .......... Seamless and welded carbon, ferritic and austenitic alloy heat exchanger tubes with integral fins
A511 .......... Seamless mechanical tubing
A554 .......... Welded mechanical tubing
A608 | Centrifugally cast iron-chromium nickel high alloy tubing for pressure application at high temperatures
A630 | Seamless and welded tubing, small diameter, for general service, austenitic
A688 | Welded feedwater heater tubes, austenitic
A771 | Tubing for breeder reactor core components, austenitic
A778 | Welded tubular products, unannealed austenitic
A789 | Seamless and welded tubing for general service, ferritic/austenitic
A791 | Welded tubing, unannealed ferritic
A803 | Welded feedwater heater tubes, ferritic
A826 | Duct tubes for breeder reactor core components, austenitic and ferritic
A851 | High-frequency induction-welded condenser tubes, austenitic
A908 | Needle tubing
A909 | Seamless and welded tubing, austenitic chromium-nickel-silicon alloy
A1012 | Seamless and welded ferritic and austenitic duplex alloy steel condenser and heat exchanger tubes with integral fins
A1016 | General requirements for alloy and stainless steel tubes

Wire and Wire Rod (ASTM Volume 01.03)
A313 | Spring wire, chromium-nickel
A360 | Wire strand
A417 | Weaving wire, chromium-nickel
A490 | Rope wire
A495 | Cold heading and cold forging bar and wire
A560 | General requirements for wire and wire rods
A580 | Wire
A681 | Wire, free-machining

STAINLESS STEEL SPECIFICATIONS ACCORDING TO PRODUCT TYPE
Architectural Applications
A600 | Sheet, strip, plate and flat bar, for structural and architectural applications, austenitic (ASTM Volume 01.03)
A947M | Textured sheet (ASTM Vol. 01.03)

Bearings (ASTM Volume 01.05)
A756 | Anti-friction bearing steel

Bolts and Nuts (ASTM Volume 01.01)
A193 | Bolts
A194 | Nuts
A230 | Bolting for low temperature service
A457 | Alloy steel turbine-type bolting material specially heat treated for high temperature service
A453 | Bolting materials, high temperature, 50 to 120 ksi yield strength with expansion coefficients comparable to austenitic steels

Fasteners (ASTM Volume 15.08)
F930 | Bolts, hex cap screws and studs
F934 | Nuts
F738M | Metric bolts, screws and studs
F936M | Metric nuts
F937 | Socket head cap screws
F979M | Metric socket button and flat countersunk cap screws
F980 | Socket set screws

Fittings, Flanges & Valves (ASTM Volume 01.01)
A182 | Forged flanges, fittings and valves
A403 | Pipe fittings
A774 | As-welded fittings for general corrosive service
A815 | Pipe fittings, ferritic, ferritic/austenitic and martensitic
A988 | Hot isostatically-pressed flanges, fittings, valves and parts for high temperature service

Floor Plate (ASTM Volume 01.03)
A739 | Rolled floor plate, austenitic

Industrial Wire Cloth, Screens & Perforated Plate (ASTM Volume 14.02)
E437 | Industrial wire cloth and screens (square opening series)
E454 | Industrial perforated plate and screens (square opening series)
E674 | Industrial perforated plate and screens (round opening series)

Needle Tubing (ASTM Volume 01.01)
A908 | Needle tubing

Nuclear Applications
A771 | Tubing for breeder reactor core components, austenitic (01.01)
A826 | Duct tubes for breeder reactor core components, austenitic and ferritic (01.01)
A831 | Bars, billets and forgings for use in core components (01.03)
A887 | Bonded stainless steel plate, sheet and strip for nuclear applications (01.03)

Sanitary Tubing (ASTM Volume 01.01)
A270 | Sanitary tubing, austenitic

Surgical Implant Materials (ASTM Volume 13.01)
F138 | Surgical implants, bar and wire, special quality
F139 | Surgical implants, sheet and strip, special quality
F352 | Lock washers (surgical implants)
F621 | Forgings for surgical implants
F642 | Flexible wire for surgical fixations for soft tissue
F745 | Shot/bar/ingot for cast/solution treated implants
F999 | Billet, bar and wire for surgical instruments
F1079 | Inserted and noninserted surgical scissors
F1314 | Bar and wire for surgical implants, nitrogen strengthened high manganese high chromium
F1350 | Surgical fixation wire
F1586 | Bar for surgical implants nitrogen-strengthened, 21Cr-10Ni-3Mn-2.5Mo
## SELECTED STAINLESS STEEL TYPES AND APPLICABLE SPECIFICATIONS

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**Unified Numbering System:** Included in the tables are six-character designations under the Unified Numbering System (UNS) for the AISI numbered stainless steels. The Unified Numbering System originated through a cooperative effort of the American Society for Testing and Materials and the Society of Automotive Engineers, and UNS numbers apply to all metals and alloys. All stainless steels will be identified under this system with the letter “S” followed by five digits.
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