

METINOX METINOX METAL LLP



SALEM STEEL TRADING Co



CERTIFICATE

The Certification Body
of TÜV SÜD South Asia Private Limited
certifies that



METINOX METAL LLP
PLOT NO :10, KVT GARDEN, PHASE-III,
100 FEET INNER RING ROAD, MADHAVARAM
CHENNAI – 600 060, TAMIL NADU, INDIA

has implemented Quality Management System
in accordance with **ISO 9001:2015**
for the scope of

TRADING OF FERROUS & NON FERROUS METALS.
OUTSOURCING OF SLITTING, SHEARING AND
POLISHING PROCESSES OF SHEET METAL

The certificate is valid from 2025-01-21 until 2028-01-20

Subject to successful completion of annual periodic audits

The present status of this certificate can be obtained through TUV SUD website by scanning below QR code and by entering the certificate number (without spaces) on web page. Further clarifications regarding the status & scope of this certificate may be obtained by consulting the certification body at info.in@tuvsud.com

Certificate Registration No. 99 100 24523

Date of Initial certification: 2025-01-21

Issue Date : 2025-01-21 Rev. 00

Rahul Kale
Head of Certification Body
of TÜV SÜD South Asia Private Limited,
Mumbai
Member of TÜV SÜD Group





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Company Profile

We commenced our operations in the year 1999, we are one of the trustworthy Manufacturer, Importers, Stockist and Leading suppliers of Stainless-Steel Raw Material & Products. We deal in raw material of Jindal Stainless Limited (JSL) & Steel Authority Of India Limited (SAIL), we also import these materials / products from Korea, Europe, South Africa, South America, Vietnam, Thailand, Indonesia and other countries.

We never compromise on quality, and this makes us a preferred choice among our competitors. The best part is that quality norms are not only followed in procuring, the broad spectrum of this stretches to delivery as well. After receiving the request from the concerned clients, we deliver these products within the defined time frame. We keep constant touch with the clients to know their exact requirements.

Our mentor has been the guiding star since decades. Owing to his industrial experience and managerial skills, we are able to attain huge success rate. By adopting fair business policies and transparency, we are able to attain complete client satisfaction.

Product Portfolios

We are instrumental in offering wide assortment of stainless steel products for the clients. Since the day of commencement, we are executing our business operations smoothly our products plethora includes

- Stainless Steel Coils
- Stainless Steel Slit Coils
- Stainless Steel Sheets
- Stainless Steel Plates
- Stainless Steel Pipes
- Stainless Steel Tubes
- Stainless Steel Flats
- Stainless Steel Angles
- Stainless Steel Rods
- Stainless Steel Fittings
- Stainless Steel Decorative & Perforated Sheets
- Stainless Steel Channel
- Aluminum Sheets
- Aluminum Coils
- Aluminum Flats
- Aluminium Chequered Plates
- Copper & Brass

Client Satisfaction

Being the client oriented organization; we are able to cater qualitative products for the clients. Keeping in mind the convenience of our clients, we provide products in diverse specifications in order to fulfill their varied requirements. Furthermore, due to quick deliveries of the orders, our competent professionals have supported us in earning great respect across the region. Your valuable feedback is widely appreciated as it helps in upgrading our services.

Industrial experience blended with quality, commitment, promptness
punctuality & trust worthiness has been our

"SECRET OF SUCCESS"

and the quality oriented customer once experienced our empathetic
approach really wants us by all means which has been our

"STRENGTH"

we enjoy serving you
The Owners

MoU No.: CPSOCH0137



CERTIFICATE OF
MOU PARTNERSHIP

This is to certify that
SALEM STEEL TRADING CO.
has entered into an

Memorandum of Understanding (MoU)

for dealing in Stainless Steel Products of Jindal Stainless,
on non-exclusive basis, for the period
April 1, 2024 to March 31, 2025*

A handwritten signature in black ink, appearing to read 'Rajeev Garg'.

Rajeev Garg
Head - Domestic & International Sales

**Subject to Terms & Conditions*

This MOU does not entitle you to represent Jindal Stainless Limited (JSL) in any Public / PSUs / Government tenders and related activities nor to make any commitment on behalf of JSL to any person whatsoever.

A handwritten signature in black ink, appearing to read 'Khulbe'.

Tarun Khulbe
CEO



स्टील अथॉरिटी ऑफ इण्डिया लिमिटेड
STEEL AUTHORITY OF INDIA LIMITED

Certificate of MoU Partnership

This is to certify that

Metinox Metal LLP

has signed a

Memorandum of Understanding (MoU)

for purchase of Stainless Steel from SAIL Salem Steel Plant
for the period
April 2024 to March 2025*

SNM Rao
Chief General Manager (Marketing)
SAIL / Salem Steel Plant



VK Pandey
Executive Director
SAIL / Salem Steel Plant

* Subject to Terms and Conditions



Product Range - Stainless Steel

Stainless Steel is available in a variety of forms. We have a ready stock of the following product range :

S.No.	Product Description	Thickness (mm)	Width (mm)	Length (mm)
1.	S.S. Foils	0.05 - 0.50	50-600	Any Length
2.	S.S. Coils	0.20 - 12.0	600-2500	Any Length
3.	S.S. Sheets	0.40 - 4.0	900-2000	Any Length
4.	S.S. Plates	4.00 - 100.0	1000-2500	Any Length
5.	S.S. Strips	0.20 - 3.0	9-600	Any Length
6.	S.S. Flats	3.0 - 50.0	Any width	Any Length
7.	S.S. Pipes	0.5-25.0 (Wall)	3.0-610.0 (O.D)	Any Length
8.	S.S. Wires	0.05 - 2.0 (Ø)	-	Any Length
9.	S.S. Rods	2.0 - 400.0 (Ø)	-	Any Length
10.	S.S. Rounds	0.10 - 50.0 (Ø)	10-2000 (Ø)	-
11.	S.S. Flanges	Any Size	Any Size	Any Size
12.	S.S. Channels	Any Size	Any Size	Any Size
13.	S.S. Angles	Any Size	Any Size	Any Size
14.	S.S. Pipe Fittings	Any Size	Any Size	Any Size
15.	S.S. Balls	Any Size	Any Size	Any Size
16.	S.S. Rings	Any Size	Any Size	Any Size

Any Non Standard Size Can Be Provided

Surface Finishes - Stainless Steel

Surface finish is an important element in any specification for stainless steel. SSTC offers you a wide range of finishes with expert guidance on which finish would be best suited for your application.

Hot Rolled

No.1 Finish : Slabs are hot rolled to plate / coils, annealed shot blasted and pickled. This results in a dull, slightly rough surface; quite suitable for industrial application.

Cold Rolled

2D Finish : Material with No. 1 finish is cold rolled, annealed and pickled, This results in a dull but superior finish, when compared to No. 1 finish. it is suitable for severe deep drawing as the dull surface retains the lubricant during the drawing operation.

2B Finish : Material with 2D finish is given a subsequent light skin pass operation between polished rolls. It is brighter than 2D and is semi - reflective.

No3 Finish : This is ground unidirectional uniform finish obtained with 100 - 120 grit abrasive. It is a good intermediate finish for surfaces which would require finer finish after the fabrication / forming process.

No4 Finish : This is ground unidirectional uniform finish obtained with 120 - 150 grit abrasive. It is not highly reflective but is suited for components which would suffer from rough handling.

BA Finish : Annealing is done in a controlled atmosphere of cracked ammonia to avoid any oxidation of metal which ensures a bright finish called BA finish. The final surface developed will have a MIRROR type finish. Strips processed through bright annealing line have a brighter luster than material conventionally annealed and pickled.

No8 Finish : This is the most reflective finish obtained by polishing with rotating cloth mops and polishing soaps / paste containing fine abrasives.

Special Finishes

Chequered, Moon Rock, striped Finish

The are typical rolled finishes produced by using an etched roll in the final pass in cold reduction.

Matt Finish : This produced by using a specific rough ground roll during skin passing of 2D Finish material. It offers a matt surface with least reflectivity.

Note : Any specific finish requirements can be supplied with mutual discussion



Stainless Steel Characteristics & Applications

Series		Grades	Characteristics	Applications
Austenitic Series	Basic	AISI 304	Widely used, corrosion resistant, heat resistant, good mechanical properties in low temperature, no heat treatment hardening, weak magnetism.	Home Kitchen utensils, industry, medical apparatus, building material and decoration.
		AISI 304L	Better intergranular corrosion resistance, can be heat treated after welding.	Petroleum equipment, chemical equipment, building material, heat resistant parts and the parts are difficult to heat treatment.
	High tensile Strength	AISI 301	Low content of Cr and N than 304 grade, It's strength, hardness and magnetism can be increased by cold working.	Trains, aircrafts, vehicles, springs.
		AISI 301L *	Improving, intergranular corrosion resistance by decreasing content and increasing N content from 301 grade.	Frame and crust parts of train.
	Deep Drawing	AISI 304Cu	Better formability than 304 grade by addition of cu, suitable for deep drawing.	Domestic appliances.
		AISI 304Ni8.5	Better formability than 304 grade by increasing Ni content, suitable for deep drawing.	Domestic appliances.
		AISI 304Ni9	Better formability than 304 grade by increasing Ni content, suitable for deep drawing.	Domestic appliances.
	High Corrosion Resistance	AISI 316	Better formability than 304 grade in sea water and other corrosive solutions, higher heat-resistance, good cold work hardening and performance, no magnetism.	Chemical industry, food processing equipments, coastal installations.
		AISI 316L	Compare with AISI 316, has better intergranular corrosion resistance and water heat-resistance, no magnetism.	Chemical industry, food processing equipments used in severe corrosive condition, coastal installations used.
		AISI 321	Intergranular corrosion resistance, heat resistant, good formability and weldability anit-oxidizing in high temperature.	jet engine parts, heat exchanger, boiler cover, chemical devices.
		AISI 310 / 310S	Excellent high temperature properties with good ductility & weldability.	Used upto 1150°C for continuous service & 1050° for intermittent service in oxidising atmosphere.
Ferritic Series	Basic	AISI 430	Typical ferritic, stainless steel grade, low thermal extensibility, good formability and antioxygenic property.	Heat-resistance utensils, combustion devices, domestic appliance, kitchen utensils category, building decorating material.
	Welded and Corrosion Resistant	AISI 409L	good formability and weldability, antioxygenic property in high temperature.	exhaust system of automobiles
		AISI 436L *	good corrosion resistance, formability and weldability, corrosion resistant to condensation in exhaust piping of automobiles.	Automobiles exhaust piping, boiler.
		AISI 444	good corrosion resistance, formability and weldability, compare with 316L, has better stress corrosion resistance and spot corrosion resistance.	Water heater, water tank, automobile, exhaust piping.
		AISI 409 / 409 M	It replaces carbon steels and low alloy steels where higher strength, abrasion resistance, weld-ability and slide-ability are required. It posses good scaling & oxidation resistance at elevated temperature including sulphur bearing atmospheres	Solids handling areas/bunkers, transport(wagons), petrochemical, sugar, agriculture, fishing, mining & quarrying, sewage plants and general engineering industries
Martensite Series	Basic	AISI 403	12% Cr ensuring high degree of cleanliness hard enable by heat treatment.	Reactor components, turbine blades and ring & other highly stressed parts
		AISI 410 / 410S	General purpose corrosion & heat resisting steel; gives maximum corrosion resistance after heat treatment. Hard enable by heat treatment.	Cutlery, Shafts, Cracking tower, babbler caps & trays for oil & gas industry, beater bars for paper & pulp industries etc.
		AISI 420J2*	High post-quenching strength, suitable for wearable parts.	Knife, pipe nozzles, valves, metal rules and cooking utensils.

*Austenitic Stainless Steels are not Hard enable by heat treatment. This can be Hardened by cold work only.

Equivalent International Stainless Steel Grades

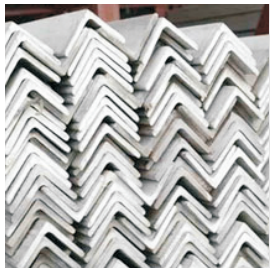
	Grades	UNS Designation	USA - Canada / AISI - ASTM - ASME	INDIA / IS Letter Symbol	European	Chinese	GERMANY / DIN Designation	Japan/ JIS	GOST
Austenitic Cr-Mn	201	S20100	201	X10Cr17Mn6Ni4N20	-	-	X12CrMnNiN17-7-5	SUS201	-
	201L	S20103	201L	-	1.4371	-	X2CrMnNiN17-7-5	-	-
	201LN	S20153	201LN	-	-	-	-	-	-
	202	S20200	202	X10Cr18Mn9Ni5	-	-	X12CrMnNiN18-9-5	SUS202	-
	204 Cu	S20430	-	-	-	-	-	-	-
Austenitic Cr-Ni	301	S30100	301	X10Cr17Ni7	1.4310	1Cr17Ni7	X12CrNi17-7	SUS301	-
	301L	S30103	301L	-	-	-	-	-	-
	301LN	S30153	301LN	-	1.4318	-	X2CrNi18-7	-	-
	304	S30400	304	X04Cr19Ni9	1.4301	0Cr18Ni9	X5CrNi18-10	SUS304	-
	304H	S30409	304H	-	-	-	-	-	-
	304L	S30403	304L	-	1.4307	-	X2CrNi18-9	SUS304L	-
	304LN	S30453	304LN	-	1.4311	-	X2CrNi18-10	SUS304LN	-
	309	S30900	309	X15Cr24Ni13	1.4828	-	-	-	-
	309S	S30908	309S	-	1.4833	1Cr23Ni13	X7CrNi23-14	SUS309S	-
	310	S31000	310	X20Cr25Ni20	-	-	X15CrNiSi25-20	SUH310	20Ch25N20S2
	310S	S31008	310S	-	1.4845	0Cr25Ni20	X12CrNi25-21	SUS310S	20Ch23N18
	316	S31600	316	X04Cr17Ni12Mo2	1.4401	0Cr17Ni12Mo2	X5CrNiMo17-12-2	SUS316	-
	316L	S31603	316L	X02Cr17Ni12Mo2	1.4404	00Cr17Ni14Mo2	X2CrNiMo17-13-2	SUS316L	-
	316LN	S31653	316LN	-	1.4429	-	X2CrNiMoN17-11-2	SUS316LN	-
	316Ti	S31635	316Ti	X04Cr17Ni12Mo2Ti	1.4571	0Cr18Ni12Mo2Ti	X6CrNiMoTi17-12-2	SUS316Ti	10Ch17N13M2T
	317	S31700	317	-	-	-	-	-	-
	317L	S31703	317L	-	1.4438	00Cr19Ni13Mo3	X2CrNiMo18154	SUS317L	-
	317LN	S31753	317LN	-	-	-	-	-	-
	31727	S31727	-	-	-	-	-	-	-
	321	S32100	321	X04Cr18Ni10Ti	1.4541	0Cr18Ni10Ti	X6CrNiTi18-10	SUS321	08Ch18N10T
	347	S34700	347	X04Cr18Ni10Nb	1.4550	0Cr18Ni11Nb	X6CrNiNb18-10	SUS347	08Ch18N12B
Martensitic	410	S41000	410	X12Cr12	1.4006	1Cr12	X12Cr13	SUS410	-
	415	S41500	-	-	1.4313	-	X3CrNiMo13-4	-	-
	420	S42000	420	X20Cr13	1.4021	-	X20Cr13	SUS420J1	-
	431	S43100	431	-	1.4057	1Cr17Ni2	X17CrNi15-2	-	20Ch17N2
	405	S40500	405	X04Cr12	1.4002	0Cr13Al	X6CrAl13	SUS405	-
Ferritic	409	S40900	409	-	1.4512	-	X2CrTi12	SUH409	-
	409RC	-	-	-	-	-	-	-	-
	410S	S41008	410S	-	1.4000	0Cr13	X6Cr-13	SUS403	-
	430	S43000	430	X07Cr17	1.4016	1Cr17	X6Cr-17	SUS430	-
	430Ti	-	-	-	-	-	X3CrTi17	SUS430LX	-
	436	S43600	436	-	-	-	-	-	-
	436L	S43932	436L	-	-	-	-	SUS436L	-
	439	S43035	439	-	-	00Cr18Ti	X3CrTi17	-	-
	441	S43940	-	-	1.4509	-	X2CrTiNb18	-	-
	Ferritic + Martensitic								
	409M	-	-	-	-	-	-	-	-
Duplex (Austenitic+ Ferritic)									
	2205	S32205	2205	-	-	-	-	-	-
	31803	S31803	-	-	1.4462	-	X2CrNiMoN 22-5-3	SUS329J3L	-
	2304	S32304	2304	-	1.4362	-	X2CrN N 23-4	-	-

Mechanical Properties of Stainless Steel

Grade	UTS N/mm ² (Min.)	0.2% Proof Stress N/mm ² (min.)	% Elongation on 50% GL (Min.)	Hardness RB (max)
301	515	205	40	95
304	515	205	40	92
304L	485	170	40	92
310S	515	205	40	95
316	515	205	40	95
316L	485	170	40	95
321	515	205	40	95
409	380	205	20	88
409M	450	275	20	90
410S	415	205	22	89
430	450	205	22	89

Physical Properties : of Stainless Steel

Property	301	304	316	310S	430	409
Density (gm/cm ³)	7.9	7.9	8.0	7.9	7.7	7.7
Modulus of Elasticity (Kg/mm ²)	19700	19700	19700	20300	20300	20300
Specific Heat Capacity (Cal/gm/°C)	0.12	0.12	0.12	0.12	0.11	0.11
Thermal Conductivity (Cal/cm ² /sec/°C/cm at 100°C)	0.039	0.039	0.0373	0.033	0.0625	0.0595
Specific Electrical Resistance (mW/cm ³)	72	72	74	80	60	57
Melting Range (°C)	1400 - 1420	1400-1455	1370-1400	1400-1455	1430-1510	1430-1510
Magnetic	Non Magnetic	Non Magnetic	Non Magnetic	Non Magnetic	Ferro Magnetic	Ferro Magnetic



Chemical Composition of Stainless Steel

AUSTENITIC CR-MN

Grade	%C (Max)	%Mn (Max)	%P (Max)	%S (Max)	%Si (Max)	%Cr	%Ni	%Mo	N PPM (Max)	%OTHERS
201#	0.15	5.5-7.5	0.060	0.030	1.00	16.00-18.00	3.50-5.50	-	2500	-
201L	0.030	5.5-7.5	0.045	0.030	0.75	16.00-18.00	3.50-5.50	-	2500	-
201LN	0.030	6.4-7.5	0.045	0.015	0.75	16.00-17.50	4.00-5.00	-	100-2500	Cu=1.0 Max.
202	0.15	7.5-10.0	0.060	0.030	1.00	17.00-19.00	4.00-6.00	-	2500	-
204 Cu	0.10	6.5-9.0	0.060	0.010	0.75	16.00-17.50	1.50-3.50	-	1000-200	Cu=2.0-4.0
J1	0.08	6.0-8.0	0.070	0.010	0.75	16.00-18.00	4.00-6.00	-	1000	Cu=1.5-2.0
J4/SSLN1%	0.10	8.50-10.0	0.080	0.010	0.75	15.00-16.00	1.00-2.00	-	2000	Cu=1.5-2.0
JT/SSLNA	0.13	9.75-11.0	0.1	0.015	0.75	14.00-15.25	0.40	-	-	-
301	0.15	2.00	0.045	0.030	0.75	16.00-18.00	6.00-8.00	-	1000	-
301L	0.030	2.00	0.045	0.030	0.75	16.00-18.00	6.00-8.00	-	2000	-
301LN	0.030	2.00	0.045	0.030	0.75	16.00-18.00	6.00-8.00	-	700-2000	-
304	0.07	2.00	0.045	0.030	0.75	17.50-19.50	8.00-10.50	-	1000	-
304M	0.04-0.10	2.00	0.045	0.030	0.75	18.00-20.00	8.00-10.50	-	-	-
304L	0.030	2.00	0.045	0.030	0.75	17.50-19.50	8.00-12.00	-	100	-
X5crNi18-10	0.07	2.00	0.045	1	1.00	17.50-19.50	8.00-12.00	-	1000-1600	-
304LN	0.030	2.00	0.045	0.030	0.75	18.00-20.00	8.00-12.00	-	-	-
309	0.20	2.00	0.045	0.030	0.75	22.00-24.00	12.00-15.00	-	-	-
309S	0.08	2.00	0.045	0.030	0.75	22.00-24.00	12.00-15.00	-	-	-
310	0.25	2.00	0.045	0.030	1.50	24.00-26.00	19.00-22.00	-	-	-
310S	0.08	2.00	0.045	0.030	1.50	24.00-26.00	19.00-22.00	-	-	-
316	0.08	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	1000	-
316L	0.030	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	1000	-
316LN	0.030	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	1000-1600	-
316Ti	0.08	2.00	0.045	0.030	0.75	16.00-18.00	10.00-14.00	2.00-3.00	1000	Ti=5x(C+N)Min., 0.07 Max.
317	0.08	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	1000	-
317L	0.030	2.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	1000	-
317LN	0.030	1.00	0.045	0.030	0.75	18.00-20.00	11.00-15.00	3.00-4.00	1000-2200	-
31727	0.030	2.00	0.045	0.030	0.75	17.50-19.00	14.50-16.50	3.80-4.50	1500-2100	Cu=2.8-4.0
321	0.08	2.00	0.045	0.030	0.75	17.00-19.00	9.00-12.00	-	1000	Ti=5x(C+N)Min., 0.07 Max.
347	0.08	2.00	0.045	0.030	0.75	17.00-19.00	9.00-13.00	-	-	Nb=10XC Min., 1.00 Max.
410	0.08-0.15	1.00	0.040	0.030	1.00	11.50-13.50	0.75 max	-	-	-
415	0.05	0.50-1.00	0.030	0.030	0.60	11.50-14.00	3.50-5.50	0.50-1.00	-	-
420	0.15 min	1.00	0.040	0.030	1.00	12.00-14.00	0.75 mx	0.50 max	-	-
431	0.20	1.00	0.040	0.030	1.00	15.00-17.00	1.25-2.50	-	-	-
BS	0.6-0.7	1.00	0.030	0.015	0.75	12.50-13.50	-	-	-	-
405	0.08	1.00	0.040	0.030	1.00	11.50-14.50	0.60	-	-	Al=0.10-0.30
409	0.030	1.00	0.040	0.020	1.00	10.50-11.70	0.50 max	-	-	Ti=6x(C+N)Min., 0.05 Max.
409L	0.030	1.00	0.040	0.030	1.00	10.50-11.70	0.50 max	-	300	Ti=6x(C+N)Min., 0.05 Max.
410S	0.08	1.00	0.040	0.030	1.00	11.50-13.50	0.60 max	-	-	-
430	0.12	1.00	0.040	0.030	1.00	16.00-18.00	0.75 max	-	-	-
430Ti	0.030	1.00	0.040	0.030	1.00	16.00-19.00	-	0.75-1.25	-	Ti=0.10-1.00
436	0.120	1.00	0.040	0.030	1.00	16.00-18.00	-	0.75-1.25	-	Nb=5XC Min., 0.70 Max.
436L	0.025	1.00	0.040	0.030	1.00	16.00-19.00	-	-	250	%Nb or & Ti or % Combination =8x (C+N) Min., 0.80 Max.
439	0.030	1.00	0.040	0.030	1.00	17.00-19.00	0.50 max	-	300	Ti=0.20-4x(C+N) Min., 1.10 Max. Al=0.15 Max.
441	0.030	1.00	0.040	0.015	1.00	17.50-18.50	-	-	-	Nb=3X%C+0.3 Min. 1% Max. Ti=0.14-0.6%
409M	0.030	0.8-1.5	0.030	0.030	1.00	10.80-12.50	1.50 max	-	300	Ti=0.75Max
X2crNi12	0.030	1.50	0.045	0.015	1.00	10.50-12.50	0.3-1.0	-	-	-
2205	0.030	2.00	0.030	0.020	1.00	22.00-23.00	4.50-6.50	3.0-3.50	1400-2000	-
2304	0.030	2.50	0.040	0.030	1.00	21.50-24.50	3.00-5.50	0.05-0.60	500-2000	Cu0.05 Min.-0.60 Max.
31803	0.030	2.00	0.030	0.020	1.00	21.00-23.00	4.50-6.50	2.50-3.50	800-2000	-

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Dimensional Tolerances of Stainless Steel

Normal Tolerances on Thickness (Width upto 1500 mm) Cold Rolled

Thickness (mm)	Tolerance ($\pm$) mm
0.30 to < 0.60	0.05
0.60 to < 0.80	0.07
0.80 to < 1.00	0.09
1.00 to < 1.25	0.10
1.25 to < 1.60	0.12
1.60 to < 2.00	0.15
2.00 to < 2.50	0.17
2.50 to < 3.15	0.22
3.15 to < 4.00	0.25
4.00 to < 6.00	0.25

Normal Tolerances on Thickness (width upto 1500 mm) Hot Rolled

Thickness (mm)	Tolerance ($\pm$) mm
2.00 to < 2.25	0.18
2.25 to < 2.50	0.20
2.50 to < 2.75	0.23
2.75 to < 3.00	0.25
3.00 to < 3.25	0.25
3.25 to < 3.50	0.30
3.50 to < 3.75	0.30
3.75 to < 4.00	0.36
4.00 to < 4.99	0.36
4.99 to < 5.00	0.36

- For thickness above 5.00 mm the applicable tolerance would be 5-8% of the thickness.
- Thickness measurement are taken at 20mm from the edge.
- The above tolerances are applicable both for sheets and coils.

Tolerances on Length

Upto 4 mm thickness	+10 mm
Beyond 4 mm thickness	+30 mm

Note : The above tolerances are applicable for sheets and plates only.

Selection of welding processes of stainless steel

Welding Method	Recommended Thickness (mm)	Austentic	Weldability Ferritic	Martensitic
Shield Metal Arc Welding (SWAW)	>0.8	Easy to weld	can be welded with care	Difficult to weld Requires Special Care
Gas Tungsten Arc Welding (GTAW)	<3.0	Easy to weld	can be welded with care	can be welded with care
Gas Metal Arc Welding (GMAW)	>3.0	Easy to weld	can be welded with care	can be welded with care
Submerged Arc Welding (SAW)	>6.0	can be welded with care	can be welded with care	can be welded with care
Resistance Spot welding	<3.0	Easy to weld	easy to weld	can be welded with care
Resistance Seam welding	<3.0	Easy to weld	can be welded with care	Difficult to weld Requires special care



Condensed ASTM Specification for Stainless Steel Tubing and Piping

Specification	Allowable outside Diameter Variations in mm			Allowable Wall Thickness Variations		Exact Length Tolerances in mm		Testing
	Nominal Diameter	Over	Under	% Over	% Under	Over	Under	
ASTMA - 213 Seamless Boiler Superheater and Heat Exchanger Tubes	Under 25.4	.1016	.1016	+20	- 0	3.175	0	Tension Test
	25.4 - 381 incl.	.1524	.1524	+20	- 0	3.175	0	Flattening Test
	38.1 - 50.8 excl.	.2032	.2032	+22	- 0	3.176	0	Flare Test
	50.8 - 63.5 exc.	.254	.254	+22	- 0	4.76	0	Hardness Test
	63.5 - 76.2 Excl.	.3048	.3048	+22	- 0	4.76	0	100% Hydrostatic Test
ASTM A-249 Welder Boiler Superheater and Exchanger and Condenser Tubes	76.2 - 101.6 incl.	.381	.381	+22	- 0	4.76	0	Refer to ASTM - 450
	Under 25.4	.1016	.1016	+10	-10	3.175	0	Tension Test
	25.4 - 381 incl.	.1524	.1524	+10	-10	3.175	0	Flattening Test
	38.1 - 50.8 excl.	.2032	.2032	+10	-10	3.175	0	Flare Test
	50.8 - 63.5 excl.	.254	.254	+10	-10	4.76	0	Reverse Bend Test
ASTM A-269 Seamless & Welded Tubing for General Service	63.5 - 76.2 exc.	.3048	.3048	+10	-10	4.76	0	Hydrostatic Test
	76.2 - 101.6 incl.	.381	.381	+10	-10	4.76	0	100% Hydrostatic Test
	Under 12.7	.13	.13	+15	-15	3.2	0	Reverse Flattening Test
	12.7 - 38.1 excl.	.13	.13	+10	-10	3.2	0	Refer to ASTM A-450 wherever applicable
	38.1 - 88.9 excl.	.25	.25	+10	-10	4.8	0	Flare Test
ASTM A-312 Seamless and Welded Austenitic Pipe	88.9 - 139.7 excl.	.38	.38	+10	-10	4.8	0	Flange Test (Welded only)
	139.7 - 203.2 excl.	.76	.76	+10	-10	4.8	0	Hardness Test
	13.72 - 48.26	+0.40	-0.79	-12.5%				Reverse Flattening Test
	60.33 - 114.3	+0.79	-0.79					(welded only)
	141.3 - 219.08	+1.59	-0.79					100% Hydrostatic Test
ASTM A-358 Welded Austenitic pipe	168.28 - 219.08	+1.59	-0.79					Refer to ASTM A-269
	273.05 - 373.85	+2.38	-0.79					
ASTM A-409 Welded austenitic pipe	219.08 - 750 mm	± 0.5%		-0.3 mm				Tension Test
	355.6 - 750 mm	±0.2% to ±0.4%		-0.46 mm				Flattening Test
								100% Hydrostatic Test

Theoretical Mass

Weight (in kg/mtr) & Thickness of SS Pipe & Tube for Boiler, Heat Exchangers.

Size (inch)	O.D. (mm)	10G (3.25)	12G (2.64)	14G (2.03)	16G (1.62)	18G (1.21)	20G (0.91)	22G (0.71)
¼	6.35	0.025	0.232	0.216	0.192	0.152	0.122	0.099
5/16	7.93	0.378	0.349	0.295	0.262	0.199	0.159	0.126
3/8	9.52	0.505	0.448	0.442	0.322	2.659	0.192	0.152
½	12.70	0.751	0.664	0.521	0.445	0.349	0.262	0.209
¾	19.05	1.283	1.033	0.850	0.714	0.535	0.412	0.322
1	25.40	1.798	1.475	1.166	0.977	0.724	0.555	0.435
1 ¼	31.82	2.313	1.927	1.489	1.246	0.914	0.664	-
1 ½	38.10	2.828	2.326	1.801	1.502	1.103	-	-
1 ¾	44.45	3.390	2.765	2.147	1.761	1.296	-	-
2	50.80	3.859	3.191	2.436	2.017	1.485	-	-
2 ¼	57.15	4.371	3.606	2.752	2.283	1.675	-	-
2 ½	63.50	4.892	4.022	3.071	2.632	1.868	-	-
2 ¾	69.85	5.418	4.447	3.311	2.815	2.057	-	-
3	76.20	5.923	4.853	3.706	3.071	2.247	-	-
3 ½	88.90	6.953	5.710	4.341	3.596	2.629	-	-
4	101.60	7.987	6.551	4.976	4.118	3.008	-	-
4 ½	114.30	9.018	7.392	5.344	4.643	3.390	-	-
5	127.00	10.048	8.233	6.245	5.165	3.769	-	-
5 ½	139.70	11.168	9.074	6.880	5.694	4.155	-	-
6	152.40	12.145	9.915	7.515	6.232	4.533	-	-
6 ½	165.10	13.212	10.822	8.150	6.741	4.902	-	-



STAINLESS STEEL PIPE DIMENSION STANDARD SCHEDULE SIZE IN KG. PER MTR. (As per ANSI B 36. 19-1965)

NOMINAL BORE		Outside Diameter	Schedule 5 S		Schedule 10 S		Schedule 20 S		Schedule 40 S		Schedule 80 S		Schedule 160 S		Schedule XXS	
MM	INCH	MM	WT MM	WEIGHT (KG/MT)	WT MM	WEIGHT (KG/MT)	WT MM	WEIGHT (KG/MT)	WT MM	WEIGHT (KG/MT)	WT MM	WEIGHT (KG/MT)	WT MM	WEIGHT (KG/MT)	WT MM	WEIGHT (KG/MT)
3	1/8	10.3	1.24	0.276	1.24	0.28	1.5	0.33	1.73	0.37	2.41	0.47	-	-	-	-
6	1/4	13.7	1.24	0.390	1.65	0.49	2.00	0.58	2.24	0.631	3.02	0.80	-	-	-	-
10	3/8	17.1	1.24	0.490	1.65	0.63	2.00	0.74	2.31	0.845	3.20	1.10	-	-	-	-
15	1/2	21.3	1.65	0.80	2.11	1.00	2.30	1.07	2.77	1.27	3.75	1.62	4.75	1.94	7.47	2.55
20	3/4	26.7	1.65	1.03	2.11	1.28	2.55	1.52	2.87	1.68	3.91	2.20	5.54	2.90	7.82	3.63
25	1	33.4	1.65	1.30	2.77	2.09	3.00	2.24	3.38	2.50	4.55	3.24	6.35	4.24	9.09	5.45
32	1.1/4	42.2	1.65	1.65	2.77	2.70	3.00	2.90	3.56	3.39	4.85	4.47	6.35	5.61	9.70	7.77
40	1.1/2	48.30	1.65	1.91	2.77	3.11	3.00	3.55	3.68	4.05	5.08	5.41	7.14	7.25	10.1	9.54
50	2	60.3	1.65	2.40	2.77	3.93	3.00	4.24	3.91	5.44	5.54	7.48	8.74	11.1	11.07	13.44
65	2.1/2	73.0	2.11	3.69	3.05	5.26	4.00	6.81	5.16	8.63	7.01	11.41	9.53	14.9	14.02	20.39
80	3	88.9	2.11	4.51	3.05	6.45	4.00	8.37	5.49	11.29	7.62	15.27	11.1	21.30	15.24	27.68
100	4	114.3	2.11	5.84	3.05	8.36	4.50	12.18	6.02	16.07	8.56	22.32	13.49	33.54	17.12	41.03
125	5	141.3	2.77	9.47	3.40	11.57	5.00	16.80	5.55	21.8	9.53	31.97	15.88	49.11	19.05	57.43
150	6	168.3	2.77	11.32	3.40	13.84	6.35	25.36	7.11	28.30	10.97	42.70	18.20	67.56	21.95	79.22
200	8	219.1	2.77	14.79	3.76	19.96	6.35	33.31	8.18	42.61	12.7	64.64	23.01	111.27	22.23	107.92
250	10	273.1	3.40	22.63	4.19	27.78	6.35	41.77	9.27	60.50	12.7	96.01	28.58	172.33	25.40	155.15
300	12	323.9	3.96	31.25	4.57	36.00	6.35	49.7	9.53	73.88	12.7	132.08	33.32	238.76	25.40	186.97
350	14	355.6	3.96	34.36	4.78	41.3	7.92	67.80	11.13	94.59	19.05	158.08	35.71	281.70	-	-
400	16	406.4	4.19	41.56	4.78	47.29	7.92	77.83	12.7	123.30	21.41	203.33	40.46	365.11	-	-
450	18	457.0	4.19	46.80	4.78	53.42	7.92	87.71	14.27	155.80	23.8	254.36	45.71	466.40	-	-
500	20	508.0	4.78	56.25	5.54	68.61	9.53	117.14	15.09	183.42	26.19	311.2	49.99	564.68	-	-
600	24	610.0	5.54	82.47	6.35	94.45	9.53	141.12	17.48	255.41	30.96	442.08	59.54	808.22	-	-
650	26	660.4	-	-	7.92	129.40	-	-	9.53	155.32	12.70	205.97				
700	28	711.2	-	-	7.92	139.47	-	-	9.53	167.44	12.70	222.13				
750	30	762.0	6.35	120.15	7.92	149.55	-	-	9.53	179.56	12.70	238.28				
800	32	812.8	-	-	7.92	159.62	-	-	9.53	191.69	12.70	254.44				
850	34	863.6	-	-	7.92	169.64	-	-	9.53	203.74	12.70	270.50				
900	36	914.4	-	-	7.92	179.77	-	-	9.53	215.93	12.70	286.75				

Formula - Pipe Weight Kg/Mtr OD - Thick x Thick x 0.02466 = Kg Per Mtr.



Stainless Steel Tube Weight Calculation

SIZE		6Mtrs (Per Length)				
MM	INCH	1.0MM	1.2MM	1.5MM	2.00MM	3.00MM
ROUND		Weight	Weight	Weight	Weight	Weight
12.7	1/2	1.8Kgs	2.1Kgs	2.5kgs	3.2kgs	4.4kgs
15.9	5/8	2.3Kgs	2.7kgs	3.3kgs	4.2kgs	5.8kgs
19.1	3/4	2.9Kgs	3.2kgs	4kgs	5.1kgs	7.2kgs
25.4	1	3.7Kgs	4.4Kgs	5.5kgs	7kgs	10.02kgs
31.8	1 1/4	4.7Kgs	5.5kgs	7kgs	9kgs	13.0kgs
38.1	1 1/2	5.8Kgs	7kgs	8.2kgs	11kgs	16.0kgs
50.8	2	7.3Kgs	9kgs	11kgs	15kgs	21.3kgs
63.5	2 1/2	9.4Kgs	11.2kgs	14kgs	18.3kgs	27.1kgs
76.2	3	12Kgs	13.4kgs	17kgs	22.1kgs	32.7kgs
101.6	4	15Kgs	18kgs	22.4kgs	30kgs	44.1kgs
SQUARE (125%)						
12.5 X 12.5	1/2 X 1/2	2.3Kgs	2.6Kgs	3.2kgs	4kgs	5.41kgs
15 X 15	5/8 x 5/8	2.9Kgs	3.3Kgs	4.1kgs	5.2kgs	6.2kgs
20 X 20	3/4 x 3/4	3.7Kgs	4kgs	5kgs	6.4kgs	9.03kgs
25 X 25	1 x 1	4.7Kgs	5.5Kgs	7kgs	9kgs	11.9kgs
30 X 30	1 1/4 x 1 1/4	5.9Kgs	7kgs	8kgs	11.1kgs	14.8kgs
40 X 40	1 1/2 x 1 1/2	7.3Kgs	9kgs	10.3kgs	13.5kgs	20.1kgs
50 X 50	2 x 2	9.2Kgs	11.1kgs	14kgs	18.2kgs	26.3kgs
65X65	2 1/2 x2 1/2	12Kgs	14kgs	17.3kgs	23kgs	34.9kgs
80 X 80	3 X 3	15Kgs	17kgs	21kgs	28kgs	43.6kgs
100 X 100	4 X 4	19Kgs	22.5kgs	28kgs	37.1kgs	55.1kgs
RECTANGLE						
13 X 26	1/2 x 1	3.5Kgs	4.0Kgs	5kgs	6.4kgs	8.6kgs
20 X 40	3/4 x 1 1/2	5.6Kgs	6.5kgs	8.110	10.2kgs	14.6kgs
25 X 50	1 x 2	7Kgs	8.3kgs	10.5kgs	14.1kgs	18.7kgs
40 X 80	1 1/2 x 3	11.2Kgs	13kgs	15.5kgs	21kgs	31.5kgs
50 X 100	2 X 4	14.1Kgs	17kgs	21kgs	28kgs	39.9kgs
TOTAL						



Theoretical Mass

Weight of Round, Square & Hexagonal stainless steel Bars
Size in inches, Weight in kg / Metre

Size (inch)	Round	Square	Hexagon	Size (inch)	Round	Square	Hexagon
1/16	0.0149	0.0196	-	2 7/8	33.2400	42.4142	36.7302
1/8	0.0631	0.0801	0.0754	3	36.2316	46.2036	39.9877
3/16	0.1419	0.1811	0.1509	3 1/4	42.5472	54.2144	45.8379
1/4	0.2519	0.3201	0.2715	3 1/2	49.3281	62.8568	54.4803
5/16	0.0466	0.5025	0.4377	3 3/4	56.5080	72.1640	62.5244
3/8	0.5657	0.7213	0.6189	4	64.4191	82.1028	71.3330
7/16	0.7711	0.9825	0.8452	4 1/4	72.8288	92.7063	78.8220
1/2	1.0065	1.2827	1.1165	4 1/2	81.6374	103.9414	90.0637
9/16	1.2754	1.6244	1.4037	4 3/4	90.9114	115.7749	101.2191
5/8	1.5725	2.0020	1.7357	5	100.7172	128.2731	111.1911
11/16	1.9049	2.4265	2.1127	5 1/4	111.0880	141.4362	122.5891
3/4	2.2669	2.8878	2.5046	5 1/2	121.8910	155.1310	134.5389
13/16	2.6605	3.39048	2.9277	5 3/4	133.2591	169.5904	147.0471
7/8	3.0843	3.9289	3.3971	6	144.9264	184.7479	160.1170
15/16	3.5400	4.5106	3.9090	6 1/4	157.3914	200.5701	173.6956
1	4.0220	5.1256	4.4375	6 1/2	170.1888	217.0239	187.8824
1 1/8	5.0923	6.4984	5.6275	6 3/4	183.6510	234.0627	202.6709
1 1/4	6.2956	8.0108	6.9405	7	197.4456	251.7265	217.9147
1 3/8	7.6119	9.7060	8.3631	7 1/4	211.7055	269.9752	233.7603
1 1/2	9.041	11.5342	10.0052	7 1/2	226.7300	288.8389	250.2141
1 5/8	10.6368	13.5453	11.7436	7 3/4	241.9207	308.4605	267.1166
1 3/4	12.3320	15.7225	13.6151	8	257.6100	328.6771	284.6175
1 7/8	14.1436	18.0327	15.6327	8 1/2	291.4217	371.0913	321.2878
2	16.1214	20.5090	17.7834	9	331.6022	416.0584	360.2218
2 1/8	18.1822	23.2347	20.0769	9 1/2	364.0245	463.4487	401.4228
2 1/4	20.4426	26.0535	22.4702	10	403.2012	513.5447	444.7312
2 3/8	23.2181	29.1847	25.0962	10 1/2	444.6847	566.2134	490.3066
2 1/2	25.1626	32.0766	27.7886	11	487.6308	621.4450	538.1456
2 5/8	27.7554	35.3341	30.6140	11 1/2	533.4189	679.2427	588.2482
2 3/4	30.4810	38.8243	33.5724	12	580.3704	739.4570	640.4616



Stainless Steel Flanges

Types and Application

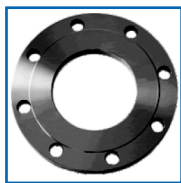
A flange is a forged or cast ring of steel designed to connect section of pipe or join pipe to a pressure vessel, valve, pump or any other integral flanged assembly.

Flanges are joined to each other by bolting and joined to the piping system by welding or threading.

The basic types of flanges are : **Slip On, Blind, Weldneck, Threaded, Socket Weld, Lap Joint and Plate.**

Flanges are designed to the following pressure rating : 150 lb, 300 lb, 400 lb, 600 lb, 900 lb, 1500 lb and 2500 lb or 10 Bar, 15 Bar, 25 Bar, 40 Bar, 64 Bar, 100 Bar and 150 Bar.

The most common facings machined on flanges are : (a) Raised face (b) Flat face (c) Ring type



Slip on Flanges

The Flange is slipped over the pipe and then welded both inside and outside to provide sufficient strength and prevent leakage. This flange is used in preference to weld necks by many users because of its lower cost and the fact that less accuracy is required while cutting pipe to length.



Threaded Flanges

This is similar to a slip on flange in outline but bore is threaded, thus enabling assembly without welding. This obviously limits its application to relatively low pressure piping systems. The flange may be welded around the joint after method of increasing its applications.



Blind Flanges

This is flange without a bore and it is used to shut off a piping system or vessel opening. It also permits easy access to vessel or piping system for inspection purpose. Blind flanges can be supplied with or without hubs at the manufacturer's option.



Socket weld flanges

This is similar to a slip-on flanges in outline, but the bore is counter-bored to accept pipe. The diameter of the remaining bore is the same as the inside diameter of the pipe. The flange is attached to the pipe by a fillet weld around the hub of the flange. An optional interval weld may be applied in high stress applications. Its biggest use is in high pressure systems such as hydraulic and steam line.



Weld neck flanges

This is designed to be joined to a piping system by butt welding. It is relatively expensive because of its long neck, but is preferred for high stresses to the pipe, reducing stress applications. The neck, or hub, transmits stress concentration at the base of the flange. The gradual transition of thickness from the base of the hub to the wall thickness at the butt weld provides important reinforcement of the flange. The bore of the flange matches the bore of the pipe, reducing turbulence and erosion.



Lap joint flanges

This is again similar to a slip-on flange, but it has radius at the intersection of the bore and the flange face to accommodate a lap stub end. The face on the stub end forms the gasket face of the flange. The type of the flange is used in application where sections of piping systems need to be dismantled quickly and easily for inspection or replacement.



Plate Flange

This is usually used with a pressed collar or stub end and is placed behind the collar or stub end. It is not weld and thus allows for easy alignment. Also permits use of other materials for the flange is not in direct contact with the liquid.



Dimensions of Various Stainless Steel Flanges

Table D - BS-10 Flange

Flange designation nominal bore of pipe	Approx. Outside diameter of Steel Pipe H	Dia- meter of flange D	Pitch Circle dia- meter (PCD) P	No. of Bolts N	Dia- meter of bolts O	Thick- ness T
in	in	in	in	in	in	in
½	27/32	3 ¾	2 5/8	4	½	3/16
¾	1 1/16	4	2 7/8	4	½	3/16
1	1 11/32	4 ½	3 ¾	4	½	3/16
1 ¼	1 11/16	4 ¾	3 7/16	4	½	¼
1 ½	1 29/32	5 ¼	3 7/8	4	½	¼
2	2 3/8	6	4 ½	4	5/8	5/16
2 ½	3	6 ½	5	4	5/8	5/16
3	3 ½	7 ¼	5 ¾	4	5/8	3/8
4	4 ½	8 ½	7	4	5/8	3/8
5	5 ½	10	8 ¾	8	5/8	½
6	6 5/8	11	9 ¾	8	5/8	½
8	8 5/8	13 ¾	11 ½	8	5/8	½
10	10 ¾	16	14	8	¾	5/8
12	12 ¾	18	16	12	¾	¾
14	14	20 ¾	18 ½	12	7/8	7/8
16	16	22 ¾	20 ½	12	7/8	7/8
18	18	25 ¼	23	12	7/8	1
20	20	27 ¾	25 ¼	16	7/8	1 1/8
22	22	30	27 ½	16	1	1 1/8
24	24	32 ½	29 ¾	16	1	1 ¼

Table E - BS-10 Flange

Flange designation nominal bore of pipe	Approx. Outside diameter of Steel Pipe H	Dia- meter of flange D	Pitch Circle dia- meter (PCD) P	No. of Bolts N	Dia- meter of bolts O	Thick- ness T
in	in	in	in	in	in	in
½	27/32	3 ¾	2 5/8	4	½	¼
¾	1 1/16	4	2 7/8	4	½	¼
1	1 11/32	4 ½	3 ¾	4	½	9/32
1 ¼	1 11/16	4 ¾	3 7/16	4	½	5/16
1 ½	1 29/32	5 ¼	3 7/8	4	½	11/32
2	2 3/8	6	4 ½	4	5/8	3/8
2 ½	3	6 ½	5	4	5/8	13/32
3	3 ½	7 ¼	5 ¾	4	5/8	7/16
4	4 ½	8 ½	7	4	5/8	½
5	5 ½	10	8 ¾	8	5/8	9/16
6	6 5/8	11	9 ¾	8	¾	11/16
8	8 5/8	13 ¾	11 ½	8	¾	¾
10	10 ¾	16	14	12	7/8	7/8
12	12 ¾	18	16	12	7/8	1
14	14	20 ¾	18 ½	12	7/8	1 1/8
16	16	22 ¾	20 ½	12	7/8	1 ¼
18	18	25 ¼	23	16	7/8	1 3/8
20	20	27 ¾	25 ¼	16	7/8	1 ½
22	22	30	27 ½	16	1	1 ¾
24	24	32 ½	29 ¾	16	1 1/16	1 7/8

Table F - BS-10 Flange

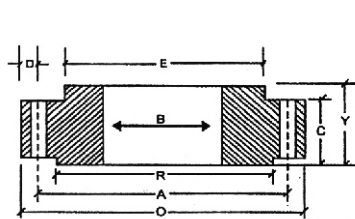
½	27/32	3 ¾	2 5/8	4	½	3/8
¾	1 1/16	4	2 7/8	4	½	3/8
1	1 11/32	4 ¾	3 7/16	4	5/8	3/8
1 ¼	1 11/16	5 ¼	3 7/8	4	5/8	½
1 ½	1 29/32	5 ½	4 1/8	4	5/8	½
2	2 3/8	6 ½	5	4	5/8	5/8
2 ½	3	7 ¼	5 ¾	8	5/8	5/8
3	3 ½	8	6 ½	8	5/8	5/8
4	4 ½	9	7 ½	8	5/8	¾
5	5 ½	11	9 ¾	8	¾	7/8
6	6 5/8	12	10 ¾	12	¾	7/8
8	8 5/8	14 ½	12 ¾	12	¾	1
10	10 ¾	17	15	12	7/8	1 1/8
12	12 ¾	19 ¼	17 ¼	16	1	1 ¼
14	14	21 ¾	19 ½	16	1	1 3/8
16	16	24	21 ¾	20	1	1 5/8
18	18	26 ½	24	20	1 1/8	1 ¾
20	20	29	26 ½	24	1 1/8	2
22	22	31	28 ½	24	1 1/8	2 1/8
24	24	33 ½	30 ¾	24	1 ¼	2 ¼

Table H - BS-10 Flange

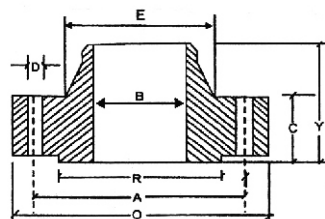
½	27/32	4 ½	3 ¾	4	5/8	½
¾	1 1/18	4 ¾	3 ¾	4	5/8	½
1	1 11/32	4 ¾	3 7/18	4	5/8	8/16
1 ¼	1 11/16	5 ¼	3 7/8	4	5/8	9/16
1 ½	1 29/32	5 ½	4 1/8	4	5/8	¾
2	2 3/8	6 ½	5	4	5/8	11/16
2 ½	3	7 ¼	5 ¾	8	5/8	¾
3	3 ½	8	6 ½	8	5/8	7/8
4	4 ½	9	7 ½	8	5/8	1
5	5 ½	11	9 ¾	8	¾	1 1/8
6	6 5/8	12	10 ¾	12	¾	1 1/8
8	8 5/8	14 ½	12 ¾	12	¾	1 1/4
10	10 ¾	17	15	12	7/8	1 3/8
12	12 ¾	19 ¼	17 ¼	16	7/8	1 5/8
14	14	21 ¾	19 ½	16	1	1 7/8
16	16	24	21 ¾	20	1	2 1/8
18	18	26 ½	24	20	1 1/8	2 3/8
20	20	29	26 ½	24	1 1/8	2 5/8
22	22	31	28 ½	24	1 1/8	2 3/4
24	24	33 ½	30 ¾	24	1 ¼	3



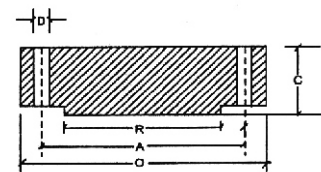
Dimensions Of Forged Flanges Ansi B 16.5



SLIP-ON FLANGE



WELDING NECK FLANGE



BLIND FLANGE

ASA 150 CLASS

Nominal Pipe Size (MM)		Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia of Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
								S/O & S/W Y	W/N Y	L/J Y	S/O & S/W B	L/J B			
(MM)	(INCH.)														
15	1/2	88.9	60.3	15.9	4	11.1	30.2	15.9	47.6	15.9	22.3	22.9	34.9	9.5	21.33
20	3/4	98.4	69.8	15.9	4	12.7	38.1	15.9	52.4	15.9	27.7	28.2	42.9	11.1	26.67
25	1	107.9	79.4	15.9	4	14.3	49.2	17.5	55.6	17.5	34.5	35.0	50.8	12.7	33.40
32	1 1/4	117.5	88.9	15.9	4	15.9	58.7	20.6	57.1	20.6	43.2	43.7	63.5	14.3	42.16
40	1 1/2	127.0	98.4	15.9	4	17.5	65.1	22.2	61.9	22.2	49.5	50.0	73.0	15.9	48.26
50	2	152.4	120.6	19.0	4	19.0	77.8	25.4	63.5	25.4	62.0	62.5	92.1	17.5	60.31
65	2 1/2	177.8	139.7	19.0	4	22.2	90.5	28.6	69.8	28.6	74.7	75.4	104.8	19.0	73.02
80	3	190.5	152.4	19.0	4	23.8	107.9	30.2	69.8	30.2	90.7	91.4	127.0	20.6	88.90
100	4	228.6	190.5	19.0	8	23.8	134.9	33.3	76.2	33.3	116.1	116.8	157.2	23.8	114.30
125	5	254.0	215.9	22.2	8	23.8	163.5	36.5	88.9	36.5	143.8	144.5	185.7	23.8	141.30
150	6	279.4	241.3	22.2	8	25.4	192.1	39.7	88.9	39.7	170.7	171.4	215.9	27.0	168.27
200	8	342.9	298.4	22.2	8	28.6	246.1	44.4	101.6	44.4	221.5	222.2	269.9	31.7	219.07
250	10	406.4	361.9	25.4	12	30.2	304.8	49.2	101.6	49.2	276.3	277.4	323.8	33.3	273.05
300	12	482.6	431.8	25.4	12	31.8	365.1	55.6	114.3	55.6	327.1	328.2	381.0	39.7	323.85
350	14	533.4	476.2	28.6	12	34.9	400.0	57.1	127.0	79.4	359.1	360.2	412.7	41.3	355.60
400	16	596.9	539.7	28.6	16	36.5	457.2	63.5	127.0	87.3	410.5	411.2	469.9	44.4	406.40
450	18	635.0	577.8	31.7	16	39.7	504.8	68.3	139.7	96.8	461.8	462.3	533.4	49.2	457.20
500	20	698.5	635.0	31.7	20	42.9	558.8	73.0	144.5	103.2	513.1	514.3	584.2	54.0	508.00
600	24	812.8	749.3	34.9	20	47.6	663.6	82.5	152.4	111.1	615.9	615.9	692.1	63.5	609.60

All Dimensions are in Millimeters • Flanges except Lap Joint will be furnished with (1.6mm) Raised Face, which is included in Thickness (C) and Length through Hub (Y).

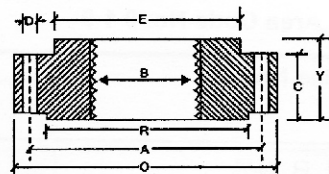
ASA 300 CLASS

Nominal Pipe Size (MM)		Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia of Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
								S/O & S/W Y	W/N Y	L/J Y	S/O & S/W B	L/J B			
(MM)	(INCH.)														
15	1/2	95.2	66.7	15.9	4	14.3	38.1	22.2	52.4	22.2	22.3	22.9	34.9	9.5	21.33
20	3/4	117.5	82.5	19.0	4	15.9	47.6	25.4	57.1	25.4	27.7	28.2	42.9	11.1	26.67
25	1	123.8	88.9	19.0	4	17.5	54.0	27.0	61.9	27.0	34.5	35.0	50.8	12.7	33.40
32	1 1/4	133.3	98.4	19.0	4	19.0	63.5	27.0	65.1	27.0	43.2	43.7	63.5	14.3	42.16
40	1 1/2	155.6	114.3	22.2	4	20.6	69.8	30.2	68.3	30.2	49.5	50.0	73.0	15.9	48.26
50	2	165.1	127.0	19.0	8	22.2	84.1	33.3	69.8	33.3	62.0	62.5	92.1	17.5	60.31
65	2 1/2	190.5	149.2	22.2	8	25.4	100.0	38.1	76.2	38.1	74.7	75.4	104.8	19.0	73.02
80	3	209.5	168.3	22.2	8	28.6	117.5	42.9	79.4	42.9	90.7	91.4	127.0	20.6	88.90
100	4	254.0	200.0	22.2	8	31.8	146.0	47.6	85.7	47.6	116.1	116.8	157.2	23.8	114.30
125	5	279.4	234.9	22.2	8	34.9	177.8	50.8	98.4	50.8	143.8	144.5	185.7	-	141.30
150	6	317.5	269.9	22.2	12	36.5	206.4	52.4	98.4	52.4	170.7	171.4	215.9	-	168.27
200	8	381.0	330.2	25.4	12	41.3	260.3	61.9	111.1	61.9	221.5	222.2	269.9	-	219.07
250	10	444.5	387.3	28.6	16	47.6	320.7	66.7	117.5	95.2	276.3	277.4	323.8	-	273.05
300	12	520.7	450.8	31.7	16	50.8	374.6	73.0	130.2	101.6	327.1	328.2	381.0	-	323.85
350	14	584.2	514.3	31.7	20	54.0	425.4	76.2	142.9	111.1	359.1	360.2	412.7	-	355.60
400	16	647.7	571.5	34.9	20	57.2	482.6	82.5	146.0	120.6	410.5	411.2	469.9	-	406.40
450	18	711.2	628.5	34.9	24	60.3	533.4	88.9	158.7	130.2	461.8	462.3	533.4	-	457.20
500	20	774.7	685.8	34.9	24	63.5	587.4	95.2	161.9	139.7	513.1	514.3	584.2	-	508.00
600	24	914.4	812.8	41.3	24	69.8	701.7	106.4	168.3	152.4	615.9	615.9	692.1	-	609.60

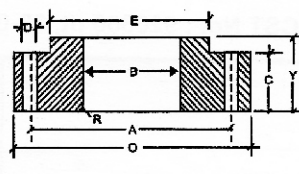
All Dimensions are in Millimeters • Flanges except Lap Joint will be furnished with (1.6mm) Raised Face, which is included in Thickness (C) and Length through Hub (Y).



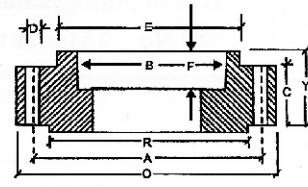
Dimensions Of Forged Flanges Ansi B 16.5



THREADED FLANGES



LAP JOINT FLANGES



SOCKET WELD FLANGES

ASA 600 CLASS

Nominal Pipe Size (MM)	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia of Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
							S/O & S/W	W/N	L/J	S/O & S/W	L/J			
							Y	Y	Y	B	B			
15	95.2	66.7	15.9	4	14.3	38.1	22.2	52.4	22.3	22.3	22.8	34.9	9.5	21.33
20	117.5	82.5	19.0	4	15.9	47.6	25.4	57.1	25.4	27.7	28.1	42.9	11.1	26.67
25	123.8	88.9	19.0	4	17.5	54.0	27.0	61.9	26.9	34.5	35.0	50.8	12.7	33.40
32	133.3	98.4	19.0	4	20.6	63.5	28.6	66.7	28.4	43.2	43.6	63.5	14.2	42.16
40	155.6	114.3	22.2	4	22.2	69.8	31.7	69.8	31.7	49.5	50.0	73.0	15.8	48.26
50	165.1	127.0	19.0	8	25.4	84.1	36.5	73.0	36.5	62.0	62.4	92.1	17.4	60.31
65	190.5	149.2	22.2	8	28.6	100.0	41.3	79.4	41.1	74.7	75.4	104.8	19.0	73.02
80	209.5	168.3	22.2	8	31.8	117.5	46.0	82.5	45.9	90.7	91.4	127.0	-	88.90
100	273.0	215.9	25.4	8	38.1	152.4	54.0	101.6	53.8	116.1	116.8	157.2	-	114.30
125	330.2	266.7	28.6	8	44.4	188.9	60.3	114.3	60.4	143.8	144.5	185.7	-	141.30
150	355.6	292.1	28.6	12	47.6	222.2	66.7	117.5	66.5	170.7	171.4	215.9	-	168.27
200	419.1	349.2	31.7	12	55.6	273.0	76.2	133.3	76.2	221.5	222.2	269.9	-	219.07
250	508.0	431.8	34.9	16	63.5	342.9	85.7	152.4	111.2	276.3	277.4	323.8	-	273.05
300	558.8	488.9	34.9	20	66.7	400.0	92.1	155.6	117.3	327.1	328.2	381.0	-	323.85
350	603.2	527.0	38.1	20	69.9	431.8	93.7	165.1	127.0	359.1	360.1	412.7	-	355.60
400	685.8	603.2	41.3	20	76.2	495.3	106.4	177.8	139.7	410.5	411.2	469.9	-	406.40
450	742.9	654.0	44.4	20	82.6	546.1	117.5	184.1	152.4	461.8	462.3	533.4	-	457.20
500	812.8	723.9	44.4	24	88.9	609.9	127.0	190.5	165.1	513.1	514.3	584.2	-	508.00
600	939.8	838.2	50.8	24	101.6	717.5	139.7	203.2	184.1	615.9	615.9	692.1	-	609.00

All Dimensions are in Millimeters • Flanges except Lap Joint will be furnished with(6.35mm) Raised Face, which is not included in Thickness (C) and Length through Hub(Y).

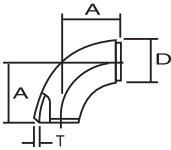
ASA 900 CLASS

Nominal Pipe Size (MM)	Flange Dia O	Dia of Bolt Circle A	Dia of Bolt Holes D	No. of Holes	Thk of Flange C	Dia of Hub E	Length through Hub			Dia of Bore		Dia of R/F R	Depth of Socket F	Pipe Dia X
							S/O & S/W	W/N	L/J	S/O & S/W	L/J			
							Y	Y	Y	B	B			
15	120.6	82.5	22.2	4	22.2	38.1	31.7	60.3	31.7	22.3	22.8	34.9	9.5	21.33
20	130.2	88.9	22.2	4	25.4	44.4	34.9	69.8	35.0	27.7	28.1	42.9	11.1	26.67
25	149.2	101.6	25.4	4	28.6	52.4	41.3	73.0	41.1	34.5	35.0	50.8	12.7	33.40
32	158.7	111.1	25.4	4	28.6	63.5	41.3	73.0	41.1	43.2	43.6	63.5	14.2	42.16
40	177.8	123.8	28.6	4	31.8	69.8	44.4	82.5	44.4	49.5	50.0	73.0	15.8	48.26
50	215.9	165.1	25.4	8	38.1	104.8	57.1	101.6	57.1	62.0	62.4	92.1	17.4	60.31
65	244.5	190.5	28.6	8	41.3	123.8	63.5	104.8	63.5	74.7	75.4	104.8	19.0	73.02
80	241.3	190.5	25.4	8	38.1	127.0	53.9	101.6	53.8	90.7	91.4	127.0	-	88.90
100	292.1	234.9	31.7	8	44.4	158.7	69.8	114.3	69.8	116.0	116.8	157.2	-	114.30
125	349.2	279.4	35.0	8	50.8	190.5	79.3	127.0	79.2	143.7	144.5	185.7	-	141.30
150	381.0	317.5	31.7	12	55.6	234.9	85.8	139.7	85.8	170.6	171.4	215.9	-	168.27
200	469.9	393.7	38.1	12	63.5	298.4	101.6	162.0	114.3	221.4	222.2	269.9	-	219.07
250	546.1	469.9	38.1	16	69.8	368.3	107.9	184.1	127.0	276.3	277.3	323.8	-	273.05
300	609.6	533.4	38.1	20	79.3	419.1	117.4	200.0	142.7	327.1	328.1	381.0	-	323.85

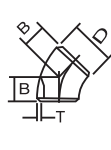
All Dimensions are in Millimeters • Flanges except Lap Joint will be furnished with(6.35mm) Raised Face, which is not included in Thickness (C) and Length through Hub(Y).



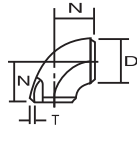
Dimensions Of Butt-welding Fitting Ansi B-16.9 / B-16.28



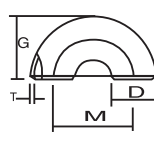
90° Elbow
Long Radius



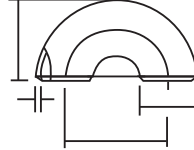
45° Elbow



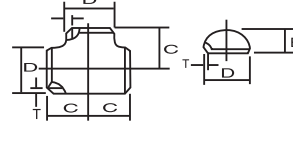
90° Elbow
Short Radius



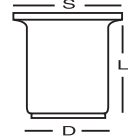
180° Return
Short Radius



180° Return
Long Radius



Tee Equal Tee



Stub-End

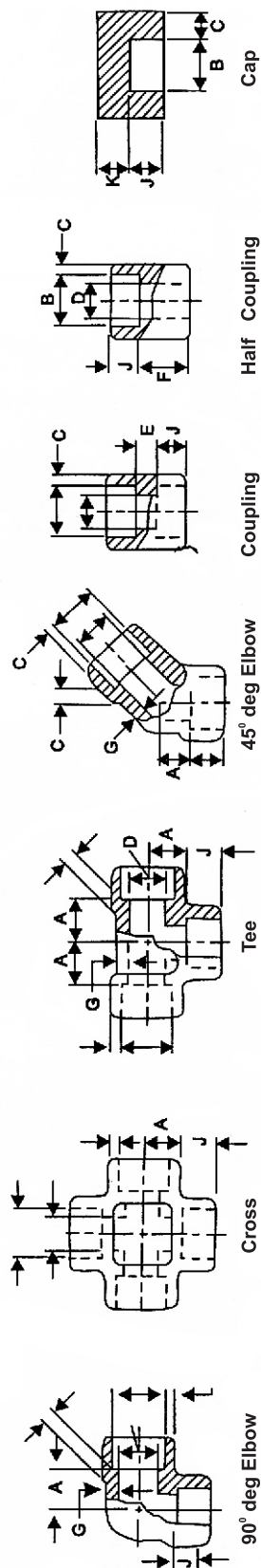
Nominal Pipe Size		Outside Diameter	Center to Face				Back to Face			Center to Center			Length 'L'	
INCH	MM	D	A R=1.5D	B	C	N R=1D	E	F	G	R	M	S	Short L	Long L
1/2	15	21.3	38.00	16.0	25.0	-	25.0	48.0	-	76.0		35.0	50.8	76.2
3/4	20	26.7	29.00	11.0	29.0	-	25.0	43.0	-	57.0		43.0	50.8	76.2
1	25	33.4	38.00	22.0	38.0	25.0	38.0	56.0	41.0	76.0	51.0	51.0	50.8	101.6
1.1/4	32	42.2	48.00	25.0	48.0	32.0	38.0	70.0	52.0	95.0	64.0	64.0	50.8	101.6
1.1/2	40	48.3	57.15	29.0	57.0	38.0	38.0	83.0	62.0	114.0	76.0	73.0	50.8	101.6
2	50	60.3	76.00	35.0	64.0	51.0	38.0	106.0	81.0	152.0	102.0	93.0	63.5	152.4
2.1/2	65	73.0	95.25	44.0	76.0	64.0	38.0	132.0	100.0	191.0	127.0	105.0	63.5	152.4
3	80	88.9	114.30	51.0	86.0	76.0	51.0	159.0	121.0	229.0	152.0	127.0	63.5	152.4
3.1/2	90	101.6	133.35	57.0	95.0	89.0	64.0	184.0	140.0	267.0	178.0	140.0	76.2	152.4
4	100	114.3	152.0	64.0	105.0	102.0	64.0	210.0	159.0	305.0	203.0	157.0	76.2	152.4
5	125	141.3	190.0	79.0	123.0	127.0	76.0	262.0	197.0	381.0	254.0	186.0	76.2	203.2
6	150	168.3	229.0	95.0	143.0	152.0	102.0	313.0	237.0	457.0	305.0	218.0	88.9	203.2
8	200	219.1	305.0	127.0	178.0	203.0	89.0	414.0	313.0	610.0	406.0	270.0	101.6	203.2
10	250	273.1	381.0	159.0	216.0	254.0	102.0	515.0	391.0	762.0	508.0	324.0	127.0	254.0
12	300	323.8	457.0	190.0	254.0	305.0	127.0	619.0	467.0	914.0	610.0	381.0	152.4	254.0
14	350	355.6	533.0	222.0	279.0	356.0	152.0	711.0	533.0	1067.0	711.0	413.0	152.4	305.0
16	400	406.4	610.0	254.0	305.0	406.0	165.0	813.0	610.0	1219.0	813.0	470.0	152.4	305.0
18	450	457.2	686.0	286.0	343.0	457.0	178.0	914.0	686.0	1372.0	914.0	533.0	152.4	305.0
20	500	508.0	762.0	318.0	381.0	508.0	203.0	1016.0	762.0	1524.0	1016.0	584.0	152.4	305.0
22	550	559.0	838.0	343.0	419.0	559.0	229.0	1118.0	838.0	1676.0	1118.0	614.4	152.4	305.0
24	600	610.0	914.0	381.0	432.0	610.0	254.0	1219.0	914.0	1829.0	1219.0	692.0	152.4	305.0
26	650	660.0	991.0	405.0	495.0	660.0	267.0							
28	700	711.0	1067.0	438.0	521.0	771.0	267.0							
30	750	762.0	1143.0	470.0	559.0	762.0	267.0							
32	800	813.0	1219.0	502.0	597.0	813.0	267.0							
34	850	864.0	1295.0	533.0	635.0	864.0	267.0							
36	900	914.4	1372.0	565.0	673.0	914.0	267.0							



All Dimensions in Millimeters



Dimensions Of Socket-welding Fittings Ansi B 16.11



Avg. Min.

Nominal Pipe Size		Socket Bore Diameter B Note 1	Bore Diameter of Fitting D [Note(1)]		Socket Wall Thickness, C [Note (2)]						Body Wall G		Min. Depth of Socket J	Center to Bottom of Socket, A				Laying Lengths		Tolerances			End Wall Thickness K, Min.									
					Class Designation									Class Designation																		
			Class Designation	3000	6000	9000	Avg.	Min.	Avg.	Min.	9000	Class Designation	3000	6000	9000	Min.	90° Elbows, Tees & Crosses	Class Designation				Couplings E	Half Couplings F	A	E	F	Class Designation	3000	6000	9000		
NB	INCH	Note 1	3000	6000	9000																											
6	1/8			7.6	4.8	...	3.18	3.18	3.96	3.43	...	...	2.41	3.15	...	9.5	11.0	11.0	...	8.0	8.0	...	6.5	16.0	1.0	1.5	1.0	4.8	6.4	...	...	
8	1/4			10.0	7.1	...	3.78	3.30	4.60	4.01	...	...	3.02	3.68	...	9.5	11.0	13.5	...	8.0	8.0	...	6.5	16.0	1.0	1.5	1.0	4.8	6.4	...	...	
10	3/8			13.3	9.9	...	4.01	3.50	5.03	4.37	...	...	3.20	4.01	...	9.5	13.5	15.5	...	8.0	11.0	...	6.5	17.5	1.5	3.0	1.5	4.8	6.4	...	...	
15	1/2			16.6	12.5	7.2	4.67	4.09	5.97	5.18	9.35	8.18	3.73	4.78	7.47	9.5	15.5	19.5	25.5	11.0	12.5	15.5	9.5	22.5	1.5	3.0	1.5	6.4	7.9	11.2	...	
20	3/4			21.7	16.3	11.8	4.90	4.27	6.96	6.04	9.78	8.56	3.91	5.56	7.82	12.5	19.0	22.5	28.5	13.0	14.0	19.0	9.5	24.5	1.5	3.0	1.5	6.4	7.9	12.7	...	
25	1			27.2	20.2	14.8	10.3	5.69	4.98	7.92	6.93	11.38	9.96	4.55	6.35	9.09	12.5	22.5	27.0	32.0	14.0	17.5	20.5	12.5	28.5	2.0	4.0	2.0	9.6	11.2	14.2	...
32	1 1/4			34.3	27.4	21.5	16.0	6.07	5.28	7.92	6.93	12.14	10.62	4.85	6.35	9.70	12.5	27.0	32.0	35.0	17.5	20.5	22.5	12.5	30.0	2.0	4.0	2.0	9.6	11.2	14.2	...
40	1 1/2			49.2	41.6	34.7	28.7	6.35	5.54	8.92	7.80	12.70	11.12	5.08	7.14	10.15	12.5	32.0	38.0	38.0	20.5	25.5	25.5	12.5	32.0	2.0	4.0	2.0	11.2	12.7	15.7	...
50	2			61.7	53.3	43.6	38.9	6.93	6.04	10.92	9.50	13.84	12.12	5.54	8.74	11.07	16.0	38.0	41.0	54.0	25.5	28.5	28.5	19.0	41.0	2.0	4.0	2.0	12.7	15.7	19.0	...
65	2 1/2			74.4	64.2	...	...	8.76	7.67	...	...	...	...	7.01	...	...	16.0	41.0	—	...	28.5	...	...	19.0	43.0	2.5	5.0	2.5	15.7	19.0	...	...
80	3			90.3	79.4	...	...	9.52	8.30	...	...	...	...	7.62	...	...	16.0	57.0	—	...	32.0	...	...	19.0	44.5	2.5	5.0	2.5	19.0	22.4	...	...
100	4			115.7	108.8	...	...	10.69	9.35	...	...	...	...	8.56	...	...	19.0	66.5	—	...	41.0	...	...	19.0	48.0	2.5	5.0	2.5	22.4	28.4	...	...

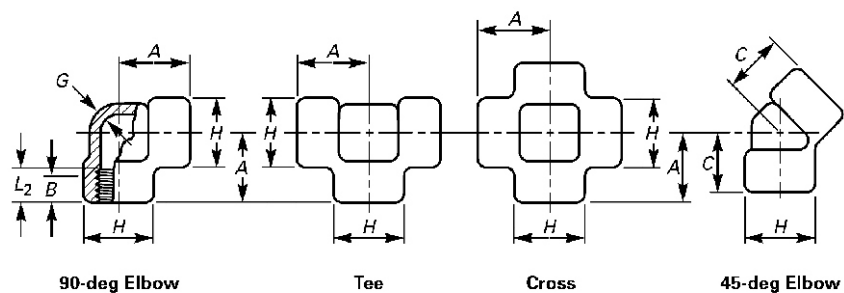
(1) All Dimensions Are In Millimeters

(2) Upper and lower values for each size are the respective maximum and minimum dimensions.

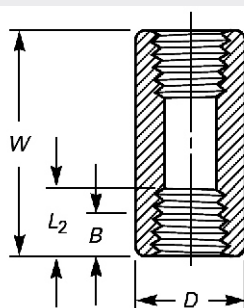
(3) Average of socket wall thickness around periphery shall be no less than listed values. The minimum values are permitted in localized areas.



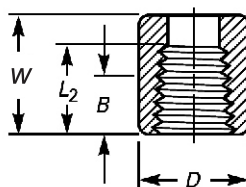
Dimensions Of Threaded Fittings Ansi B 16.11



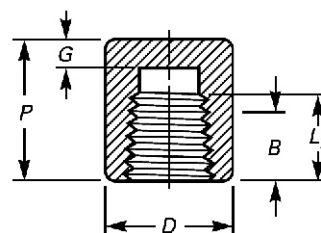
Nominal Pipe Size		Center to End Elbows, Tees, Crosses A			Center to End 45 Elbows C			Outside Diameter of Bend H			Minimum wall Thickness G			Min. Length of Thread Note - 1	
NB	INCH	2000	3000	6000	2000	3000	6000	2000	3000	6000	2000	3000	6000	B	L2
6	1/8	21	21	25	17	17	19	22	22	25	3.18	3.18	6.35	6.4	6.7
8	1/4	21	25	28	17	19	22	22	25	33	3.18	3.30	6.60	8.1	10.2
10	3/8	25	28	33	19	22	25	25	33	38	3.18	3.51	6.98	9.1	10.4
15	1/2	28	33	38	22	25	28	33	38	46	3.18	4.09	8.15	10.9	13.6
20	3/4	33	38	44	25	28	33	38	46	56	3.18	4.32	8.53	12.7	13.9
25	1	38	44	51	28	33	35	46	56	62	3.68	4.98	9.93	14.7	17.3
32	1 1/4	44	51	60	33	35	43	56	62	75	3.89	5.28	10.59	17.0	18.0
40	1 1/2	51	60	64	35	43	44	62	75	84	4.01	5.56	11.07	17.8	18.4
50	2	60	64	83	43	44	52	75	84	102	4.27	7.14	12.09	19.0	19.2
65	2 1/2	76	83	95	52	52	64	92	105	121	5.61	7.65	15.29	23.6	28.9
80	3	86	95	106	64	64	79	109	121	146	5.99	8.84	16.64	25.9	30.5
100	4	106	114	114	79	79	79	146	152	152	6.55	11.18	18.67	27.7	33.0



Coupling



Half-Coupling



Cap

Nominal Pipe Size		End to End Couplings W	End to End Caps P		Outside Diameter D		End Wall Thickness min. G		Min. Length of Thread Note - 1	
NB	INCH	3000 and 6000	3000	6000	3000	6000	3000	6000	B	L2
6	1/8	32	19	-	16	22	4.8	-	6.4	6.7
8	1/4	35	25	27	19	25	4.8	6.4	8.1	10.2
10	3/8	38	25	27	22	32	4.8	6.4	9.1	10.4
15	1/2	48	32	33	28	38	6.4	7.9	10.9	13.6
20	3/4	51	37	38	35	44	6.4	7.9	12.7	13.9
25	1	60	41	43	44	57	9.7	11.2	14.7	17.3
32	1 1/4	67	44	46	57	64	9.7	11.2	17.0	18.0
40	1 1/2	79	44	48	64	76	11.2	12.7	17.8	18.4
50	2	86	48	51	76	92	12.7	15.7	19.0	19.2
65	2 1/2	92	60	64	92	108	15.7	19.0	23.6	28.9
80	3	108	65	68	108	127	19.0	22.4	25.9	30.5
100	4	121	68	75	140	159	22.4	28.4	27.7	33.0



Wrought Alloys : Near Equivalent Designations Aluminum

INDIA		U.S.A. (A.A.)	BRITAIN (B.S.)	CANADA	GERMANY (DIN)	RUSSIA	I.S.O.	FRENCH ND
NEW I.S.	OLD I.S.							
19501	1E	1050(E.C.)	1E	C 1S	E-Al 99.5	-	-	-
19500	1B	1050	1B	1S	A-99.5	-	AI-99.5	1050A
19600	-	1060	-	-	-	-	-	-
19700	-	1070	-	-	AI-99.7	-	A1-99.7	-
19800	1A	1080	1A	-	-	-	AI-99.8	-
19000	IC	1100	1C	2S	AI-99.0	AD	AI-99.0	1200
-	-	2011	FC1	28S	AI-Cu-IN-Pb	-	AI-Cu-6 Bi Pb	2011
24345	H15	2014	H15	B26S	AI-Cu-Si	AK	-	-
24534	H14	2017	H14	17S/16S	-	DI	AI-Cu-4Mg Si	-
-	-	2024	-	24S	AI-Cu-Mg.2	-	AI-Cu-4Mg 1	2024
31000	N3	3003	N3	3S	AI-Mn	A-Mn	AI-Mn 1	3003
43000	N21	4043	N21	33S	AI-Si-5	AK	AI-Si5	4043
46000	N2	4047	N2	35S	-	-	-	-
51000	-	5005	-	B575	-	-	AI-Mg-1	-
52000	N4	5052	N4	M57S	AI-Mg.2	A-Mg	AI-Mg-2.5	5051
53000	N5	5086	N5	54S	-	A.Mg-3	AI-Mg-4	-
54300	N8	5083	N8	D54S	AI-Mg-4.5 Mn	-	AI-Mg-4.5 Mn	5083
55000	N6	5056	N6	A56S	AI-Mg.5	-	AI-Mg.5	5356
65032	H20	6061	H20	65S	AI-Mg-Si Cu	-	AI-Mg-1Si Cu	-
63400	H9	6063	H9	50S	AI-Mg-Si 0.5	-	AI-Mg-Si	-
64430	H30	6351	H30	B51S	AI-Mg-Si 1	AV	AI-Si-1 Mg	6081
64423	H11	6066	H11	C62S	-	-	-	-
62400	-	6005	-	C51S	-	-	-	-
63401	91E	6101	91E	D50S	E.AI.Mg.Si 0.5	-	-	-
64401	-	6201	-	-	-	-	-	-
74530	-	7039	-	D74S	AI-Zn-Mg. 1	-	-	3004
-	-	7075	DTD	75S	AI-Zn-Mg Cu 1.5	-	AI-Zn 6 Mg Cu	7075
			5124					



Wrought Alloys : Chemical Composition Limits (Percent) Aluminum

Alloy (ISS) Old	New	Equivalent Alloy (AA) U.S.A.	Copper		Magnesium		Silicon		Iron	Manganese		*Others (Total) Max	Remarks
			Min.	Max.	Min.	Max.	Min.	Max.		Min.	Max.		
1 C	19000	1100	-	0.10	-	-	-	0.5	0.6	-	0.1	0.1	Aluminium 99.0% Min
		1200	-	0.05	-	-	Si+Fe 1.0			-	0.05	0.1	Aluminium 99.0% Min
1 B	19500	1050	-	0.05	-	-	-	0.25	0.4	-	0.05	0.1	Aluminium 99.5% Min
1 E	19501	-	-	0.04	-	-	-	0.15	0.35	-	0.03	0.1	Aluminium 99.5% Min
	-	1350	-	0.05	-	-	-	0.10	0.40	-	0.01	0.1	Aluminium 99.5% Min
-	19600	1060	-	0.05	-	-	-	0.25	0.35	-	0.03	0.1	Aluminium 99.6% Min
-	19700	1070	-	0.03	-	-	-	0.2	0.25	-	0.03	0.1	Aluminium 99.7% Min
H 15	24345	2014	3.8	5.0	0.2	0.8	0.5	1.2	0.7	0.3	1.2	0.5	-
H 14	24534	2017	3.5	4.7	0.4	1.2	0.2	0.7	0.7	0.4	1.2	0.5	-
N 3	31000	30003	-	0.1	-	0.4	-	0.6	0.7	1.0	1.5	0.4	-
N 21	43000	4043	-	0.1	-	0.2	4.5	6.0	0.6	-	0.5	0.2	-
N 2	46000	4047	-	0.1	-	0.2	10.0	13.0	0.6	-	0.5	0.2	-
N 4	52000	5052	-	0.1	1.7	2.6	-	0.6	0.5	-	0.5	0.4	Cr + Min = 0.5
N 5	53000	5086	-	0.1	2.8	4.0	-	0.6	0.5	-	0.5	0.4	Cr + Min = 0.5
N 6	55000	5056	-	0.1	4.5	5.6	-	0.6	0.7	-	0.5	0.4	Chromium upto 0.25
N 8	54300	5083	-	0.1	4.0	4.9	-	0.4	0.7	0.5	1.0	0.4	Chromium upto 0.25
H 20	65032	-	0.15	0.4	0.7	1.2	0.4	0.8	0.7	0.2	0.8	0.4	**cr = 0.15-0.35
%													
-	-	6061	0.15	0.4	0.8	1.2	0.4	0.8	0.7	-	0.15	0.4	Chromium upto 0.35
H 9	63400	6063	-	0.1	0.4	0.9	0.3	0.7	0.6	-	0.3	0.4	-
-	-	6066	0.7	1.2	0.8	1.4	0.9	1.8	0.3	0.6	1.1	0.4	-
-	64423	-	0.5	1.0	0.5	1.3	0.7	1.3	0.8	-	1.0	-	-
91 E	63431	6101	-	0.05	0.4	0.9	0.3	0.7	0.5	-	0.03	0.1	-
-	64401	6201	-	0.1	0.6	0.9	0.5	0.9	0.5	-	0.03	0.1	-
H30	64430	6351	-	0.1	0.4	1.2	0.6	1.3	0.6	0.4	1.0	0.3	-
		6082	-	0.1	0.6	1.2	0.7	1.3	0.5	0.4	1.0	0.3	Chromium upto 0.25
-	74530	7039	-	0.2	1.0	1.5	-	0.4	0.7	0.2	0.7	0.4	Zinc 4.0 - 5.0 %
-	-	7075	1.2	2.0	2.1	2.9	-	0.5	0.5	-	0.3	0.2	Zinc (5.1 - 6.1)% &
													Chromium (0.18-0.26)%

*Titanium and / or other grain refining elements

**Either Min or Cr shall be present

Wrought Alloys : Mechanical Properties Aluminum

Alloy AA Old (ISS) New (ISS)	Temper	Ultimate Tensile Strength Kg/mm ³		0.2% Proof Stress Kg/mm ²	Elongation On 50 mm GL
		Min.	Max.		
1100[1C][19000]	0	-	11.0	-	25
1050P1B][19500]	0	-	10.0	-	25
1060[19600]	0	-	9.5	-	25
1070[19700]	0	-	9.5	-	25
4043[N21][43000]	0	-	13.0	-	18
4047[N2][46000]	0	-	15.0	-	12
5052[N4][52000]	0	-	24.5	-	18
5086[N5][53000]	0	-	26.5	-	16
5056[N6][55000]	0	-	34.5	-	15
5083[N8][54300]	0	-	35.5	-	13

Heat Treatable Alloys

2014[H15] [24345]	T4[W] T6[WP]	39 49	- -	24.0 43.0	10 6
2017[H14] [24534]	T4[W]	39	-	24.0	10
6063 [H9] [63400]	T4[W] T6[WP]	14 19	- -	8.0 15.5	14 7
6061[H20] 65032]	M or O T4[W] T6[WP]	- 19 28.5	15.0 - -	- 11.5 24.0	16 14 7
6351[H30] [64430]	M or O T4[W] T6[WP]	- 19 31.5	15 - -	- 12.0 27.5	16 14 7
6066	O T4[W] T6[WP]	- 28 35	20.5 - -	- 17.5 31.5	16 14 7
6101[91E] [63401]	T4[W] T6[WP]	14 20.5	- -	8.0 17.0	12 10
6201 [64401]	T4[W] T8[WDP]	16 32	- -	7.0 -	14 3
7039 [74530]	T4[W] T6[WP]	28 31.5	- -	23.5 26.5	9 7
7075	T6[WP]	54	-	46.5	6

Properties indicated herein are typical properties and are given for information only. However properties of all the profiles in specific alloy shall be as per I.S. Specification.

Wrought Aluminum & Aluminum Alloys :- Mechanical and Electrical Properties

Alloy		Temper Designation	Tessle Strength Min	0.2 percent Proof Stress Min.	Percent Elongation on 5.65 Min	Electrical Conductivity at 20° C, Min	Maximum Electrical Resistivity at 20° C	Thickness	Inside bond radius Min.	Coeff. of thermal expansion	Thermal conductivity
AA	IS		Mpa	Mpa		% IACS	ohm mm/mm ²	mm		per °C at 20°C typical	CGS AT 25°C typical
1050	19501	M	60	-	25	60.00	0.02874	upto 12	1 x thickness	23.8x10	0.56
6101	63401	W	140	80	12	-	-	-	-	-	-
6101	63401	WP (range 1)	170	135	12	56.50	0.03052	3.00 to 9.50	1 x thickness	23.4x10	0.52
6101	63401	Wp (range 2)	200	170	10	55.00	0.03135	3.00 to 9.50	2 x thickness	23.4x10	0.52
6101	-	T81	-	-	-	52.50	0.03283	-	-	23.5x10	0.50

NOTE

1 MPa=1N/mm² = 0.102 kg/mm²

Proprieties in M temper are only typical values and are given for information only.

If required the cross-section shall be calculated from the mass and length of a straight test piece taking density 2.705 for grade 19501 and 2.700 for grade 63401

Formula of Calculating Weight

Weight of Stainless Steel Pipe

O.D. (mm) - Wall Thick (mm) x Wall Thick (mm) x 0.0248 = Wt. per Mtr.

O.D. (mm) - Wall Thick (mm) x Wall Thick (mm) x 0.00756 = Wt. per Feet

Weight of Stainless Steel Round Bar

Dia (mm) x Dia (mm) x 0.00623 = Wt. per Mtr.

Dia (mm) x Dia (mm) x 0.0019 = Wt. per Feet

Weight of Stainless Steel Square Bar

Dia (mm) x Dia (mm) x 0.00788 = Wt. per Mtr

Dia (mm) x Dia (mm) x 0.0024 = Wt. per Feet

Weight of Stainless Steel hexagonal Bar

A/F (mm) x A/F (mm) x 0.00680 = Wt. per Mtr,

A/F (mm) x A/F (mm) x 0.002072 = Wt. per Feet

Weight of Stainless Steel Flat Bar

Width (mm) x Thickness (mm) x 0.00798 = Wt. per Mtr.

Width (mm) x Thickness (mm) x 0.00243 = Wt. per Feet

Weight of stainless Steel Sheets & Plates

Length (Mtrs) x Width (Mtrs) x Thick (mm) x 8 = Wt. per PC

Length (Feet) x Width (Feet) x Thick (mm) x 3/4 = Wt. per PC

Weight of Stainless Steel Circle

Dia (mm) x Dia (mm) x Thick (mm) 160 = Gms. per PC

Dia (mm) x Dia (mm) x Thick (mm) 0.0000063 = kg. per PC

Weight of Brass Metal

Weight of Stainless Steel + 9%

Weight of Copper Metal

Weight of stainless Steel + 12%

Weight of Aluminum Metal

Weight of stainless Steel ÷ 3

Conversion

1 Metre = 3.2808 Foot

1 Feet = 304.8 mm

1 Inch = 25.4 mm

Barlow's Formula for calculating bursting pressure

$P = \frac{2ST}{D}$ or $t = \frac{DP}{2S}$ or $S = \frac{DP}{2T}$ or $D = \frac{2ST}{P}$

P= Bursting pressure Psi

S = Tensile Strenght of tube

T = Wall thickness (in inches)

D = Outside Diameter (in inches)

* Formula for healthy Business

Honesty + Quality Goods + Quick service + Reasonable Rate = Good Healthy Business



Automobiles



Railways



Defence



Fabrications



Bus Body



Valves



Refineries



Chemicals



Power



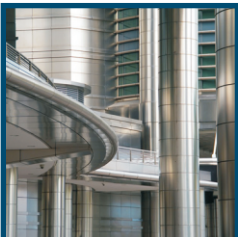
Distilleries



Boilers



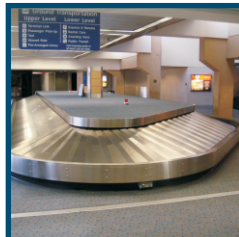
Pharma



Architecture



Escalators



Conveyors



Solar



Ducting



Pumps



Food Processing



Dairy Equipments



Rice Mill



Refrigeration



Kitchen Equipments



Home Appliances

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