Jai Hind Metal



info@jaihindmetal.com

Innovating for a Strong World



Company Profile

Jai Hind Metal based in Mumbai, India, founded by Mr. Deepak Shah in 2005 is the professional Importers and Stockists of various Stainless Steel materials such as.

Jai Hind Metal is a leading Manufacturers, Importers & Stockists of High Nickel Alloys, such as: Inconel, Monel, Nickel, Hastelloy, Nimonic, Nitronic, Nilo / Invar, Cobalt, Titanium, PH – Grade, Duplex Alloy, Stainless Steel Etc.

Jai Hind Metal covers a wide range of products, i.e. Pipes, Tubes, Round Bars, Fittings, Flanges, Fastener, Sheets, Plates, Coils, Bars and Precision Components and Special Drawings in various materials of construction, namely:

We are well placed to supply quality material with Government Approved labora- tory Test Certificates within the user's time schedules. We also undertake third party inspection wherever necessary. It is needless to mention here that, we have gained substantial experience in this field of business by virtue of supplying large quantities to many projects throughout the world.

We are in the supplying the above materials to various clients across industries Such As:

- Oil and Gas
- Pharmaceutical Manufacturing
- Chemical Manufacturing
- Automation Machinery Manufacturing
- Motor Vehicle Manufacturing
- Industrial Machinery Manufacturing
- Food processing industry
- Machinery manufacturing
- Dairy products manufacturing
- Sugar and confectionery product manufacturing
- Aviation and Aerospace Component Manufacturing



PIPES & TUBES

PIPES SIZE	:-	1/8 NB to 600 NB X Thickness Range: SCH 5, 10, 40, 80, 160, XS, XXXS.
TUBES SIZE:	:-	1/4" OD to 12" OD in GUAGE : 25 SWG to 10 SWG Bright Polish, Bright Annealed / Electro Polish & Capillary Tubes. Round, Square, Rectangle, U-Tubes & Specialize Fabricated Pipes Etc.
Inconel	:-	600, 601, 617, 625, 690, 718, 725, X-750, 783, 800, 800H/HT, 825, 925, 27-27MO.
Monel	:-	400, 404, 405, K-500.
Nickel	:-	Nickel 20, Nickel 200, Nickel 201, Nickel 330.
Hastelloy	:-	B2, B3, C-4, C22, C276, C-22 HS, C-2000, HYBRID-BC1, Hastelloy X.
Nimonic	:-	NIMONIC 75, NIMONIC 80A, NIMONIC 90, NIMONIC 263.
Nitronic	:-	NITRONIC 30, NITRONIC 40, NITRONIC 50 / FERMONIC 50 (XM 19), NITRONIC 60.
Nilo / Invar	:-	NILO 36 (INVAR 36), NILO 42 (INVAR 42), NILO 48, NILO K, NILO MAG 77.
Cobalt	:-	HAYNES 25 (L-605), 188, 230, COBALT 6B (Stellite 6B).
Titanium	:-	Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6, Grade 7, Grade 9, 12.
PH – Grade	:-	13-8 MO, 15-5 PH, 15-7 MO, 17-4 PH, 17-7 PH.
Duplex Alloy	:-	254 SMO, F-51, F-60, F-61, F-53, F-55, LDX2101, LDX 2404, 2304, FERRALIUM 255.
Stainless Steel	:-	304, 304L, 309, 310S, 316, 316L, 316 TI, 321, 347, 317L, 446, CUSTOM 450, 455, 465, JETHETE M152.



WIRES





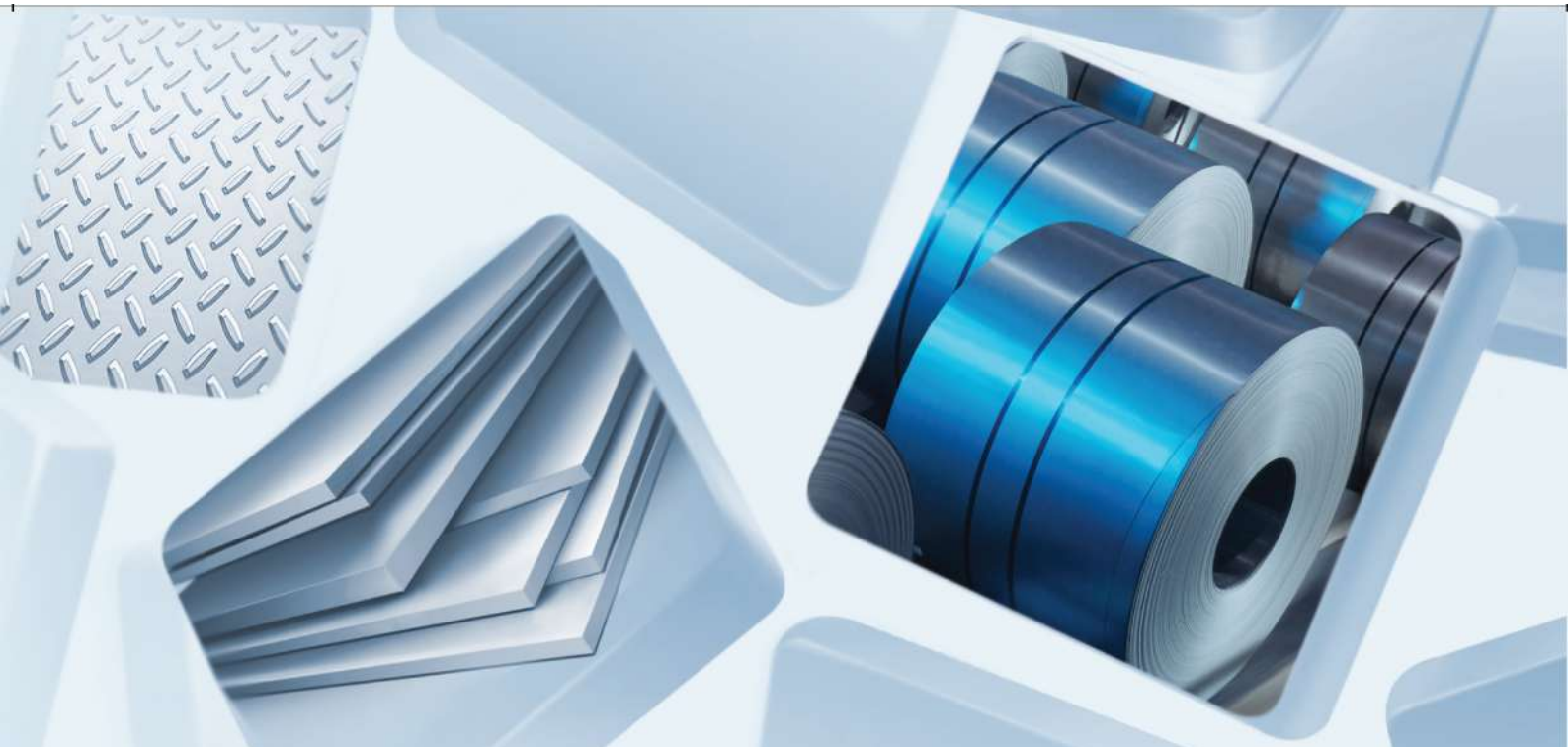


RODS

RODS

Size	:-	Size Range: 5 MM to 500 MM / Length : 2 Mtr to 8 Mtr in Black, Bright, Polish Bright Round, Square, Hex (A/F), Rectangle & Flat Bars.
Dimension	:-	ANSI B 16.5
Size Tolerances	:-	h8, h9, h10, h11, h12, k12, k13, A-484, EN-10060, DIN-1013 etc.
Ultrasonic Test	:-	100% tested through Digital Ultrasonic Flaw Detector, as per ASTM A-388, EN 10308 (class 1 to 4),API 6A/ISO 10423:2003-PSL 3, SEP 1920:1984 (class A, B, C), MIL STD 2154
Heat Treatment	:-	Annealed, Solution Annealed, Quenched and Tempered (QT), Hardened and Tempered (HT), Quenched and Double Tempered.

Inconel	:-	600, 601, 617, 625, 690, 718, 725, X-750, 783, 800, 800H/HT, 825, 925, 27-27MO.
Monel	:-	400, 404, 405, K-500.
Nickel	:-	Nickel 20, Nickel 200, Nickel 201, Nickel 330.
Hastelloy	:-	B2, B3, C-4, C22, C276, C-22 HS, C-2000, HYBRID-BC1, Hastelloy X.
Nimonic	:-	NIMONIC 75, NIMONIC 80A, NIMONIC 90, NIMONIC 263.
Nitronic	:-	NITRONIC 30, NITRONIC 40, NITRONIC 50 / FERMONIC 50 (XM 19), NITRONIC 60.
Nilo / Invar	:-	NILO 36 (INVAR 36), NILO 42 (INVAR 42), NILO 48, NILO K, NILO MAG 77.
Cobalt	:-	HAYNES 25 (L-605), 188, 230, COBALT 6B (Stellite 6B).
Titanium	:-	Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6, Grade 7, Grade 9, 12.
PH - Grade	:-	13-8 MO, 15-5 PH, 15-7 MO, 17-4 PH, 17-7 PH. H900, H925, H1025, H1075 H1100, H1150
Duplex Alloy	:-	254 SMO, F-51, F-60, F-61, F-53, F-55, LDX2101, LDX 2404, 2304, FERRALIUM 255.
Stainless Steel	:-	304, 304L, 309, 310S, 316, 316L, 316 TI, 321, 347, 317L, 440 C/B, 446, CUSTOM 450, 455, 465, JETHETE M152.
Carbon Steel & Alloy Steel	:-	ASTM A105 A694, F42, 46, 52, 56, 60, 65, 70, A350, LF3, A350 LF2 & Alloy Steel ASTM A182 51, F5, F9, F11, F22, F91 Etc..



COIL SHEET PLATE

SHEET / PLATE / COIL

Size	:-	Width: 1000 MM to 2500 MM / Length : 1000 MM to 12000 MM, Thicknees 0.5 MM to 50 MM + Thicknees in Variuse Size in Sheets, Plates & Coils.
Finish	:-	2B, 2D, CR, HR, BA (No. 8 To No. 4) Satin (Met With Plastic Coated)
From	:-	Designer Sheet, Perfoated Sheets, Chequered Plate, Strip, Flats, Blank (Circle), Ring (Flange) Etc..

Inconel	:-	600, 601, 617, 625, 690, 718, 725, X-750, 783, 800, 800H/HT, 825, 925, 27-27MO.
Monel	:-	400, 404, 405, K-500.
Nickel	:-	Nickel 20, Nickel 200, Nickel 201, Nickel 330.
Hastelloy	:-	B2, B3, C-4, C22, C276, C-22 HS, C-2000, HYBRID-BC1, Hastelloy X.
Nimonic	:-	NIMONIC 75, NIMONIC 80A, NIMONIC 90, NIMONIC 263.
Nitronic	:-	NITRONIC 30, NITRONIC 40, NITRONIC 50 / FERMONIC 50 (XM 19), NITRONIC 60.
Nilo / Invar	:-	NILO 36 (INVAR 36), NILO 42 (INVAR 42), NILO 48, NILO K, NILO MAG 77.
Cobalt	:-	HAYNES 25 (L-605), 188, 230, COBALT 6B (Stellite 6B).
Titanium	:-	Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6, Grade 7, Grade 9, 12.
PH - Grade	:-	13-8 MO, 15-5 PH, 15-7 MO, 17-4 PH, 17-7 PH.
Duplex Alloy	:-	254 SMO, F-51, F-60, F-61, F-53, F-55, LDX2101, LDX 2404, 2304, FERRALIUM 255.
Stainless Steel	:-	304, 304L, 309, 310S, 316, 316L, 316 TI, 321, 347, 317L, 446, CUSTOM 450, 455, 465, JETHETE M152.

BUTT WELD



FLANGES

FLANGES

Range	:-	15 NB to 1200 NB X Class 150 #, 300 #, 600 #, 900 #, 1200 #, 1500 #, 2500 #. With IBR Test Certificate.
Type	:-	Slip On, Blind, Weld Neck, Socket-weld, Lap-joint, Spectacles, Weld-neck Ring Joint, Orifice, Long Weld Neck, Disk Flanges, Tongue flange, Groove Flange, Din Standard, Flange O-let, etc.
Dimension	:-	ANSI B 16.5
Inconel	:-	600, 601, 617, 625, 690, 718, 725, X-750, 783, 800, 800H/HT, 825, 925, 27-27MO.
Monel	:-	400, 404, 405, K-500.
Nickel	:-	Nickel 20, Nickel 200, Nickel 201, Nickel 330.
Hastelloy	:-	B2, B3, C-4, C22, C276, C-22 HS, C-2000, HYBRID-BC1, Hastelloy X.
Nimonic	:-	NIMONIC 75, NIMONIC 80A, NIMONIC 90, NIMONIC 263.
Nitronic	:-	NITRONIC 30, NITRONIC 40, NITRONIC 50 / FERMONIC 50 (XM 19), NITRONIC 60.
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Cobalt	:-	HAYNES 25 (L-605), 188, 230, COBALT 6B (Stellite 6B).
Titanium	:-	Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6, Grade 7, Grade 9, 12.
PH - Grade	:-	13-8 MO, 15-5 PH, 15-7 MO, 17-4 PH, 17-7 PH.
Duplex Alloy	:-	254 SMO, F-51, F-60, F-61, F-53, F-55, LDX2101, LDX 2404, 2304, FERRALIUM 255.
Stainless Steel	:-	304, 304L, 309, 310S, 316, 316L, 316 TI, 321, 347, 317L, 446, CUSTOM 450, 455, 465, JETHETE M152.
Carbon Steel & Alloy Steel	:-	ASTM A 105, A694, F42, 46, 52, 56, 60, 60, 65, 70, A350 LF3 / LF2, C22.8 Etc. and ASTM A182 F1, F5, F9, F11, F22, F91 Etc..

BUTT WELD FITTINGS

Size Range	:-	15 NB to 1200 NB X SCH 5, 10, 40, 80, 160, XS, XXXS.
Type	:-	45°, 90°, 180°, L.R. / S.R Elbows, Equal / Unequal Tees, Barreled Tees, Concentric / Eccentric Reducers, Stubends, Caps, Cross, Short Radius Bends Jacketed, Claded upto size 24" N.B. (600 MM N.B.)
Dimension	:-	B.16.9, B.16.28, MSS SP 43, MSS SP 95 & NACE Etc..
Inconel	:-	600, 601, 617, 625, 690, 718, 725, X-750, 783, 800, 800H/HT, 825, 925, 27-27MO.
Monel	:-	400, 404, 405, K-500.
Nickel	:-	Nickel 20, Nickel 200, Nickel 201, Nickel 330.
Hastelloy	:-	B2, B3, C-4, C22, C276, C-22 HS, C-2000, HYBRID-BC1, Hastelloy X.
Nimonic	:-	NIMONIC 75, NIMONIC 80A, NIMONIC 90, NIMONIC 263.
Nitronic	:-	NITRONIC 30, NITRONIC 40, NITRONIC 50 / FERMONIC 50 (XM 19), NITRONIC 60.
Nilo / Invar	:-	NILO 36 (INVAR 36), NILO 42 (INVAR 42), NILO 48, NILO K, NILO MAG 77.
Cobalt	:-	HAYNES 25 (L-605), 188, 230, COBALT 6B (Stellite 6B).
Titanium	:-	Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6, Grade 7, Grade 9, 12.
PH - Grade	:-	13-8 MO, 15-5 PH, 15-7 MO, 17-4 PH, 17-7 PH.
Duplex Alloy	:-	254 SMO, F-51, F-60, F-61, F-53, F-55, LDX2101, LDX 2404, 2304, FERRALIUM 255.
Stainless Steel	:-	304, 304L, 309, 310S, 316, 316L, 316 TI, 321, 347, 317L, 446, CUSTOM 450, 455, 465, JETHETE M152.
Carbon Steel & Alloy Steel	:-	A 234 WPB, A 234 WPC, WP1, WP5, WP9, WP11, WP12, WP22, WP91



FORGED FITTINGS

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Size Range	:-	15 NB to 100 NB X Thickness Range: Class 3000 #, 6000 #, 9000 # Plain, Bevel, Socketweld & Threaded.
Type	:-	Elbow, Tee, Reducers, Nipple, Coupling, Stub End, Plug, Socket, Bushing, Union, Swage Nipple, Cross, Boss, Insert, Hex Nipple, Weldolet, Thredolet, Elbowlet, Sockolet, Nipolet, Letrolet Etc..
Inconel	:-	600, 601, 617, 625, 690, 718, 725, X-750, 783, 800, 800H/HT, 825, 925, 27-27MO.
Monel	:-	400, 404, 405, K-500.
Nickel	:-	Nickel 20, Nickel 200, Nickel 201, Nickel 330.
Hastelloy	:-	B2, B3, C-4, C22, C276, C-22 HS, C-2000, HYBRID-BC1, Hastelloy X.
Nimonic	:-	NIMONIC 75, NIMONIC 80A, NIMONIC 90, NIMONIC 263.
Nitronic	:-	NITRONIC 30, NITRONIC 40, NITRONIC 50 / FERMONIC 50 (XM 19), NITRONIC 60.
Nilo / Invar	:-	NILO 36 (INVAR 36), NILO 42 (INVAR 42), NILO 48, NILO K, NILO MAG 77.
Cobalt	:-	HAYNES 25 (L-605), 188, 230, COBALT 6B (Stellite 6B).
Titanium	:-	Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6, Grade 7, Grade 9, 12.
PH – Grade	:-	13-8 MO, 15-5 PH, 15-7 MO, 17-4 PH, 17-7 PH.
Duplex Alloy	:-	254 SMO, F-51, F-60, F-61, F-53, F-55, LDX2101, LDX 2404, 2304, FERRALIUM 255.
Stainless Steel	:-	304, 304L, 309, 310S, 316, 316L, 316 TI, 321, 347, 317L, 446, CUSTOM 450, 455, 465, JETHETE M152.
Carbon Steel & Alloy Steel	:-	ASTM A105 A694, F42, 46, 52, 56, 60, 65, 70, A350, LF3, A350 LF2 & Alloy Steel ASTM A182 51, F5, F9, F11, F22, F91 Etc..

Stainless Steel





TYPES 304 & 304L

Type 304 is low carbon (0.08% max.) version of the 18.8. Its physical and mechanical properties as well as corrosion, oxidation and forming characteristics are similar to Type 302. It is available from us in the same six temper ranges as type 302. In the annealed condition. It has slightly lower strength than type 302 due to the low carbon content. Type 304 finds extensive usage in welding applications because the low carbon permits some exposure in the cardide precipitation range of 800°-1500°F without the need for post environment may necessitate annealing after welding or the use of 304L.

Type 304 has a carton content of 0.03% or less. Composition is labelled 304L for "Low carbon" or 304E for " Extra-low carbon". This alloy can be used in the as-welded condition without becoming susceptible to intergranular corrosion.

(Severe corrosive conditions or when operating temperature exceeds 800°F, Types 321, 347 or 348 should be considered.) Types 304 and 304L have oxidation resistance upto 1650°F for continuous service, and up to 1500°F where cyclic heating is involed.

Typical application of types 304 and 304L - control diaphragms, tubing, ferrules, gaskets, Watchbands, and metal house.

Type 305 is essentially Type 302 but with 2 to 3% higher nickel for decreased work-hardening, Because of the low-hardening rates, it is very popular in deep-draw applications. In many instances, intermediate anneals can be eliminated by choosing Type 305 over Types 302 or 304. It develops little or no magnestism when cold worked.

The maximum temperature for oxidation resistance in continuous service is about 1650°F, and intermittent service is about 1500°F.

TYPES 309 & 309S

Types 309 and 309S are heat resistant stainless steels containing 25% chromium and 12% nickel. They display excellent oxidation resistance and elevated temperature strength. In Type 309S, the carbon content is limited to 0.08% and therefore it is more suited for service in the welded condition than Type 309.

Types 309 and 309S are more resistant to marine atmospheres than Type 304. These alloys are also resistant to sulfite liquors.

Types 309 and 309S have satisfactory oxidation resistance up to 2000°F for continuous service, and up to 1800°F for intermittent service

TYPES 310 & 310S

Type 310 and 310S contain 25% chromium and 20% nickel and are excellent candidates for applications requiring oxidation resistance and high-temperature strength. Due to their lower thermal expansion compared to Type 309, they form a more fightly adherent scale and perform better than 309 under intermitted heating and cooling. Because of the lower thermal expansion they also warp less when heated.

Type 310S with 0.08% maximum carbon is used where improved performance in the as-welded condition is desired.

Type 310S with 0.08% maximum carbon is used where improved performance in the as-welded condition is desired.

These grades are resistance to carburization and certain sulfur bearing atmospheres and exhibit good oxidation resistance up to 2000°F for continuous service, and up to 1900°F for components, and furnace insulation.

TYPES 316. 316L & 316TI

Type 316 is a molybdenum bearing stainless steel possessing improved to pitting by, provides excellent elevated temperature tensile, creep and stree-rupture strengths.

Type 316 is more resistant to atmospheric and other mild environments than Type 304. It is resistant to dilute solutions (i.e.1-5%) of sulphuric acid up to 120°F. However, in certain oxidizing acids, Type 316 is less resistant than Type 304.

Type 316 is susceptible to carbide precipitation when exposed in the temperature range of 800°-1500°F and therefore is susceptible tp intergranular corrosion in the as-welded condition. Annealing after

welding will restore corrosion resistance.

Type 316L has the same composition as Type 316 expect the carbon content is below 0.03%. Not unexpectedly, its general resistance and other properties closely correspond to those of Type 316. However, it does provide immunity to intergranular attack in the as range of 800° - 1500°F. The use of 316L is recommended when exposure in the carbide precipitation range is unavoidable and where annealing after welding is not practical. It is noted, however, that prolonged exposure in this range may embrittle the material such instances to intergranular attack. In such instances one of the stabilized grades such as 321, 347 or 348 is recommended.

Typical applications for types 316 and 316L-bellows, instrument diaphragms, exhaust containers, filters, seals, and chemical equipment.

TYPE 321

Type 321 is basic Type 304 modified by adding titanium in an amount at least 5 times the carbon plus nitrogen contents . Type 321 is quite immune to intergranular corrosion when heated within the carbide precipitation range. Titanium addition eliminates the formation of chromium carbises at the grain boundaries by tying up the carbon and nitrogen as titanium carbides or nitrides. These particles are normally distributed within the grains rather than at the grain boundaries.

Type 321 has better high temperature properties than Type 304 or 304L and is generally used for parts which are intermittently heated up to 1500°F, For continuous service, the alloy is good up to 1650°F, Typical applications - bellow, gasket, flexible hose, aircraft, insulation and heat exchangers.



Nickel Alloy

NICKEL 200 / 201
Commercial pure nickel with good mechanical properties and excellent resistance to may corrosive media. Important characteristic are its magnetic and magnetostrictive properties, the high thermal and electrical conductivity at low gas content.

MONEL 400 (ALLOY 400)
Alloy 400 is especially resistant to saline and other acids in ventilated condition. It is successfully employed in the salt winning process. Alloy 400 is especially suited for employment in sea brakage water at high speed, where resistance against cavitation and erosion is of great importance. This alloy is very resistant to solvents, glass etching agents, sulfuric and other acids and virtually to all alkalis. This grade is not sensitive to stress corrosion cracking in oxidizing media. Alloy 400 can be employed at temperatures up to 550" Celsius.

MONEL K-500 (ALLOY K-500)
An age-hardening alloy with the same corrosion resistance as Alloy 400, though with increased tensile strength and hardness. Alloy K-500 retains its strength up to temperature of about 650° Celsius.

INCONEL 600 (ALLOY 600)
Alloy 600 has excellent resistance to oxidation at temperatures upto 1175° Celsius and is also resistant to a variety of corrosive media. It retains its high strength up to about 650'' Celsius. Even at lowest temperature, alloy 600 is employed in components of power plants. This grade can be welded without thermal retreatment.

INCONEL 625 (ALLOY 625)
Excellent corrosion resistance with high strength and ductility at temperature upto 700° Celsius applicable upto 1100° Celsius. Alloy 625 is weldable without thermal retreatmet.

INCOLLOY 800 (H) (ALLOY 800 (H)
This Alloy is resistant to corrosion resulting form hydrigen sulfied as well as to stress corrosion cracking. It is highly heat resistant and insensitive to the separation of sigma phase. Alloy 800 H with controlled carbon content improves furthermore the creep strength depending on time solution annealed condition.

INCOLLOY 825 (ALLOY 825)
Resistance to sulfuric acid, phosphoric acid solvents and sea water as well as to many oxidising chemicals. Alloy 825 has good resistance to reducing acid. It can be employed without thermal treatment after the welding process.

HASTALLOY C-276 (ALLOY C-276)
Today probably one of the best and manifold alloys on the market, hen employed in extremely corrosive reducing and oxidising applications. applications. Alloy C-276 has excellent resistance to strong oxidising media contaminated by chloride, dry chloride acid formate acid, acetic hydride solutions, sea water solutions and saline solutions. The alloys is resistant to the corrosive influence of we hydrochloride acid, hydrochloride chlorine diexide solutions.

HASTALLOY C-4 (Alloy C-4)
Excellent resistance against strong oxidising agents, hot contaminated miniral acid, solvent, chlorine and media contaminated by chlorine (organic and inorganic), dry chloric acid, formic acid, acetic acid, acetic hydride solutions, sea water solutions and saline solution. This alloy has high ductility and corrosive resistance even in temperature range of 650-1040" celsius. Alloy C-4 is resistant against the formation of grain boundary carbides and can thus used in most cases without heat-treatment after welding.

INCOLLY DS (ALLOY DS)
Alloy Ds is a heat resistant Ni-Cr-Fe alloy with Si addition for the employment at high temperatures where sufficient strength and corrosive resistance are required. Alloy Ds is heat-resistant upto 1100'' Celsius when in fresh air. This alloy is especially resistant against changing oxidising / reducing conditions as well as the formation of sigma phase in the critical temperature range of 590-870" Celsius. Furthermore it is green rot. Due to high strength and heat resistance to alloy DS, smaller sections than usual can be manufactured from this material.

ALLOY 20
Alloy 20 is a high-allyoed stainless steel. Its corrosion properties surpass those of usual stainless qualities. For example. alloy 20 has excellent stress corrosion to boiling 20-40% sulfuric acid. Although alloy 20 was originally developed for usage in sulfuric environment, its range application has been steadily extended and today also includes machining of artificial rubber, plastic, synthetic fiber etc. In pharmaceutical and food producing application, where purity has to be guaranteed, Alloy 20 is employed to prevent metalic contamination. The most important advantages of this grade are its excellent mechanical properties as well as its comparatively easy machine ability.



Nickel 200

Commercial pure (99.6%) wrought nickel with good mechanical and resistance to a range of corrosive media. Good thermal, electrical and magnetostrctive properties Used for a variety of processing equipment, particularly to maintain product purity in handing foods, synthetic fibers and alkalies. Standard product forms are round, flats, pipe,tube, plate, sheet, forging, stock, strip and wire.

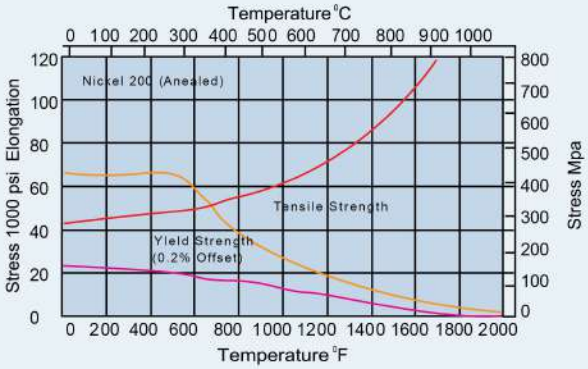
Limiting Chemical Composition, %

Ni.....99.0 min.....Mn.....0.35 max. S.....0.01 max
Cu.....0.25 max.....C.....0.15 max
Fe.....0.40 max.....Si.....0.35 max.

* Plus co.

Typical Mechanical Properties (Annealed)

Tensile Strength Psi 67.000
Mpa.....462
Yield Strength (0.2% Offset), Psi 21.500
Mpa.....148
Elongation,%.....47



Physical Constants and Thermal Properties

Density, lb / in 3 ..... 0.321
Mg/m 3 ..... 8.89
Melting Range, °F 2615 2635
°C 1435 1446
Specific Heat, Btu/ lb' °F 0.109
J/Kg °C 456
Curie Temperature, °F 680
°C 360
Permeability .... Ferromagnetic
Coefficient of Expansion, 70-200° F, 10-6 in l °F.....7.4
21-93 °C.pm/m °C 13.3
Thermal Conductivity, Btu • in ft2•h• °F 487
W/m •°C 70.2
Electrical Resistivity ohm cire mil/ft 58
• m 96

Specifications and Designations

UNS No 2200
BS 3072-3076 (NA11)
ASTM B 160 - B 163
B 725. B 730
ASME SB - 160-SB -163, Boiler Code Sections, III, VIII, IX
DIN 17740, 17750-17754
Wrekstoff Nr 2,4060

Monel Alloys 400

A nickel-copper alloy with high strength and A nickel-copper alloy with high strength and excellent corrosion resistance in a range of media including sea, water hydrofluoric chemical

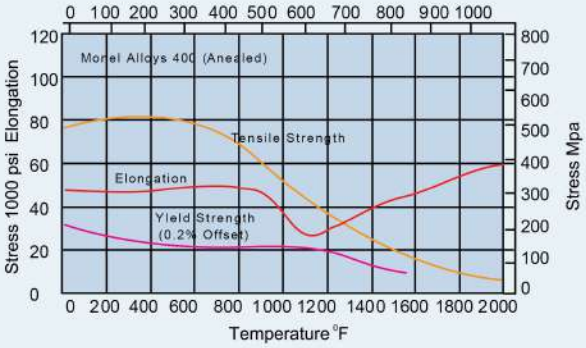
Limiting Chemical Composition, %

Ni.....63.0min.....Mn.....2.0 max. ....S.....0.01 max
Cu.....28.0-34.0.....C.....0.3 max
Fe.....2.5 max.....S.....0.24 max

* Plus co.

Typical Mechanical Properties (Annealed)

Tensile Strength Psi.....67.000
Mpa.....462
Yield Strength (0.2% Offset), Psi..... 21.500
Mpa.....148
Elongation,%.....47



Physical Constants and Thermal Properties

Density, lb /in 0.318
Mg/m 8.80
Melting Range, °F ..... 2370 - 2460
°C .....1300 - 1350
Specific Heat, Btu/ lb' °F 0.102
J/Kg °C 427
Curie Temperature, °F 70-120
°C 20-50
Coefficient of Expansion, 70-200° F, 10-6 in'/ °F.....7.7
21-93 °C /m °C 13.9
Thermal Conductivity, Btu • in ft2•h• °F 151
W/m 'C.....21.8
Electrical Resistivity ohm cire mil/ft 329
• m 0.547

Specifications and Designations

UNS No 4400
BS 3072-3076 (NA-13)
ASTM B 127, B 163 - B 165, B 564
ASME B 127, B 163 - SB - 165
SB -564, Boiler Code
Sections III, IV, VIII, IX
ACEMA pr EN 2305
AFNOR NU 30
SAE AMS 4544, 4574, 4545
4675, 4730, 4731, 7233
DIN 17743, 17750 - 17754
Wrekstoff Nr 2.4360, 2.4361
Vd TUV 263
MIL-T-1368, MIL-T-23520
MIL-N-24106
QQ-N-281
NACE MR - 01 - 75



Inconel Alloys 600

A nickel - chromium alloy with good oxidation resistance at high temperatures and resistance to chloride-ion stress corrosion cracking, corrosion by high-purity water, and caustic corrosion. Used for furnace components, in chemical and food processing, in nuclear engineering, and for sparking electrodes. Standard product forms are round, hexagon, extruded section, flats, forging stock,

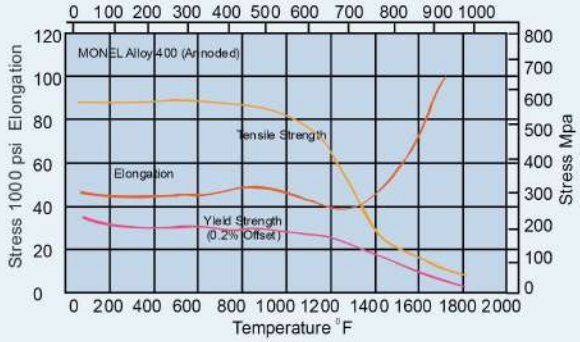
Limiting Chemical Composition, %

Nia.....72.0min.....C..0.15 max. Si.....0.5 max Cr.....14.0-17.0.....Mn...1.0max. Cu.....0.5 max
Fe.....6.0-10.0....S.....0.015 max.

* Plus co.

Typical Mechanical Properties (Annealed)

Tensile Strength Psi 95000
Mpa.....655
Yield Strength (0.2% Offset), Psi 45000
Mpa.....310
Elongation,%.....40



Physical Constants and Thermal Properties

Density, lb / in 3 ..... 0.306
Mg/m 3 ..... 8.47
Melting Range, °F .....22470 - 2575
°C .....1435 - 1413
Specific Heat, Btu/ lb' °F 0.106
J/Kg °C 444
Curie Temperature, °F .....-192
°C ..... -124
Permeability at 200 oersted (15.9 KA/m).....1.010
Coefficient of Expansion, 70-200° F, 10-6 in l °F.....7.4
21-93 °C.pm/m °C 13.3
Thermal Conductivity, Btu • in ft2•h• °F 103
W/m •°C 14.9
Electrical Resistivity ohm cire mil/ft 620
• m 1.03

Specifications and Designations

BS 3072-3076 (NA14)
ASTM B 163-B 166, B 168
ASTM SB-163, SB-166-SB-168
ASTM B 516, B 517, B 564, B 751
SB-554
Boiler Code Sections I III,VIII, IX
SAE AMS 5540, 5580
5665, 5687, 7232
DIN 17742, 17750-17754
Wrekstoff Nr 2.4816
Vd TUV 305
NACE MR - 01 -75
QQ-W-390
MIL-R-5031, MIL-T-23227
MIL-N-23228, MIL-N-23229

Inconel Alloys 800

A nickel-iron-alloy with good strength and excellent resistence to oxidation and carburization in high temperature atmospheres. It also resist corrosion by many aqueous environments. The alloy maintains a stable austenitic strucre during prolonged exposure to high temperatures. used for processing piping, heat enchanters, car buizing equipment, heating-element sheathing and nuclear steam-generator, tubing. Standard product forms are round, flats, forging stock, pipe, tube, plate, sheet, strip and wire.

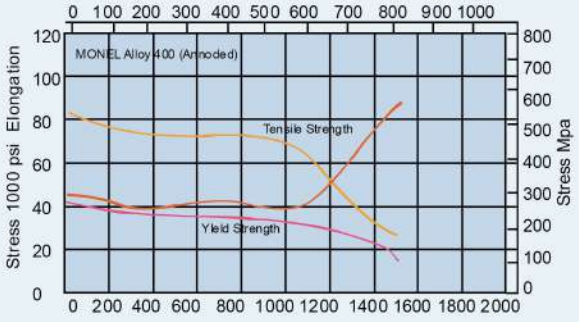
Limiting Chemical Composition, %

Ni.....30.0-35.0.0.....Mn.....1.5max. Al.....0.15-0.60
Fe.....39.5 min.....S.....0.015 max. Tl.....0.15-0.60
Cr.....19.0-23.0.....Si.....1.0 max.
C..... .10 max.... Cu.....0.75 max.

Typical Mechanical Properties (Annealed)

Rupture Strength (1000h)

	Psi	Mpa
1000°F / 540°C	48 000	330
1100°F / 595°C	32 000	220
1200°F / 650°C	21 000	145
1300°F / 705°C	11 000	75



Physical Constants and Thermal Properties

Density, lb /in 0.287
Mg/m 7.94
Melting Range, °F ..... 2475 - 2525
°C .....1357 - 1385
Specific Heat, Btu/ lb' °F 0.11
J/Kg °C 460
Curie Temperature, °F .....-.175
°C ..... -.115
Coefficient of Expansion, 70-200° F, 10-6 in'/ °F.....7.7
Permeability at 200 oersted (15.9 KA/m)..... 79
20-100 °C/m °C 14.4
Thermal Conductivity, Btu • in ft2•h• °F 80
W/m 'C.....115
Electrical Resistivity ohm cire mil/ft 595
• m 0.989

Specifications and Designations

UNS No 8801
BS 3072-3076 (NA-15)
ASTM B 163 B 407 - B 409
B 514 B 515, B 564, B 751
ASTM SB 163, SB 407-
SB - 409, SB - 564
Boiler Code Sections I, III, VIII, IX
SAE AMS 4544, 4574, 4545
Wrekstoff Nr 1.4876
VdTUV 412
NACE MR 01 - 75
AFNOR Z5 NC 35-20





Nimonic Alloy 75

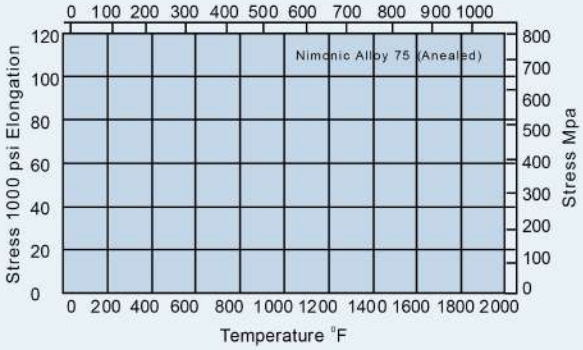
A nickel-chromium alloy with good mechanical properties and oxidation resistance at high temperatures. Used for sheet-metal fabrications in gas-turbine engines, for components of industrial furnaces, for heat-treating equipment and fixtures and in nuclear engineering. Standard product forms are round, hexagon, flats, extrude section, tube, pipe, plate, sheet, strip and wire.

Limiting Chemical Composition, %

Ni.....Reminder.....C.....0.08-0.15 Fe.....5.0 max.
Cr....18.0-21.0.....Si..... 1.0 max Mn.....1.0 max.
Ti.....0.2-0.6..... Cu.....0.5 max

Typical Mechanical Properties (Annealed)

Rupture Strength (1000h)	Psi	Mpa
1400°F / 760°C	7000	40
1500°F / 815°C	3500	24
1600°F / 870°C	2200	15
1700°F / 925°C	1500	10
1800°F / 980°C	1200	8



Physical Constants and Thermal Properties

Density, lb / in 3 ..... 0.302
Mg/m 3 .....8.37
Melting Range, °F 2440-2520
°C 1340-1380
Specific Heat, Btu/ lb' °F .....,,,,,.0.110
J/Kg °C 461
Coefficient of Expansion, 68-212F, 10 in / F.....6.1
20-100 °C.pm/m °C 11.0
Thermal Conductivity, Btu • in ft2•h• °F 81.1
W/m •°C 11.7
Electrical Resistivity ohm cire mil/ft 656
• m 1.09

Specifications and Designations

UNS No 6075 Wrekstoff Nr 2.4951, 2.4630
BSHR5, HR 203, HR 403 WL Nr 24630.
HR 504 AFNOR NC 20 T
DIN 17742, 17750 - 17752 AECMA Pr EN 2293, 2294
2302, 2306 - 2308, 2402, 2411

Hastelloy Alloy C-276

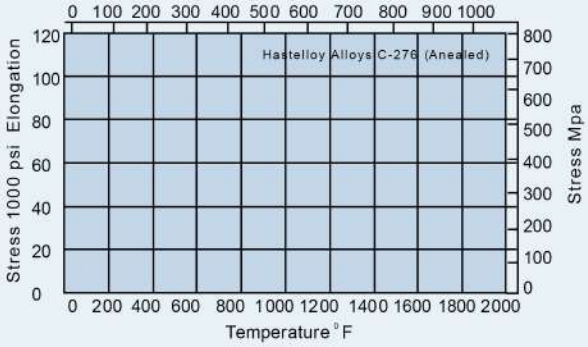
A nickel-molybdenum-chromium alloy with an addition of Tungsten having excellent corrosion resistance in a wide range of severe environments. The high molybdenum content makes the alloy especially resistant to pitting and crevice corrosion. The carbon content minimizes carbide precipitations during welded structures. Used in pollution control, chemical processing, pulp and paper production and waste treatment. standard product forms are round, forging stock, tube, pipe, plate, sheet, strip and wire.

Limiting Chemical Composition, %

Ni.....Reminder.....Co.....2.5 max. S.....0.03 max.
Mo...15.0-17.0.....Mn.....1.0 max. Si.....0.08 max.
Cr.....14.5-16.5.....C.....0.01max.
Fe....4.0-7.0.....V.....0.035 max.
W.....3.0-4.5.....P.....0.04 max.

Typical Mechanical Properties (Annealed)

Tensile Strength Psi.....115.000
Mpa.....790
Yield Strength (0.2% Offset), Psi..... 60.000
Mpa.....415
Elongation,%.....50



Physical Constants and Thermal Properties

Density, lb /in 0.321
Mg/m 8.89
Melting Range, °F 2415-2500
°C 1325-1370
Specific Heat, Btu/ lb' °F 0.102
J/Kg °C 427
Coefficient of Expansion, 70-200° F, 10-6 in'/ °F.....6.8
21-93 °C /m °C 12.2
Thermal Conductivity, Btu • in ft2•h• °F 67.9
W/m 'C.....9.8
Electrical Resistivity ohm cire mil/ft 739.2
• m 1.229
Permeability at 200 oersted (15.0 KA/m)..... 1.0002

Specifications and Designations

UNS No 10276 ASME SB-574, SB-575,
ASTM B 574, B 575, B 619 4SB-619, SB-622, SB-626
B 622, B 626, B 751 Boiler Code Sections I, III, VIII, IX
NACE MR 01 - 75 Werkstoff Nr. 2.4819
DIN 17744, 17750, 17752



Inconel Alloys DS

A nickel-iron-chromium alloy with an addition silicon. It has good high temperature strength and excellent resistance to oxidation and carburization. The silicon content makes alloy resistant to internal oxidation in high temperature atmospheres that very between oxidizing and reducing. Used in industrial furnaces and for heat treating baskets, trays and fixtures. Standard product forms are round, pipe, tube, plate, sheet, strip, and wire.

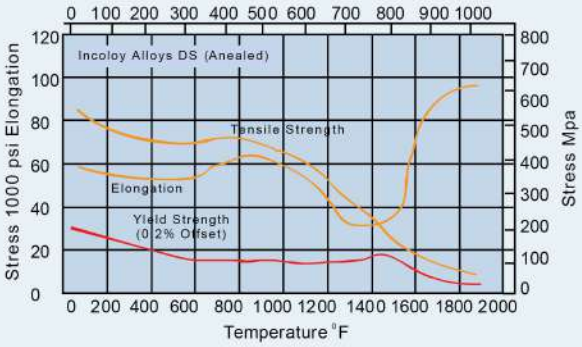
Limiting Chemical Composition, %

Ni.....34.5-41.0.....Si.....1.9-2.6 Cu.....0.50 max.
Fe.....Reminder.....Mn.....0.8-1.5 Ti.....0.20 max.
Cr.....17.0-19.0.....C.....0.10 max. S.....0.30 max.

* Plus co.

Typical Mechanical Properties (Solution Annealed)

Rupture Strength (1000h)	Psi	Mpa
1380°F / 750°C	7100	49
1560°F / 850°C	3800	26
1740°F / 950°C	2200	15
1920°F / 1050°C	970	6.7



Physical Constants and Thermal Properties

Density, lb / in 3 ..... 0.284
Mg/m 3 .....7.6
Melting Range, °F ..... 2430 - 2550
°C .....1330 - 1400
Specific Heat, Btu/ lb' °F 0.108
J/Kg °C 452
CurieTemperature, °F 680
°C 360
Permeability at 200 oersted (15.9 KA/m).....1.038
Coefficient of Expansion, 68-212° F, 10-6 in l °F.....8.3
22-100 °C.pm/m °C 15.0
Thermal Conductivity, Btu • in ft2•h• °F 83.2
W/m •°C 12.0
Electrical Resistivity ohm cire mil/ft 650
• m 1.08

Specifications and Designations

BS 3072 - 3076 (Na17)

Inconel Alloys 330 (S.S.330)

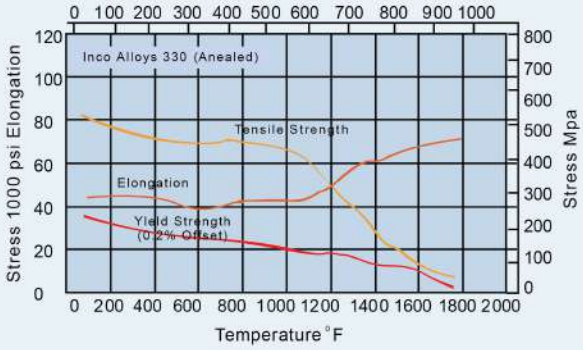
A nickel-iron-chromium alloy with an addition of silicon for enhanced oxidation resistance. It has good strength at high temperatures and excellent resistance to oxidation and carburizing and oxidizing atmospheres. Then allyos austenitic micro structure remains stable during long-time exposure ti high temperature. Used in industrial heating for furnace muffles, retorts and conveyor systems and for heat treating baskets and fixtures. Standard product forms are round, flats, forging stock, plate, sheet, strip and wire.

Limiting Chemical Composition, %

Ni.....30.0-35.0.0....Mn.....1.5max. Al.....0.15-0.60
Fe.....39.5 min.....S.....0.015 max. Tl.....0.15-0.60
Cr.....19.0-23.0.....Si.....1.0 max.
C..... .10 max..... Cu.....0.75 max.

Typical Mechanical Properties (Annealed)

Rupture Strength (1000h)	Psi	Mpa
1400°F / 760°C	7000	48
1600°F / 870°C	3100	21
1800°F / 980°C	1250	8.6
2000°F / 1095°C	780	5.4



Physical Constants and Thermal Properties

Density, lb /in 0.292
Mg/m 8.08
Melting Range, °F ..... 2450 - 2600
°C .....1345 - 1425
Specific Heat, Btu/ lb' °F 0.11
J/Kg °C 460
Permeability at 200 oersted (15.9 KA/m)..... 1.02
Coefficient of Expansion, 75-200° F, 10 in'/ °F.....8.3
24-93 °C m/m °C 14.9
Thermal Conductivity, Btu • in ft2•h• °F 12.9
W/m 'C.....612
Electrical Resistivity ohm cire mil/ft 1.017
• m 0.989

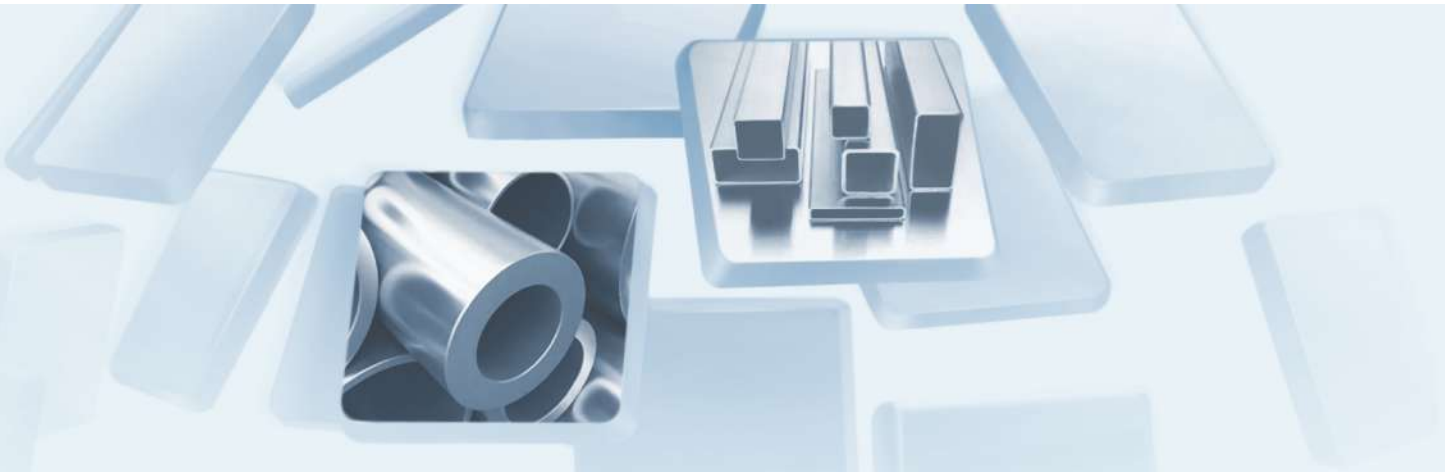
Specifications and Designations

UNS No 8330 SAE AMS 5592, 5716
ASTM B 511, B 512, B 535, SAE J 405 J 412
B 536, B 546, B 710
ASME SB 511, SB 536, SB 710
Boiler Code Sections I, VIII, IX



Weights & Thickness of S.S. Pipe & Tubes for Boilers

Size in	Outside Dia	10 Gauge	12 Gauge	14 Gauge	16 Gauge	18 Gauge	20 Gauge	22 Gauge	25 mm
inches	mm	(3.25 mm)	(2.64 mm)	(2.03 mm)	(1.62 mm)	(1.21 mm)	(0.91 mm)	(0.71 mm)	(0.50 mm)
1/4"	6.35	-	-	-	0.192	0.14	0.122	0.100	0.072
3/8"	9.52	0.549	0.447	0.405	0.341	0.268	0.193	0.165	0.112
1/2"	12.7	0.768	0.654	0.542	0.451	0.350	0.264	0.213	0.153
3/4"	19.05	1.285	1.068	0.864	0.710	0.544	0.407	0.320	0.231
1"	25.4	1.801	1.482	1.187	0.969	0.738	0.549	0.432	0.311
1-1/4"	31.75	2.291	1.906	1.497	1.211	0.917	0.696	0.547	-
1-1/2"	38.1	2.834	2.309	1.832	1.487	1.126	0.820	0.654	-
1-3/4"	45.00	3.408	2.722	2.191	1.775	1.341	0.834	0.765	-
2"	50.8	3.868	3.136	2.478	2.006	1.541	1.119	0.877	-
2-1/2"	63.5	4.901	3.963	3.123	2.524	1.858	-	-	-
3"	76.2	5.934	4.790	3.453	2.789	2.237	-	-	-
3-1/2"	88.9	6.964	5.617	4.413	3.560	2.616	-	-	-
4"	101.6	8.000	6.444	5.059	4.078	2.995	-	-	-
4-1/2"	114.3	8.900	7.272	5.620	4.501	3.374	-	-	-
5"	127.0	9.917	8.099	6.255	5.008	3.753	-	-	-
6"	152.1	11.953	9.753	7.527	6.023	4.474	-	-	-



Nominal Thickness and Weights of Stainless Steel Pipes

Size of Pipe & Tubes		Number of Schedule													
		5S		10S		10S*		20		30		40		60	
Nominal in inch	Outside in inch	mm	Kg/m	mm	Kg/m	mm	Kg/m	mm	Kg/m	mm	Kg/m	mm	Kg/m	mm	Kg/rn
1/8"	10.3	1.0	0.23	1.28	0.28	-	-	1.60	0.345	-	-	1.73	0.36	-	-
1/4"	13.7	1.2	0.37	1.65	0.49	-	-	2.00	0.580	-	-	2.24	0.63	-	-
3/8"	17.1	1.2	0.47	1.65	0.63	-	-	2.00	0.750	-	-	2.31	0.85	-	-
1/2"	21.3	1.65	0.80	2.11	1.00	-	-	2.5	1.15	-	-	2.77	1.26	-	-
3/4"	26.7	1.65	1.03	2.11	1.28	-	-	2.5	1.500	-	-	2.87	1.68	-	-
1"	33.4	1.65	1.29	2.77	2.09	-	-	2.5	2.24	-	-	3.38	2.50	-	-
1-1/4"	42.2	1.65	1.65	2.77	2.73	-	-	3.0	2.910	-	-	3.56	3.38	-	-
1-1/2"	48.3	1.65	1.90	2.77	3.11	-	-	3.0	3.370	-	-	3.68	4.05	-	-
2"	60.3	1.65	2.38	2.77	3.99	-	-	3.0	4.9	-	-	3.91	5.43	-	-
2-1/2"	73.0	2.11	3.70	3.05	5.26	-	-	4.00	6	-	-	5.16	8.62	-	-
3"	88.9	2.11	4.50	3.05	6.45	-	-	4.00	8.423	-	-	5.49	11.47	-	-
3-1/2"	101.6	2.11	5.20	3.05	7.41	-	-	4.5	9.62	-	-	5.74	13.78	-	-
4"	114.3	2.11	5.81	3.05	8.50	-	-	4.5	12.255	-	-	6.02	16.32	-	-
5"	141.3	2.77	9.45	3.40	11.74	-	-	5.00	16.900	-	-	6.56	21.80	-	-
6"	168.3	2.77	11.31	3.40	14.04	-	-	6.35	22.08	-	-	7.11	28.69	-	-
8"	219.1	2.77	14.78	3.76	20.27	-	-	6.35	33.28	7.04	37.38	8.18	42.70	10.31	53.07
10"	273.0.6	3.40	22.62	4.19	27.80	-	-	6.35	42.41	7.80	51.81	9.27	60.30	12.70	82.8
12"	323.9	3.96	31.36	4.57	36.17	-	-	6.35	50.48	8.38	66.20	10.31	79.71	14.27	110.62
14"	355.6	3.96	34.23	4.78	41.60	6.35	55.53	7.92	68.98	9.52	82.58	11.31	95.00	15.09	128.42
16"	406.4	4.19	41.60	4.78	47.60	6.35	63.61	7.92	79.03	9.52	94.20	12.17	125.2	16.66	162.59
18"	457.2	4.19	46.83	4.78	54.15	6.35	71.69	7.92	89.10	11.13	124.32	14.27	158.27	19.05	209.00
20"	508.0	4.78	59.22	5.54	69.70	6.35	79.76	9.52	118.93	12.70	156.04	15.09	185.89	21.62	251.65
22"	558.8	4.78	63.75	5.54	76.76	6.35	87.84	9.52	131.07	12.70	172.04	-	-	22.22	298.55
24"	609.6	5.54	82.60	6.35	95.92	6.35	95.92	9.52	143.20	14.27	211.72	17.48	258.74	24.61	360.21
26"	660.4	-	-	-	-	7.92	129.40	12.70	205.97	-	-	-	-	-	-
28"	711.2	-	-	-	-	7.92	139.47	12.70	222.13	15.88	276.48	-	-	-	-
30"	762.0	-	4	-	-	7.92	148.55	12.70	238.28	15.88	296.68	-	-	-	-
32"	812.8	-	-	-	-	7.92	158.3	12.70	254.44	15.88	316.88	17.48	342.17	-	-
34"	863.6	-	-	-	-	7.92	168.32	12.70	270.50	15.88	336.96	17.48	364.01	-	-
36"	914.4	-	-	-	-	7.92	178.26	12.70	284.75	15.88	357.28	19.05	420.21	-	-

N.B. Thickness and weight "Standard" Extra-Strong and "Double Extra-Strong" within swell elges have a correspondant value in a "Schedule".
For different thickness that suitable the weights can proceed by the following formular $\frac{24.66\ (D-t)\ t}{_1000}$ * In accordance to ANSI B 36.19



Number of Schedule															
80		100		120		140		160		Standard		Extra-Strong		Double Extra Strong	
mm	Kg/m	mm	Kg/m	mm	Kg/m	mm	Kg/m	mm	Kg/m	mm	Kg/m	mm	Kg/m	mm	Kg/m
2.41	0.46	-	-	-	-	-	-	-	-	1.73	0.36	2.41	0.46	-	-
3.02	0.80	-	-	-	-	-	-	-	-	2.24	0.63	3.02	0.80	-	-
3.20	1.10	-	-	-	-	-	-	-	-	2.31	0.85	3.20	1.10	-	-
3.73	1.62	-	-	-	-	-	-	4.78	1.97	2.77	1.26	3.73	1.62	7.47	2.54
3.91	2.21	-	-	-	-	-	-	5.56	2.93	2.87	1.68	3.91	2.19	7.82	3.63
4.55	3.23	-	-	-	-	-	-	6.35	4.30	3.38	2.50	4.55	3.23	0.09	5.45
4.85	4.50	-	-	-	-	-	-	6.35	5.69	3.56	3.38	4.85	4.46	9.70	7.75
5.08	5.49	-	-	-	-	-	-	7.14	7.35	3.68	4.05	5.08	5.40	10.16	9.54
5.54	7.60	-	-	-	-	-	-	8.74	11.26	3.91	5.43	5.54	7.47	11.07	13.44
7.01	11.59	-	-	-	-	-	-	9.52	15.15	5.16	8.62	7.01	11.40	14.02	20.39
7.62	15.25	-	-	-	-	-	-	11.13	21.67	5.49	11.28	7.62	15.25	15.24	28.11
8.08	18.62	-	-	-	-	-	-	-	-	5.74	13.56	8.08	9.62	-	-
8.56	22.29	-	-	11.13	28.25	-	-	13.49	34.05	6.02	16.06	8.56	22.29	17.12	41.66
9.52	30.92	-	-	12.70	40.24	-	-	15.88	49.87	6.55	21.76	9.52	30.92	19.05	58.31
10.97	43.21	-	-	14.27	54.20	-	-	18.26	68.53	7.11	28.23	10.97	42.52	21.95	79.11
12.70	65.63	15.09	76.93	18.26	90.32	20.62	102.47	23.01	112.97	8.18	42.49	12.70	64.57	22.22	107.78
15.09	97.27	18.26	116.38	21.44	134.90	25.40	157.51	28.58	174.95	9.27	60.24	12.70	81.46	25.40	155.5
17.48	133.88	21.44	162.14	25.40	189.82	28.58	211.31	33.32	242.40	9.52	73.76	12.70	97.36	25.40	189.92
19.05	159.00	23.83	197.74	27.79	227.88	31.75	257.47	35.71	286.04	9.52	81.21	12.70	107.28	-	-
21.44	203.50	26.19	249.34	30.96	290.88	36.53	338.32	40.49	370.74	9.52	93.13	12.70	123.18	-	-
23.83	258.29	29.36	314.54	34.92	369.34	39.67	414.74	45.24	466.67	9.52	105.05	12.70	139.07	-	-
26.19	315.97	32.54	387.41	38.10	448.3	44.45	515.94	50.01	573.31	9.52	116.97	12.70	154.97	-	-
28.58	379.70	34.92	457.83	41.28	535.17	47.62	609.30	53.98	682.57	9.52	128.89	12.70	170.86	-	-
30.96	448.3	38.89	555.76	46.02	649.44	52.37	730.72	59.54	819.70	9.52	140.81	12.70	186.75	-	-
-	-	-	-	-	-	-	-	-	-	9.52	152.73	12.70	202.65	-	-
-	-	-	-	-	-	-	-	-	-	9.52	164.65	12.70	234.44	-	-
-	-	-	-	-	-	-	-	-	-	9.52	176.57	12.70	234.44	-	-
-	-	-	-	-	-	-	-	-	-	9.52	188.50	12.70	250.33	-	-
-	-	-	-	-	-	-	-	-	-	9.52	200.42	12.70	266.22	-	-
-	-	-	-	-	-	-	-	-	-	9.52	212.34	12.70	282.12	-	-

N.B. Thickness and weight "Standard" Extra-Strong and "Double Extra-Strong" within swell elges have a correspondant value in a "Schedule".
For different thickness that suitable the weights can proceed by the following formular $\frac{24.66\ (D-t)\ t}{1000}$ * In accordance to ANSI B 36.19



Highlights of ASTM Specification for Stainless Steel Tubes and Pipes

Specification	Allowable Outside Diameter Variation in mm			Allowable wall Thickness Variation		Exact Length Tolerances in mm		Testing
	Diameter	Over	Under	Over %	Under%	Over	Under	
ASTM - 270 Seamless & Welded Sanitary Tubes	25.4 38.1 50.8 63.5 76.2 101.6	.05 .05 .05 .05 .08 .08	.20 .20 .28 .28 .30 .38	+12.5 +12.5 +12.5 +12.5 +12.5 +12.5	-12.5 -12.5 -12.5 -12.5 -12.5 -12.5	3.2 3.2 3.2 3.2 3.2 3.2	0 0 0 0 0 0	Reverse Flattering test 100% Hydrostatic test External polish on all tubes Refer to ASTM A-270
ASTM A - 249 Welded Boiler, Superheater, Heat Exchanger and Condenser Tubes	Under 25.4 25.4 -38.1 incl. 38.1 - 50.8 excl. 50.8 - 63.5 excl. 63.5 - 76.2 excl. 76.2 - 101.6 incl.	0.1016 0.1524 0.2032 0.2540 0.3048 0.3810	0.1016 0.1524 0.2032 0.2540 0.3048 0.3810	+10 +10 +10 +10 +10 +10	-10 -10 -10 -10 -10 -10	3.175 3.175 3.176 3.76 4.76 4.76	0 0 0 0 0 0	Tension Test, Fletting test Flare Test * Reverse Bend Test Hardness Test 100% Hydrostatic Test *Reverse Flattering Test Refer to ASTM A-450 Whenever applicable
ASTM A - 312 Seamless & Welded Pipes	13.7 - 48.3 incl. 48.3 - 114.3 incl. 114.3 - 220 incl.	0.40 0.79 1.59	0.79 0.79 0.79	Minimum Wall tubes 12.5% under nominal wall Specified		6.4 6.4 6.4 (Normally Random lengths ordered)	0 0 0	Tension Test Fletting Test 100% Hydrostatic Test
ASTM A - 269 Seamless & Welded Service	Upto 12.7 12.7 -38.1 excl. 38.1 - 88.9 excl. 88.9 - 139.7 excl. 139.7 - 203.2 excl.	0.13 0.13 0.25 0.38 0.76	0.13 0.13 0.25 0.38 0.76	+15 +10 +10 +10 +10	-15 -10 -10 -10 -10	3.2 3.2 4.8 4.8 4.8	0 0 0 0 0	Tension Test Flange Test (Welded only) Hardness Test Reverse Flatterning test (Welded only) 100% Hydrostatic Test Refer to ASTMA-269
ASTM A - 213 Seamless Boiler, Superheater and Heat Exchanger Tubes	Upto 25.4 25.4 - 38.1 incl. 38.1 - 50.8 excl. 50.8 - 63.5 encl. 63.5 - 73.2 excl. 76.2 - 101.6 incl.	0.1016 0.1524 0.2032 0.2540 0.3048 0.3810	0.1016 0.1524 0.2032 0.2540 0.3048 0.3810	+20 +20 +22 +22 +22 +22	-0 -0 -0 -0 -0 -0	3.175 3.175 3.176 3.760 4.760 4.760	0 0 0 0 0 0	Tension Test Flattening Test Hardness test 100 % Hydrostatic Test Refer to ASTMA-450
ASTM A - 268 Seamless & Welded Femtic Stainless Steel tubes	Upto 12.7 12.7 - 38.1 excl. 38.1 - 88.9 excl. 88.9 - 168.9 excl.	0.13 0.13 0.25 0.38	0.13 0.13 0.25 0.38	+15 +10 +10 +10	-15 -10 -10 -10	3.2 3.2 4.8 4.8	0 0 0 0	Tension Test Flange Test CERW only Hardness Test Reverse Flattering Test 100% Hydrostate Test
ASTM A - 358 For Welded big Diameter Pipes	For all size	+0.5%	0.5%	No Limit	-0.3 mm	Customer's Specification		

EXOTIC GRADES

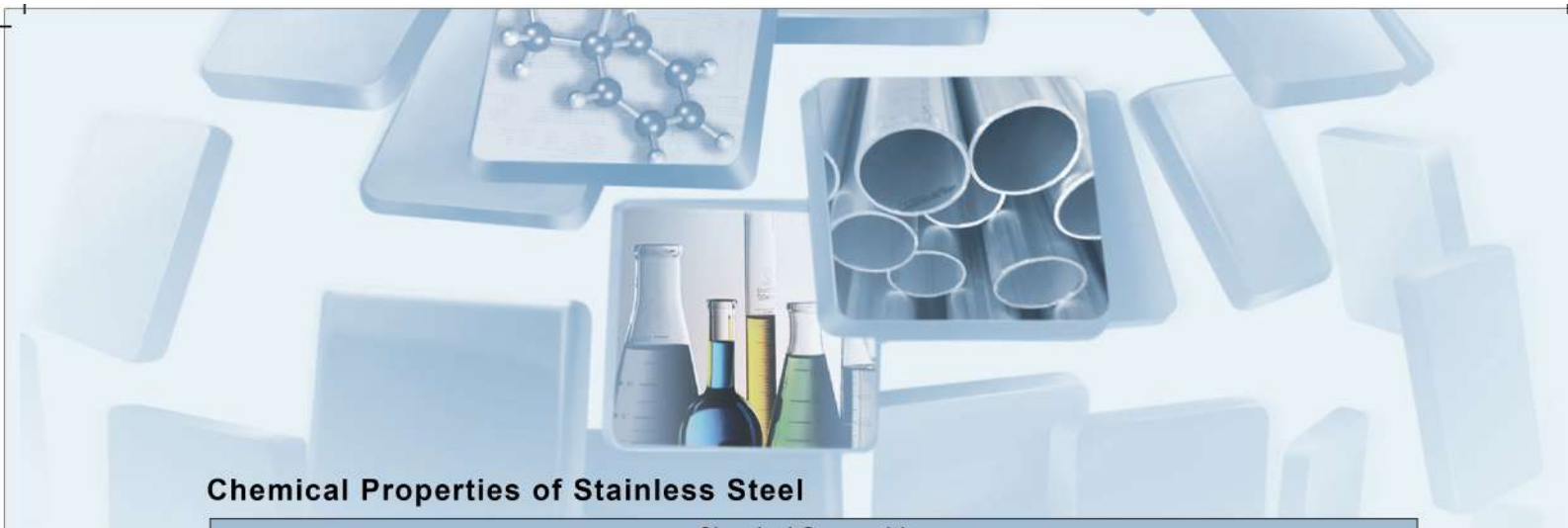
EXOTIC	UNS No	W.NR	C(Max)	Mn(Max)	S(Max)	SI(Max)	Cr	Ni	Mo	Cu	Fe	Ti	Al	Other
ALLOY 200	N02200	2.4066	0.080	0.180	0.005	0.180	-	99.5+	-	-	-	-	-	-
ALLOY 201	N02201	2.4068	0.010	0.80	0.005	0.180	-	99.5+	-	0.130	0.200	-	-	-
ALLOY 205	N02205	2.4061	0.50	0.350	0.008	0.50	-	99.0 min	-	0.15max	0.20max	0.01-0.05	-	Mg-0.01-0.08
ALLOY 400	N04400	2.4360	0.300	1.000	0.024	0.200	-	63.0mim	-	28-34	2.5max	-	-	-
ALLOY K-500	N05500	2.4375	0.250	1.500	0.010	0.050	-	63.0min	-	27-33	2-Omax	0.35-0.85	2.3-3.14	-
ALLOY 800	N08800	1.4876	0.0100	1.500	0.015	1.000	19.0-23.0	30.0-35.0	-	0.75max	39.5min	0.15-0.60	0.15-0.60	-
ALLOY 800H	N08810	1.4958	0.0500	1.500	0.015	1.000	19.0-23.0	30.0-35.0	-	0.75max	39.5min	0.15-0.60	0.15-0.60	AL-TI-0.30-1.20
ALLOY 800HT	N08811	1.4959	0.0600	1.500	0.015	1.000	19.0-23.0	30.0-35.0	-	0.75max	39.5min	0.25-0.60	0.25-0.60	AL+TI-0.85-1.20
ALLOY 330	N08330	-	0.080	2.000	0.030	0.75-1.50	17.0-20.0	34.0-37.0	-	-	Sal	-	-	P-0.030max
ALLOY DS	-	1.4862	0.100	0.8 1.5	0.030	1.9-2.6	17.0-19.0	34.5-41.0	-	0.5max	Sal	0.2max	-	-
ALLOY 706	N09706	-	0.060	0.350	0.015	0.350	14.5-17.5	39.0-44.0	-	0.30max	-	1.5-2.0	0.40max	P-0.02max, Nb-2.5-3.3, B-0.006max, Co-1.0max
ALLOY 600	N06600	2.4816	0.150	1.000	0.015	0.050	14.0-17.0	72.0min	-	0.5max	6.0-10.0	-	-	-
ALLOY 601	N06601	2.4851	0.100	1.000	0.015	0.500	21.0-25.0	58.0-63.0	-	1.0max	Sal	-	1.0-1.7	-
ALLOY 825	N08825	2.4858	0 .025	0.100	0.030	0.500	19.5-23.5	38.0-46.0	2.5-3.0	1.5-3.0	Sal	0.6-1.2	0.200	-
ALLOY 625	N06625	2.4856	0.100	0.500	0.015	0.500	20.0-23.0	58.0min	8.0-10.0	-	5.0max	0.400	0.400	P-0.015,Nb-3.15-4.15,Co-1.0max
ALLOY X-750	N07750	2.4669	0.080	1.000	0.010	0.500	14.0-17.0	70.0min	-	0.50max	5.0-9.0	2.25-2.75	0.40-1.00	Co-1.00 max, N-0.70-1.20
ALLOY 718	N07718	2.4668	0.02-0.08	0.350	0.015	0.350	17.0-21.0	50.0-55.0	2.80-3.30	0.20max	Sal	0.70-1.15	0.30-0.70	P-0.015max, B 0.006max, Nb-0.75-5.50 Co-1.0max
ALLOY 617	N06617	2.4663	0 05-015	1.000	0.015	1.000	20.0-24.0	44.5min	8.0-10.0	0.5max	3.Omax	-0.6max	0.8-1.5	80.006 max. Co-10.0-15.0
ALLOY C4	N06455	2.4610	0.010	1.000	0.010	0.050	14.5-17.5	Bal	14.0-17.0	-	3.Omax	0.70max	-	P-0.025max,Co-2.0
ALLOY C22	N06022	2.4602	0.015	0.500	0.02	0.080	20.0-22.5	-	12.5-14.5	-	2.0-6.0	-	-	P-0.020max, Co-2.5max, V-0.35max W-2.5-3.5
ALLOY C276	N010276	2.4819	0.010	1.000	0.03	0.080	14.5-16.5	Bal	15-0-17.0	-	4.0-7.0	-	-	P-0.040max, W-3.0-4.5, Co-2.5max,V-0.35max
ALLOY B2	N010665	2.4617	0.010	1.000	-	0.008	0.4 -1.0	Bal	26.0-30.0	-	2.Omax	-	-	P-0.020max,Co-1.Omax, W-3.0-4.5, V-.35max
ALLOY B3	N010675	2.4600	0.0 0	3 000	-	0.100	1.0-3.0	65.0min	27.0-32.0	0.20max	1.5max	0.2max	0.50max	Co-3.Omax, W-3.Omax
ALLOY X	N06002	2.4665	0.05-0.15	1.000	0.030	1.000	20.5-23.0	Bal	8.0-10.0	0.50max	17.0-20.0	.15max	0-50max	P-0.040max, W-.2-1.0, Co-0.5-2.5,8-.01 max
ALLOY G3	N06985	2.4619	0.015	1.000	0.03	1.000	21.0-23.5	-	6.0-8.0	1.5-2.5	18.0-21.0	-	-	P-0.04max, Nb+ta-0.50max, Co-S.Omax,W-1.5max
ALLOY 75	N06075	2.4630-2.4951	0.08-0.15	1.000	-	1.000	18.0-21.0	Bal	-	0.5max	5.Omax	0.2-0.6	-	-
ALLOY 80A	N07080	2.4631-2.4952	0.100	1.000	0.015	1.000	18.0-21.0	Bal	-	0.2max	3.Omax	1.8-2.7	1.0-1-8	Co-2.Omax, B-0.008Max, Zi-0.15Max
ALLOY 901	N09901	2.4662	0.100	0.500	0 030	0.400	11.0-14.0	40.0-45.0	5.0-6.5	0.5max	Sal	2.8-3.1	0.35max	Co-1.0max
ALLOY 90	N07090	2.4632	0.130	1.000	0.015	1.000	18.0-21.0	Bal	-	0.2max	1.5max	2.0-3.0	1.0-2.0	Co-15.0-21.0, B-0.02max, Zi-0.15max
ALLOY 105	-	2.4634	0 .120	1.000	0.010	1.000	14.0-5.7	Bal	4.5-5.5	0.2max	1.0max	0.9-1.5	4.5-4.9	Co-18-22,B-0.003-0.010, Zi-0.15max
ALLOY 115	-	2.4636	0.2-0.2	1.000	0.015	1.000	14.0-16.0	Bal	3.0-5.0	0.2max	1.Omax	3.5-4.5	4.5-5.5	Co-13-155, 8-0.01-0.025, Zi-0.15max
ALLOY 263	N07263	2.4650	0.04-0.08	0.600	0.007	0.400	19.0-21.0	Bal	5.6-6.1	0.2max	0.7max	1.9-2.4	0.60max	B-0.005max,Co-19-21,Al+Ti-2.4-2.8
ALLOY 690	N06690	2.4642	0.020	0.300	0.015	0.300	27.0-31.0	58.0min	-	0.50max	8.0-10.0	0.300	0.300	-
ALLOY-20	N08020	-	0.070	2.000	0.035	1.000	19.0-21.0	32.0-38.0	2.0-3.0	3.0-4.0	Bal	-	-	P-0.045max, Nb+Ti-8x C-1.0
CN7M	-	-	0.070	1.500	0.040	1.500	19.0-22.0	27.5-3.05	2.0 to 3.0	-	-	-	-	P-0.040max
ALLOY 28	N08028	1.4563	0.0 5	2.000	0.030	0.700	26.0-28.0	30.0-32.0	3.0-4.0	1.0-1.4	Bal	-	-	P-0.030max, N-0.15-0.25
ALLOY 31	N08031	1.4562	0.0 5	2.000	0.010	0.300	26.0-28.0	30.0-32.0	6.0-7.0	1.00-1.40	Bal	-	-	P-0.020max, N-0.15-0.25
ALLOY 904L	N08904	1.4539	0.020	2.000	0.035	1.000	19.00-23.00	23.00-28.00	4.00-5.00	1.00-2.00	Bal	-	-	P-0.045max
ALLOYAL-6XN	N08367	NIL	0.030	2.000	0.030	1.000	20.00-22.00	23.50-25-50	6.00-7.00	0.75max	Bal	-	-	P-0.040max, N-0.15-0.25
ALLOY SMO-254	S31254	1.4547	0.020	1.000	0.010	0.800	19.5-20.5	17.5-18.5	6.0-6.5	0.50-1.00	Bal	-	-	P-0.030max, N-0.18-0.22
ALLOY SMO-654	S32654	1.4562	0.020	2.00-4.00	0.005	0.500	24.0-25.0	21.0-23.0	7.0-8.0	0.30-0.60	Bal	-	-	P-0.030max, N-0.45-0.55

AGE HARDENING I MARTENSTIC STEELS

COMMON Grade	-	UNS	C	Mn	P	S	Si	Cr	Ni	Mo	N	Other
NITRONIC-40	-	S21900	0.03max	8.0- 0.0	0.04max	0.03ma	00ma	19.0-21.5	5.5-7.5	-	0 5-0 0	-
NITRONIC-50	XM-19	S21910	0.06max	4.0-6.0	0.040max	0.030max	0.75max	20.5-23.5	11.5-13.5	1.50-3.0	0.20-0.40	Cb-0.10-0.30,v-0.10-0.30
NITRONIC-60	22-13-5	S21800	0.10max	7.0-9.0	0.060max	0.030max	3.5-4.5	16.0-18.0	8.0-9.0	-	0.08-0.18	-
13-8 MO	-	S13800	0.05max	0.10max	0.01max	0.008max	0.10max	12.25-13.25	7.50-8.5	2-2.5	-	N-0.01max,Al-0.9-1.35
15-7 MO	-	S 15700	0.09max	1.0max	0.04max	0.03max	1.0max	14.0-16.0	6.5-7.75	2.0-3.0	-	Al-0.75-1.50
17-4PH	-	S17400	0.07max	1.0max	0.04max	0.03max	1.0max	15.00-17.5	3.0-5.0	-	3.0-5.0	Nb+Ta - 0.15-0.45
17-7PH	630	517780	0.09max	1.0max	0.04max	0.04max	1.0max	16.0-18.0	6.5-7.75	-	-	Al-0.75-1.50
15.5PH	XM-12	S15500	0.07max	1.00max	0.040max	0.030max	1.00max	14.00-15.50	3.50-5.50	-	-	Cb+Ta0.15.0.45,Cu-2.5-0.5
A 286	1.4980	S 66286	0.08max	2.0max	-	-	1.0max	13.5-16.00	24.0-27.0	1.0-1.5	-	Ti-1.9-2.3, Al-0.35 MAX, V-0.1-0.5,8-M03-0.010







Chemical Properties of Stainless Steel

Chemical Composition								
Type	C %	Min %	P %	S %	Si %	Cr %	Ni %	Others %
201	0.15	5.5 - 7.5	0.060	0.030	1.00	16.0 - 18.0	3.5 - 5.5	N 0.25
202	0.15	7.5 - 10.0	0.060	0.030	1.00	17.0 - 19.0	4.0 - 6.0	N 0.25
301	0.15	2.00	0.045	0.030	1.00	16.0 - 18.0	6.0 - 8.0	N 0.25
302	0.15	2.00	0.045	0.030	0.75	17.0 - 19.0	8.0 - 10.0	N 0.10
304	0.08	2.00	0.045	0.030	0.75	18.0 - 20.0	8.0 - 10.5	N 0.25
304L	0.03	2.00	0.045	0.030	0.75	18.0 - 20.0	8.0 - 12.0	N 0.25
309S	0.08	2.00	0.045	0.030	0.75	22.0 - 24.0	12.0 - 15.0	
310S	0.08	2.00	0.045	0.030	1.50	24.0 - 26.0	19.0 - 22.0	
316	0.08	2.00	0.045	0.030	0.75	16.0 - 18.0	10.0 - 14.0	Mo 2.0-3.0, N 0.10
316L	0.03	2.00	0.045	0,030	0.75	16.0 - 18.0	10.0 - 14.0	Mo 2.0-3.Q,-0.10
316Ti	0.08	2.00	0.045	0.030	0,75	16.0 - 18.0	10.0 - 14.0	N 0.10
								Ti 5 (C+N) Min, 0.70 Max
317	0.08	2,00	0.045	0.030	0.75	18.00 - 20.00	11.0 - 15.0	Mo 3.0-4.0, N 0.10
317L	0.03	2.00	0.045	0.030	0.75	18.00 - 20.00	11.0 - 15.0	Mo 3.0-4.0, N 0.10
321	0.08	2.00	0.045	0.030	0.75	17.00 - 19.00	9.0 - 12.0	Ti 5 (C+N) Min, 0.70 Max
347	0.08	2.00	0.045	0.030	0.75	17.00 - 19.00	9.0 - 13.0	Cb 10xC Min, 1.0 Max
904L	0.02	2.00	0.030	0.045	1.00	19.00 - 23.00	23.0 - 28.0	Mo 4.0 - 5.0, Cu 1.0-2.0
409L	0.03	1.00	0.030	0.040	1.00	10.50 - 11.75		Ti 6(C) Min - 0.75 Max
410S	0.08	1.00	0.030	0.040	1.00	11.50 - 13.50	0.60	
430	0.12	1.00	0.030	0.040	1.00	16.00 - 18.00	0.75	
410	0.15	1.00	0.030	0.030	1.00	11.50 - 13.50	0.75	
420	0.15(Min)	1.00	0.030	0.040	1.00	12.00 - 14.00		

Physical Properties of Stainless Steel

Garde	Density	Elastic Modulus	Mean Coeff of themal Expansion um / m / 0c"					Specific	Electrical
201	7800	197	15.7	17.5	18.4	16.2	21.5	500	690
202	7800	-	17.5	18.4	19.2	16.2	21.6	500	690
301	8000	193	17	17.2	18.2	16.2	21.5	500	720
302	8000	193	17.2	17.8	18.4	16.2	21.5	500	720
304	8000	193	17.2	17.8	18.4	16.2	21.5	500	720
304L	8000	193	17.2	17.8	18.4	16.2	21.5	500	720
305	8000	193	17.2	17.8	18.4	16.2	21.5	500	720
309S	8000	200	15	16.6	17.2	15.6	18.7	500	780
310S	7750	200	15.9	16.2	17	14.2	18.7	500	720
316	8000	193	15.9	16.2	17.5	16.3	21.5	500	740
316L	8000	193	15.9	16.2	17,5	16.3	21.5	500	740
316Ti	8000	193	15.9	16.2	17.5	16.3	21.5	500	740
317	8000	193	15.9	16.2	17.5	16.2	21.5	500	740
317L	8000	200	16.5	16.2	18.1	14.4	21.5	500	790
321	8000	193	16.6	17.2	18.6	16.1	22.2	500	720
347	8000	193	16.6	17.2	18.6	16.1	22.2	500	720
904L	8000	200	15	-	-	13	-	500	850
409L	7600	208	11	11.7	12.4	25.8	27.5	460	600
410S	7750	200	9.9	11.4	11.6	24.9	28.7	460	570
430	7750	200	10.4	11	11.4	23.9	26	460	600
410	7750	200	9.9	11.4	11.6	24.9	28.7	460	570
420	7750	200	10.3	10.8	11.7	24.9	-	460	550





Mechanical Properties

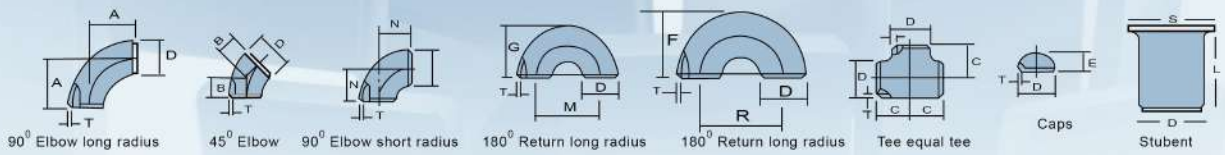
Grade	Tensile Strength Mpa (Min)	Yield Strength Mpa (Min)	% Elongation (Min)	Hardness RB (Max)
201	515	260	40	95
202	620	260	40	95
301	515	205	40	92
302	515	205	40	92
304	515	205	40	92
304L	485	170	40	92
304H	515	205	40	92
309S	515	205	40	95
310S	515	205	40	95
316	515	203	40	95
316L	485	170	40	95
316Ti	515	205	40	95
317	515	203	40	95
317L	515	205	40	95
321	515	205	40	95
347	515	205	40	92
904L	490	220	35	90
409L	380	205	20	88
410S	415	5	22	88
430	450	205	22	89
410	450	205	20	96
420	690 (Max)	-	15	96

Material Designation Number Comparison Table

ASTM	ASME	USA	JAPAN	BRITAIN	DIN	GERMANY	FRANCE	SWEDEN	ITALY	INDIA	CNS
UNS NO.	ISO	-	-	-	-	WERKSTOOF DIN'	NF	SIS	UNI	IS	202
S20200	A-3	-	-	-	-	-	Z12CN18-09	-	-	-	-
-	-	AISI	JIS	BS	-	-	-	-	-	-	-
-	-	202	SUS202	284316	-	-	-	-	-	-	-
S30200	12	302	SUS302	302S25	1.43	X12CrNi188	ZIOCNFI8-09	142332	X10CrNiSI809	-	302
S20323	17a	303Se	SUS303Se	303S41	-	-	Z8CN24-133	142346	X10CrNiS1809	-	-
S30403	10	304L	SUS304L	304S11	1.4306	X2CrNi1911	-	142352	X2CrNi1811	02Cr17Ni11	304L
S30900	-	309	SUH09	309S24	1.4828	-	Z8CN25-10	-	X16CrNi2314	-	-
S31000	-	310	SUH310	31OS24	1.4841	-	Z3CND17-12-02	142361	X6CrNi2520	-	-
S31600	20	316	SUS316	316S31	1.4401	X5CrNiMo17122	Z12C13	142343	X8CrNiMo1713	04C07Ni12Mo2	316
S32100	15	321	SUS321	321S31	1.4541	X6CrNiT0810	Z8CNTi12	142337	X6CrNiTi1811	04Cr18Ni10Ti20	321
S40300	-	403	SUS403	403S17	1.4024	X5Cr13	Z11CF13	142301	-	-	403
S40900	1Ti	409	SUS409	409S19	1.4512	X6CrTi12	Z33C13	-	-	-	409
S41600	7	416	SUS416	416S21	1.4005	X12CrS13	Z8CF17	-	X12CrS13	-	-
	5	-	SUS420J2	420545	1.4028	X30Cr13	-	-	-	-	420J2
S43020	8C	430F	SUS43OF		1.4104	X4CrMoS18	-	142383	X10CrS17	-	-



BUTT WELDING PIPE FITTING DIMENSIONAL STANDARD ANSI B-16.9 AND B-16.28



Nominal Pipe Size		Outside Diameter	Centre to Face				Back to Face			Centre to Centre			Length'L'	
Inch.	mm	D	A	B	C	N	E	F	G	R	M	S	MSS SP 43	ANSI B 16.9
1/2	15	21.3	19	16	25	-	25	48	-	38	-	34.9	50.8	76.2
3/4	20	26.7	29	11	29	-	25	43	-	57	-	42.8	50.8	76.2
1	25	33.4	38	22	38	25	38	56	41	76	51	50.8	50.8	101.6
1. 1/4	32	42.2	48	25	48	32	38	70	52	95	64	63.5	50.8	101.6
1. 1/2	40	48.3	57	29	57	38	38	83	62	114	76	73	50.8	101.6
2	50	60.3	76	35	64	51	38	106	81	152	102	92	63.5	152.4
2. 1/2	65	73.0	95	44	76	64	38	132	100	191	127	104.8	63.5	152.4
3	80	88.9	114	51	86	76	51	159	121	229	152	127	63.5	152.4
3 1/2	90	101.6	133	57	95	89	64	184	140	267	178	139.7	76.2	152.4
4	100	114.3	152	64	105	102	64	210	159	305	203	157.2	76.2	152.4
5	125	141.3	190	79	124	127	76	262	197	381	254	185.7	76.2	203.2
6	150	168.3	229	95	143	152	89	313	237	457	305	215.9	88.9	203.2
8	200	219.1	305	127	178	203	102	414	313	610	406	270	101.6	203.2
10	250	273.1	381	159	216	254	127	518	391	762	508	324	127.0	254.0
12	300	323.9	457	190	254	305	152	619	467	914	610	381	152.4	254.0
14	350	355.6	533	222	279	356	165	711	533	1067	711	412.8	152.4	305.0
16	400	406.4	610	254	305	406	178	813	610	1219	813	470	152.4	305.0
18	450	457.0	686	286	343	457	203	914	686	1372	914	533.4	152.4	305.0
20	500	508.0	762	318	381	508	229	1016	762	1524	1016	584.2	152.4	305.0
22	550	559.0	838	343	419	559	254	1118	838	1676	1118	614.4	152.4	305.0
24	600	610.0	914	381	432	610	267	1219	914	1829	1219	692.2	152.4	305.0
26	650	660.0	991.0	406.0	495	660	267							
28	700	711.0	1067	438.0	521	711	267							
30	750	762.0	1143	470.0	559	762	267							
32	800	813.0	1219	502.0	597	813	267							
34	850	864.0	1295	533.0	635	864	267							
36	900	914.0	1372	565.0	673	914	267							
38	950	965.0	1448.0	600.0	711	965	305							
40	1000	1016.0	1524.0	632.0	749	1016	305							
42	1050	1067.0	1600.0	660.0	762	1067	305							
44	1100	1118.0	1676.0	695.0	813	1118	343							
46	1150	1168.0	1753.0	727.0	851	1168	343							
48	1200	1219.0	1829.0	759.0	889	1219	343							



CHEMICAL & PHYSICAL PROPERTIES OF CARBON STEEL
STAINLESS STEEL & ALLOY STEEL BUTT - WELD PIPES FITTINGS

ASTM A234/234M PIPE FITTINGS OF WROUGHT CARBON STEEL FOR MODERATE AND ELEVATED TEMPERATURES

ASTM GRADE	C	Mn	Si	S	P	Cr	Ni	Mo	Other	Tensile Psi (MPa)	Yield Psi(MPa)	Elongation %	Hardness HB
A 234 WPB	0.30 max	0.29 1.06	0.10 min	0.058 max	0.050 max	-	-	-	-	60000-85000 (415 - 585)	35000 (240)	30Recp. Spc. 22Round Spc.	197
A 234 WPC	0.35 max	0.29 1.06	0.10 min	0.058 max	0.050 max	-	-	-	-	70000-95000 (485 - 655)	40000 (275)	30Recp. Spc. 22Round Spc.	197

ASTM A234/234M PIPE FITTINGS OF WROUGHT ALLOY STEEL FOR MODERATE AND ELEVATED TEMPERATURES

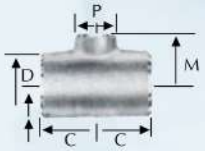
A234 / 234 M WP12 CL-1	0.2	0.30 0.80	0.60 max	0.045 max	0.035 max	0.80 1.25	-	0.44 0.65	-	60000-85000 (415 - 585)	32000 (220)	30 Recp.Spc. 22 Round Spc.	197
A 234 / 234 M WP12 CL-2	0.20	0.30 0.80	0.60 max	0.045 max	0.045 max	0.80 1.25	-	0.44 0.65	-	70000-95000 (485 - 655)	40000 (275)	30 Recp. Spc. 22 R0und Spc.	197
A 234 / 234 M WP11CL-1	0.15	0.30 0.60	0.50 1.00	0.030 max	0.030 max	1.00 1.50	-	0.44 0.65	-	60000-85000 (415 - 585)	30000 (205)	30 recp. Spc. 22 Round Spc.	197
A 234 / 234 M WP11 CL - 2	0.2	0.30 0.60	0.50 1.00	0.040 max	0.040 max	1.00 1.50	-	0.44 0.65	-	70000-9500 (485 - 655)	40000 (275)	30 Recp. Spc. 22 Round Spc.	197
A 234 / 234 M WP11 CL-3	0.2	0.30 0.60	0.50 1.00	0.040 max	0.040 max	1.00 1.50	-	0.44 0.65	-	75000-100000 (520 - 690)	45000 (310)	30 Recp. Spc. 22 Round Spc.	197
A 234 / 234 M WP22 CL-1	0.15	0.30 0.60	0.50 max	0.040 max	0.040 max	1.90 2.60	-	0.87 1.13	-	60000-85000 (415 - 585)	30000 (205)	30 Recp. Spc. 22 Round Spc.	197
A 234 / 234 M WP22 CL-3	0.15	0.30 0.60	0.50 max	0.040 max	0.040 max	1.90 2.60	-	0.87 1.13	-	75000-100000 (520 - 690)	45000 (315)	30 Recp. Spc. 22 Round Spc.	197
A 234 / 234 M WP 5	0.15 max	0.30 0.60	0.50 max	0.030 max	0.040 max	4.00 6.00	-	0.44 0.65	-	60000-850000 (415 - 585)	30000 (205)	30 Recp. Spc. 22 Round Spc.	217
A 234 / 234 M WP 9	0.15 max	0.30 0.60	0.25 1.00	0.030 max	0.030 max	8.00 10.00	-	0.90 1.10	-	60000-850000 (415 - 585)	30000 (225)	30 Recp. Spc. 22 Round Spc.	217

ASTMA 403/A403M WROUGHT AUSTENITIC STAINLESS STEEL PIPE FITTINGS

A 403 / 403 M WP 304	0.08 max	2.00	1.00	0.030	0.045	18.00 20.00	8.00 11.00	-	-	75000 (515)	30000 (205)	28 (Longit) 20 (Transv).	-
A 403 / 403 M WP / 304 L	0.035 max	2.00	1.00	0.030	0.045	18.00 20.00	8.00 13.00	-	-	70000 (485)	25000 (170)	28 (Longit) 20(Transv).	-
A 403 / 403 M WP 309	0.015 max	2.00	1.00	0.030	0.045	22.00 24.00	12.00 15.00	-	-	75000 (515)	30000 (205)	28(Longit) 20(Transv).	-
A 403 / 403 M WP 310	0.015 max	2.00	1.50	0.030	0.045	24.00 26.00	19.00 22.00	-	-	75000 (515)	30000 (205)	28(Longit) 20 (Transv).	-
A 403 / 403 M WP 316	0.08 max	2.00	1.00	0.030	0.045	16.00 18.00	10.00 14.00	2.00 3.00	- -	75000 (515)	30000 (205)	28(Longit) 20(Transv).	-
A 403 / 403 M WP 316 L N	0.030 max	2.00	0.75	0.030	0.040	16.00 18.00	11.00 14.00	2.00 3.00	N 0.1-0.16	75000 (515)	30000 (205)	28(Longit) 20(Transv).	-
A 403 / 403 M WP 316 L	0.035 max	2.00	1.00	0.030	0.045	16.00 18.00	10.00 15.00	2.00 3.00	-	70000 (485)	25000 (170)	28(Longit) 20(Transv).	-
A 403 / 403 M WP 317 L	0.030 max	2.00	1.00	0.030	0.045	18.00 20.00	11.00 15.00	3.00 4.00	- -	75000 (515)	30000 (205)	28(Longit) 20(Transv).	-
A 403 / 403 M WP 321	0.08 max	2.00	1.00	0.030	0.045	17.00 20.00	9.00 13.00	- -	Ti 5xc=0.70	75000 (515)	30000 (205)	28(Longit) 20(Tranv)	-
A 403 / 403 M WP 347 H	0.08 max	2.00	1.00	0.030	0.045	17.00 20.00	9.00 13.00	- -	Cb+Ti= 8.0-1.10	75000 (515)	30000 (205)	28(Longit) 20(Transv).	-



BUTT- WELDING PIPE FITTING ANSI B 16.9 / 16.28



Reducing Tees



Concentric Reducers



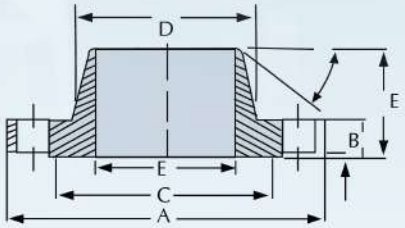
Eccentric Reducers

Nominal Pipe Size		Outside Diameter		Center to End		Length
Inch.	mm	D	P	C	M	H
1 1/2 x 3/8	15 x 10	21.3	17 1	25	25	-
1/2 x 1/4	15x8	21.3	137	25	25	-
3/4 x 1/2	20 x 15	26.7	21.3	29	29	38
3/4 x 3/8	20 x 10	26.7	17.1	29	29	38
1 x 3/4	25 x 20	33.4	26.7	38	38	51
1 x 1/2	25 x 15	33.4	21.3	38	38	51
1 1/4 x 1	32 x 25	42.2	33.4	48	48	51
1 1/4 x 3/4	32 x 20	42.2	26.7	48	48	51
1 1/4 x 1 1/2	32 x 15	42.2	21.3	48	48	51
1 1/2 x 1 1/2	40 x 32	48.3	42.2	57	57	64
1 1/2 x 1	40 x 25	48.3	33.4	57	57	64
1 1/2 x 3/4	40 x 20	48.3	26.7	57	57	64
1 1/2 x 1/2	40 x 15	48.3	21.3	57	57	64
2 x 1 1/2	50 x 40	60.3	48.2	64	60	76
2 x 1 1/4	50 x 32	60.3	42.2	64	57	76
2 x 1	50 x 25	60.3	33.4	64	51	76
2 x 3/4	50 x 20	60.3	26.7	64	44	76
2 1/2 x 2	65 x 50	73.0	60.3	76	70	89
2 1/2 x 1 1/2	65 x 40	73.0	48.3	76	67	89
2 1/2 x 1 1/4	65 x 32	73.0	422	76	64	89
2 1/2 x 1	65 x 25	73.0	33.4	76	57	89
3 x 2 1/2	80 x 65	88.9	73.0	86	83	89
3 x 2	80 x 50	88.9	60.3	86	76	89
3 x 1 1/2	80 x 40	88.9	48.3	86	73	89
3 x 1 1/4	80 x 32	88.9	42.2	86	70	89
3 1/2 x 3	90 x 80	101 6	88.9	95	92	102
3 1/2 x 2 1/2	90 x 65	101 6	73.0	95	89	102
3 1/2 x 2	90 x 50	101 6	60.3	95	83	102
3 1/2 x 2	90 x 40	101 6	48.3	95	79	102
3 1/2 x 1 1/2	90 x 32	101 6	42.2	-	-	102
4 x 3 1/2	100 x 90	114.3	101.6	105	102	102
4 x 3	100 x 80	114.3	88.9	105	98	102
4 x 2 1/2	100 x 65	114.3	73.0	105	95	102
4 x 2	100 x 50	114.3	60.3	105	89	102
4 x 1 1/2	100 x 40	114.3	48.3	105	86	102
5 x 4	125 x 100	141.3	114.3	124	117	127
5 x 3 1/2	125 x 90	141.3	101.6	124	114	127
5 x 3	125 x 80	141.3	88.9	124	111	127
5 x 2 1/2	125 x 65	141 3	73.0	124	108	127
5 x 2	125 x 50	141.3	60.3	124	105	127
6 x 5	150 x 125	1683	141.3	143	137	140
6 x 4	150 x 100	1683	114.3	143	130	140
6 x 3 1/2	150 x 90	1683	101.6	143	127	140
6 x 3	150 x 80	168.3	88.9	143	124	140
6 x 2 1/2	150 x 65	1683	73.0	143	121	140

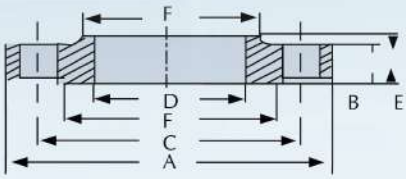
Nominal Pipe Size		Outside Diameter		Center to End		Length
Inch.	mm	D	P	C	M	H
8 x 6	200 x 150	219.1	1683	178	168	152
8 x 5	200 x 125	219.1	141 3	178	162	152
8 x 4	200 x 100	219.1	114.3	178	156	152
8 x 3 1/2	200 x 90	219.1	101 6	178	152	152
10 x 8	250 x 200	273.1	219 1	216	203	178
10 x 6	250 x 150	273.1	168 1	216	194	178
10 x 5	250 x 125	273.1	141 3	216	191	178
10 x 4	250 x 100	273.1	114.3	216	184	178
12 x 10	300 x 250	323.9	273 1	254	241	203
12 x 8	300 x 200	323.9	2191	254	229	203
12 x 6	300 x 150	323.9	1683	254	219	203
12 x 5	300 x 125	3239	141 3	254	216	203
14 x 12	350 x 300	355.6	3239	279	270	330
14 x 10	350 x 250	355.6	273 1	279	257	330
14 x 8	350 x 200	355.6	219 1	279	248	330
14 x 6	350 x 150	355.6	1683	279	238	330
16 x 14	400 x 350	406.4	3556	305	305	356
16 x 12	400 x 300	406.4	3239	305	295	356
16 x 10	400 x 250	406.4	273 1	305	283	356
16 x 8	400 x 200	406.4	2191	305	273	356
16 x 6	400 x 150	406.4	168.3	305	264	356
18 x 16	450 x 400	457.0	4064	343	330	381
18 x 14	450 x 350	457.0	3556	343	330	381
18 x 12	450 x 300	457.0	3239	343	321	381
18 x 10	450 x 250	457.0	273 1	343	308	381
18 x 8	450 x 200	457.0	2191	343	298	381
20 x 18	500 x 450	508.0	4570	381	368	508
20 x 16	500 x 400	5080	4064	381	356	508
20 x 14	500 x 350	508.0	3556	381	356	508
20 x 12	500 x 300	508.0	3239	381	346	508
20 x 10	500 x 250	508.0	273 1	381	333	508
20 x 8	500 x 200	508.8	2191	381	324	508
22 x 20	550 x 500	559.0	5080	419	406	508
22 x 18	550 x 450	559.0	4570	419	394	508
22 x 16	550 x 400	559.0	4064	419	381	508
22 x 14	550 x 350	559.0	3556	419	381	508
22 x 12	550 x 300	559.0	3239	419	371	508
24 x 10	550 x 250	559.0	273 1	419	359	508
24 x 22	600 x 550	6100	5590	432	432	508
24 x 20	600 x 500	6100	5080	432	432	508
24 x 18	600 x 450	610.0	4570	432	419	508
24 x 16	600 x 400	610.0	4064	432	406	508
24 x 14	600 x 350	610.0	3556	432	406	508
24 x 12	600 x 300	610.0	3239	432	397	508
24 x 10	600 x 250,	610.0	273.1	432	384	508



DIMENSIONAL TOLERANCES FOR FORGED STEEL FLANGES



This tolerance not covered by
ANSI B 16.5



Welding neck flanges
ANSI B 16.5

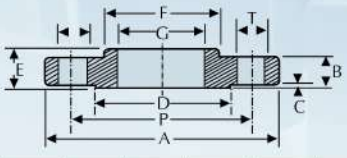
Outside Diameter (A)	When O.D. is 24" or less When 0. D is over 24"	±1/16"* ± 1/8"*	Outside Dia. of Hub (F)	12" and smaller Over 12"	+3/32"*-1/16" ± 1/8"*
Inside Diameter (D)	Threaded	Within limits on Boring gauge		Bolt Circle Bolt hole spacing	± 1/16* ±1/32*
	Slip on and Lap Joint	10" and smaller + 1/32", -0" 12" and larger + 1/16"-0"	Drilling	Eccentricity between 2' h" and smaller bolt circle diameter and machined facing Diameter	1/32" Max. 3" and larger 1/16" Max.
Diameter of Contact Face (C)	1/16 Raised Face	±1/32"	Overall Height (E)	On flanges 18" and smaller On flanges larger than 13" 13" and smaller	+1/8"*-1/32" +3/15"*-1/16" +41/8"-0"
	1/4 Raised Face, Tongue and Groove of male and Female	± 1/64"	Thickness (E)	Over 18"	+ 3/16"-0"
Diameter of Counter bore	Same as for inside diameter			Where allowance has been left On face for finish: All sizes + 1/8-1/16	

Outside Diameter (A)	When O. D. is 24: or less When O. D. is over 24"	± 1/16" ± 1/8"		Bolt Circle Bolt hole spacing	±1/161" ± 1/32"
smaller inside Diameter (D)	10" and smaller 12" to 18" Over 18"	± 1/32" ± t 1/16 + 1/8-1/16"	Drilling	Eccentricity between /2" and smaller2/z" and bolt circle diameter and machined facing diameter	1/32" max 3" and larger 1/16" max
Diameter of Contact Face (C)	1/16" Raised Face 1/4" Raised face, Tongue and Groove, or Male and Female	± t 1/32" ± 1/64"	Width of Land Angle of Hub Bevel	All sizes All Sizes 18" and smaller	± t 1/32" ± 2112" ± 1/16
Diameter of Hub at Point of Welding (G)	5" and smaller 5" and larger	+3/32"-1/32" +5/32"-1/32	Overall Height (E)	12" and larger ± 10" and smaller	± 1/8" +1/8"-0"
Diam ter of Huh at Base (F)	When "F" is 24" and smaller When "F" is over 24"	± 1/8"* ± 1/8	Thickness (E)	Over 18" Where allowanc has been left on face for Finish, All sire	+ 3/16"-0" +1/8"*-1/16"*

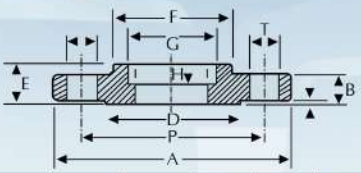


DIMENSIONS OF CLASS 150 FLANGS AS PER ANSI B 16.5

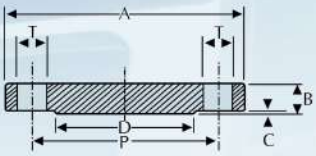
SLIP-ON



SOCKET WELD



BLIND



N.B.	A	B	C	D	E	F	G	H	J	K	L	M	N	0	P	R	T	No. of Holes
15	89	11.1	1.6	35	16	30	22.4	9.5	21.3	-	48	16	16	230	60.3	3.0	159	4
20	98	12.7	1.6	43	16	38	27.7	11.0	26.7	-	52	16	16	280	69.8	3.0	159	4
25	108	14.3	1.6	51	17	49	34.5	12.5	33.4	-	56	17	17	350	79.4	3.0	159	4
32	117	15.9	1.6	64	21	59	43.2	14.5	42.2	-	57	21	21	435	88.9	5.0	15.9	4
40	127	17.5	1.6	73	22	65	49.5	16.0	48.3	-	62	22	22	500	98.4	6.5	15.9	4
50	152	19.0	1.6	92	25	78	62.0	17.5	60.3	-	64	25	25	625	120.6	8.0	19.0	4
65	178	22.2	1.6	105	29	90	74.7	19.0	73.0	-	70	29	29	755	139.7	8.0	19.0	4
80	190	23.8	1.6	127	30	108	90.7	20.5	88.9	-	70	30	30	91 5	152.4	9.5	19.0	8
90	216	23.8	1.6	140	32	122	103.4	-	101.6	-	71	32	32	1040	177.8	9.5	19.0	8
100	229	23.8	1.6	157	33	135	116.1	-	114.3	-	76	33	33	1170	190.5	11.0	19.0	8
125	254	23.8	1.6	186	37	164	143.8	-	141.3	-	89	37	37	1450	215.9	11.0	22.2	8
150	279	25.4	1.6	216	40	192	170.7	-	168.3	-	89	40	40	171 0	241.3	12.5	22.2	8
200	343	28.6	1.6	270	44	246	221.5	-	219.1	-	102	44	44	2220	293.4	12.5	22.2	8
250	406	30.2	1 6	324	49	305	276.4	-	273.0	-	102	49	49	2770	362.0	12.5	25.4	12
300	483	31.8	1.6	381	56	365	327.2	-	323.9	-	114	56	56	3280	431.8	12.5	25.4	12
350	533	34.9	1.6	413	57	400	359.2	-	355.6	-	127	57	79	3600	476.2	12.5	28.6	12
400	597	36.5	1.6	470	64	457	410.5	-	406.4	-	127	64	87	411.0	539.8	12.5	28.6	16
450	635	39.7	1.6	533	68	505	461.8	-	457.2	-	140	68	97	4620	577.8	12.5	31.8	16
500	698	42.9	1.6	584	73	559	513.1	-	508.0	-	144	73	103	5140	635.0	12.5	31.8	20
600	813	47.6	1.6	692	83	664	616.0	-	609.6	-	152	83	111	6160	749.3	12.5	34.9	20

DIMENSIONS OF CLASS 300 FLANGS AS PER ANSI B 16.5

N.B.	A	B	C	D	E	F	G	H	J	K	L	M	N	0	P	R	T	No. of Holes
15	95	14.3	1.6	35	22	38	22.4	9.5	21.3	23.5	52	16	22	23.0	66.7	3.0	15.9	4
20	117	15.9	1.6	43	25	48	27.7	11.0	26.7	29.0	57	16	25	28.0	82.6	3.0	19.0	4
25	124	17.5	1.6	51	27	54	34.5	12.5	33.4	36.0	62	17	27	35.0	88.9	3.0	19.0	4
32	133	19.0	1.6	64	27	64	43.2	14.5	42.2	44.5	65	21	27	43.5	98.4	5.0	19.0	4
40	156	20.6	1.6	73	30	70	49.5	16.0	48.3	50.5	68	22	30	50.0	114.3	6.5	22.2	4
50	165	22.2	1.6	92	33	84	62.0	17.5	60.3	63.5	70	29	33	62.5	127.0	8.0	19.0	8
65	190	25.4	1.6	105	38	100	74.7	19.0	73.0	76.0	76	32	38	75.5	149.2	8.0	22.2	8
80	210	28.6	1.6	127	43	117	90.7	20.5	88.9	92.0	79	32	43	91.5	168.3	9.5	22.2	8
90	229	30.2	1.6	140	44	133	103.4	-	101.6	105.0	81	37	44	104	184.2	9.5	22.2	8
100	254	31.8	1.6	157	48	146	116.1	-	114.3	118.0	86	37	48	117.0	200.0	11.0	22.2	8
125	279	34.9	1.6	186	51	178	143.8	-	141.3	145.0	98	43	51	145.0	235.0	11.0	22.2	8
150	318	36.5	1.6	216	52	206	170.7	-	168.3	171.0	98	46	52	171.0	269.9	12.5	22.2	12
200	381	41.3	1.6	270	62	260	221.5	-	219.1	222.0	111	51	62	222.0	330.2	12.5	25.4	12
250	444	47.6	1.6	324	67	321	276.4	-	273.0	276.0	117	56	95	277.0	387.4	12.5	28.6	16
300	521	50.8	1.6	381	73	375	327.2	-	323.9	329.0	130	60	102	328.0	450.8	12.5	31.8	16
350	584	54.0	1.6	413	76	425	359.2	-	355.6	360.0	143	64	111	360.0	514.4	12.5	31.8	20
400	648	57.2	1.6	470	83	483	410.5	-	406.4	411.0	146	68	121	411.0	571.5	12.5	34.9	20
450	711	60.3	1.6	533	89	533	461.8	-	457.2	462.0	159	70	130	462.0	628.6	12.5	34.9	24
500	775	63.5	1.6	584	95	587	513.1	-	508.0	513.0	162	73	140	514.0	685.8	12.5	34.9	24
600	914	69.8	1.6	692	106	702	616.0	-	609.6	614.0	168	83	152	616.0	812.8	12.5	41.3	24

1) All dimensions are in Milimeters
2) Flamges except Lap Joint will be furnished with (1.6) Raised Face, which is included in "Thickness (C)" and "Lenght through Hub (Y)".

Pipes and Tubes, Round Bars, Fittings,
Flanges, Fasteners, Sheets and Plates.





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