



ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
& PED 2014/68/EU Manufacturing Certified Company



Tubes, Pipes,
Pipe Fittings,
Flanges, Fasteners,
Sheets, Plates,
Rods, Ferrous &
Non-Ferrous
Metal etc.



Eckhardt[®]
Steel & Alloys

Technical Guide
Version 6.0



**Eckhardt[®]
Steel & Alloys**

ISO 9001:2015, ISO 14001:2015,
ISO 45001:2018 & PED 2014/68/EU
Certified Manufacturing Company

One Stop Solution

About ECKHARDT

"Many factors combine to archive the success of business i.e. the right product mix, a broad knowledge of products & their application, good business relationships, logistics & financials expertise, proximity to the customer and last but not the least the appropriate range of support service. At 'Eckhardt', all these have been combined to create a new dimension."

Formed by a group of young professionals Eckhardt is one of the leading Manufacturer & Exporter of Stainless Steel, Carbon Steel, Alloy Steel, Nickel Alloys, Aluminum, Copper, Cupro Nickel, Brass, Phosphorus Bronze, Lead, Zinc, Monel[®], Inconel[®], Hastalloy[®] & other Ferrous and Non Ferrous Metals in form of:

Pipes & Tubes, Line Pipes OCTG & Drill Pipes : In Seamless and Welded in all Grades (IBR & NON IBR),

Buttwelded Pipe Fittings, Socket welded, Screwed Fittings : Such as Elbow, Return Bend, Straight and Reducing Tee, Crosses, Lap Joint Stubend, Reducers, Unions, Caps, Bush, Plug, Nipples, Couplings, Threadolets, Weldolets Elbowlets etc.

Flanges & Forging : Such WNRF, SORF, SOFF, BLRF, SWRF, LAP JOINT, WNRTJ, BLRTJ, SPECTACLE BLIND, SPADE etc.

Tube Fitting & Ferrules Fittings; Hose assembly & hydraulic Fittings

Long Radius Bends : 1/2" NB to 32" NB in 5mm to 50mm Thk RADIUS 2, 5 D / 3D / 5D / 10D UPTO 22D For Pig Launching stream & general Purpose Fittings.

Plate / Sheet / Coils / Round Bars : CromeMoly (SA387 Gr. 11/22/91/5) Nickel & Nickel Alloys / Mild Steel / Boiler Quality / Corten / Hardox / Dillidur 400v / Sailma / Ship Building with class approval etc.

Fasteners & Gaskets : Such as nuts, Bolts, studs, washers, Valves & all project reuirment at one stop etc.

We are approved suppliers to various Govt. Departments & public sector all over the country & abroad regularly supplying to them for a long time. We have got ready stock of the above items in various sizes as per National / International Standards and specification and the same shall be supplied as per your requirements at very reasonable rates. We can arrange any third party inspection agency like LRS, DNV-GL, ABS, IRS, IBR, TUV, BVQI, RINA, MECON, TCS, PDIL, GOLF, LLOYDS etc.

Quality Policy

"We at ECKHARDT STEEL & ALLOYS, Manufacturers, Exporter of Ferrous and Non Ferrous metals in the Form of Pipes, Tubes, Pipe Fittings, Flanges, Sheets, Plates & Rods are Committed to Increase our market share by satisfying Our customers Requirements through offering Products at Best Prices, on timely Delivery and Better Support. We shall Continually Improve in Knowing our customer needs and Proactively acting on things required to satisfy the same."



The quality assurance system assures every product to go through the following Quality systems.

- Material Control System
- Certification & Supplementary Test
- Process Control System
- Machining & Dimensional Control
- Finishing & Marking & Packing

As we are very much interested to do business with you on long term basis, we request you to please enlist our name in your approved vendor list and send us your valued purchase inquire from time to so as to enable us to our most competitive rates and terms.



PRODUCT RANGE



Pipes :-

Stainless Steel : ASTM A312 TP 304/ 304L/ 304H/ 316/ 316L/ 317/ 317L/ 321/310/ 347/ 904L etc.

Carbon Steel : ASTM A53 GR. B/ A106 GR. B/ API 5L GRADE B/ API 5L GR.X42/46/52/56/60/65/70/ A333 Gr.3/ Gr.6 etc.

Alloy Steel : ASTM A335 GR. P1/ P5/ P9/ P11/ P22/ P91/ P92 etc.

High Nickel Alloys : Monel[®], Nickel, Inconel[®], Hastelloy[®], Copper, Brass, Bronze, Titanium, Tantalum, Bismuth, Aluminium, High Speed Steel, Zinc, Lead etc.

Types : Round , Square, Rectangular.

Size : 1/4" NB to 32" NB (Seamless & Welded)

Wall Thickness : Sch. 5S to Sch. XXS

Size : 1/4" OD to 6"OD

Wall Thickness : 22SWG to 10SWG



Butt-Weld Fittings :-

Stainless Steel : ASTM A403 WP 304/ 304L/ 304H/316/ 316L/ 317/ 317L/ 321/ 310/ 347/904L etc.

Carbon Steel : ASTM A234 WPB/A420 WPL3/A420 WPL6/ MSS-SP-75 WPHY 42/46/52 / 56/60/65/70

Alloy Steel : ASTM A234 WP1/ WP5/ WP9/ WP11/ WP22/ WP91 / WP92 etc.

Duplex & Super Duplex Steel : UNS S31803, UNS S32750, UNS S32760, 904L, Alloy 20, 254 SMO

High Nickel Alloy : Monel[®], Nickel, Inconel[®], Hastelloy[®], Copper, Brass, Bronze, Titanium, Tantalum, Bismuth, Aluminium, High Speed Steel, Zinc, Lead, etc.

Types : Elbow, Tee, Reducer, Return Bends, Stub-Ends, Cap, Collar, Cross, Insert etc.

Size : 1/4" NB TO 32" NB. (Seamless & Welded)

Wall Thickness : Sch. 5S To Sch. XXS.



Screwed & Forged Fittings :-

Stainless Steel : ASTM A182 F304/ 304L/ 304H/ 316/ 316L/ 317/ 317L/ 321/310/ 347/ 904L etc.

Carbon Steel : ASTM A105 / A694 F42/46/ 52/56/ 60/ 65/70 / A350 LF3/ A350 LF2.

Alloy Steel : ASTM A182 F1/ F5/ F9/ F11/ F22/ F91 etc.

Others : Monel[®], Nickel, Inconel[®], Hastelloy[®], Copper, Brass, Bronze, Titanium, Tantalum, Bismuth, Aluminium, High Speed Steel, Zinc, Lead, etc.

Types : Elbow, Tee, Union, Cross, Coup, Bushing , Plug, Swage Nipple, Welding Boss, Hexagon Nipple, Barrel Nipple, Welding Nipple, Parraler Nipple, Street Elbow, Hexagon Nut, Hose Nipple, Bend, Adapter, Insert, Weldolet, Elbowlet, Sockolet, Thredolet, Nipolet, Letrolet, etc.

Size : 1/4" NB TO 4" NB. (Socketweld & Threaded)

Class : 3000#, 6000#, 9000#.



PRODUCT RANGE



Flanges :-

Stainless Steel Flanges : ASTM A182 F304/304L/304H/316/316L/317/317L/321/310/347/904L etc.

Carbon Steel Flanges: ASTM A105/ A694F42/46/52/56/60/65/70/A350 LF3/A350 LF2, etc.

Alloy Steel Flanges : ASTM A182 F1/ F5/ F9/ F11/ F22/ F91 etc.

Duplex Steel Flanges : 2205 (Duplex[®]), 2507 (Super Duplex) UNS - 31803, 32750, 32990

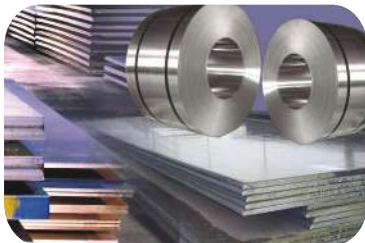
Others: Monel[®], Nickel, Inconel[®], Hastelloy[®], Copper, Brass, Bronze, Titanium, Tantalum, Bismuth, Aluminium, High Speed Steel, Zinc, Lead, etc.

Types : Weldneck, Slipon, Blind, Socket Weld, Lap Joint, Spectacles, Ring Joint, Oriface, Long Weldneck, Deck Flange, etc.

Size : 1/2" NB TO 48" NB.

Class : 150#, 300#, 400#, 600#, 900#, 1500# & 2500#. also as per National & International Standard.

Flanges such as SORF, SOFF, SOLI SWRF, SWFF, WNRF, WNFF, WNRTJ, LWNRF, BLRF, BLFF, BLRTJ, Treaded, Spectacle Blind, Orifice & Studding Outlet are manufactured according to ANSI B 16.5, B 16.47 Series A (MSS SP-44), B 16.47 Series B (API 605), MSS SP-43, DIN 2527, DIN 2566, DIN 2576, DIN 2632, DIN 2633, DIN 2634, DIN 2635, DIN 2642, BS 10, IS 1538 & IS 6392, etc.



Sheet, Plates & Coils

S. S. Sheets & Plates as per ASTM A240, Gr. TP 304, 304L, 304LN, 309, 309S, 309H, 310H, 316, 316L, 316H, 316LN, 316Ti, 317, 317L, 321, 321H, 347, 348, 3487H, 409, 410, 416, 420, 430 etc.

Alloy Steel Plates : as per ASTM A387 Gr.2, 5, 9, 11, 12 & 22, 91 in class 1 & 2 ASTM A 204 Gr. A & B, DIN 17175 Gr. 15Mo3 & 16Mo3 with IBR Test Certificate.

Carbon Steel / Boiler Quality Plates : as per IS 2062 Gr. A, B & C, IS 2002 Gr. 1 & 2 ASTM A516 Gr. 60 & 70, ASTM A 515 Gr. 70, A572 Gr. 50 etc.



Rods / Bars & Wires

Material Grade : Stainless Steel, Nickel Alloys, Carbon Steel, Alloy Steel, IBR Non IBR.

High Nickel Alloy : Monel[®], Nickel, Inconel[®], Hastelloy[®], Copper, Brass, Bronze, Titanium, Tantalum, Bismuth, Aluminium, High Speed Steel, Zinc, Lead, etc.

Types : Rods, Hex, Square, Wires, Billets, etc.



Ship Building Plates

LRS/ABS/DNV GL/IRS/RINA/BV Class Approved Marine Grade Plates / Bulb Flats / Angle / Channel / Pipes etc.

Ship Building Copper / Cupro Nickel (CuNi) / Brass/ Bronze/ Admiralty brass Products in form of Pipe, Fittings, Flanges, Sheet, Plates, Ship Shafts, Propellor & Other marine equipments etc widely used in marine industries.

Inconel[®], Incoloy[®], Monel[®], Hastelloy[®], Duplex[®]
are Registered Trade Marks of their Respective Owners



PIPES & TUBES



Stainless Steel : ASTM A312 TP 304/ 304L/ 304H/ 316/ 316L/ 317/ 317L/ 321/310/ 347/ 904L etc.

Carbon Steel : ASTM A53 GR. B/ A105 GR. / A106 GR. B/ API 5L GRADE B/ API 5L GR.X42/46/52/56/60/
65/70/S355J2H etc.

Low Temperature, Carbon Steel : A333 Gr.3/Gr.6 etc.

Alloy Steel : ASTM A335 GR. P1/ P5/ P9/ P11/ P22/ P91/P92 etc.

High Nickel Alloys : Monel[®], Nickel, Inconel[®], Hastelloy[®], Titanium, Tantalum, Bismuth, Aluminium,
High Speed Steel, Non Ferrous Metal : Copper, Brass, Bronze, Zinc, Lead etc.

Types : Round , Square, Rectangular.

Size : 1/4" NB to 32" NB (Seamless)
1/2" NB to 108" NB (Welded)

Wall Thickness : Sch. 5S to Sch. XXS & Heavy Wall Pipe
22 SWG to 10 SWG



**C.S / A.S. / S.S PIPE AND TUBES SCHEDULE DIMENSIONS,
WALL THICKNESS, WT./MTR. (KG)**

ISO 9001:2015, ISO 14001:2015, ISO 45001:2018
& PED 2014/68/EU Certified Manufacturing Company

NOMINAL PIPE SIZE		SCHEDULE DESIGNATIONS			WALL THICKNESS	WEIGHT
OD	INCH	36.10 & 36.19			MM	KG /
OD	MM	ANSI / ASME				METER
1/2 15	0.840 21.3	STD	40s		2.76	1.26
		XS	80	80s	3.73	1.62
		160			4.77	1.95
3/4 20	1.050 26.7	10	10s		2.10	1.27
		STD	40	40s	2.87	1.68
			80	80s	3.91	2.19
		160			5.53	2.88
		XXS			7.82	3.63
1 25	1.315 33.4	5	5s		1.65	1.29
		10	10s		2.76	2.09
		STD	40	40s	3.37	2.50
		XS	80	80s	4.54	3.23
		160			6.35	4.23
1-1/4 32	1.660 42.2	XXS			9.09	5.45
		5	5s		1.65	1.64
		10	10s		2.76	2.69
		STD	40	40s	3.55	3.38
		XS	80	80s	4.85	4.46
1-1/2 40	1.900 48.3	160			6.35	5.60
		XXS			9.70	7.76
		5	5s		1.65	1.89
		10	10s		2.76	3.10
		STD	40	40s	3.68	4.04
2 50	2.375 60.3	XS	80	80s	5.08	5.40
		160			7.13	7.23
		XXS			10.16	9.54
		5	5s		1.65	2.38
		10	10s		2.76	3.93
2-1/2 65	2.875 73.0	STD	40	40s	3.91	5.44
		XS	80	80s	5.53	7.48
		160			8.73	11.11
		XXS			11.07	13.45
		5	5s		2.10	3.68
3 80	3.55 88.9	10	10s		3.04	5.26
		STD	40	40s	5.15	8.63
		XS	80	80s	7.01	11.41
		160			9.52	14.91
		XXS			14.0	20.40
3-1/2 90	4.000 101.6	5	5s		2.10	5.17
		10	10s		3.04	7.40
		STD	40	40s	5.74	13.57
		XS	80	80s	8.07	18.62
		XXS			16.15	34.03
4 100	4.500 114.3	5	5s		2.10	5.83
		10	10s		3.04	8.36
		STD	40	40s	6.02	16.07
		XS	80	80s	8.56	22.32
		120			11.12	28.30
		160			13.48	33.53
		XXS			17.12	41.02
5 125	5.563 141.3	5	5s		2.76	9.45
		10	10s		3.40	11.57
		STD	40	40s	6.55	21.77
		XS	80	80s	9.52	30.95
		120			12.70	40.27
		160			15.87	49.10
		XXS			19.05	57.42
6 150	6.625 168.3	5	5s		2.76	11.30
		10	10s		3.40	13.83
		STD	40	40s	7.11	28.26
		XS	80	80s	10.97	42.56
		120			14.27	54.21
		160			18.26	67.55
		XXS			21.94	79.18
8 200	8.625 219.1	5	5s		2.76	14.76
		10	10s		3.75	19.96
		20			6.350	33.31
		30			7.036	36.78
		STD	40	40s	8.179	42.53
		60			10.31	53.08
		XS	80	80s	12.70	64.63
		100			15.08	75.89
		120			18.26	90.43
		140			20.62	100.93
		160			23.01	111.26
		XXS			22.27	107.88

NOMINAL PIPE SIZE		SCHEDULE DESIGNATIONS			WALL THICKNESS	WEIGHT
OD	INCH	ANSI / ASME			MM	KG /
OD	MM					METER
10 250	10.750 273.1	5S			3.40	22.63
		10S			4.19	27.78
		20			6.35	41.76
		30			7.79	51.00
		STD	40	40S	9.27	60.30
		XS	60	80S	12.70	81.53
		80			15.08	95.97
		100			18.26	114.74
		120			21.43	133.01
		140	XXS		25.40	155.11
		160			28.57	172.26
		12 300	12.750 323.9	5s			3.96	31.25
10s					4.57	35.99
20					6.35	49.71
30					8.38	65.20
STD	40s				9.52	73.83
40					10.31	79.73
XS	80s				12.70	97.44
60					14.27	108.97
80					17.47	132.02
100					21.43	159.86
120	XXS				25.40	186.93
140					28.57	208.06
160			33.32	238.74		
14 350	14.000 355.6	10s			4.77	41.31
		10			6.35	54.68
		20			7.92	67.94
		STD			9.52	81.28
		40	30	40s	11.12	94.50
		XS			12.70	107.38
		60	80s		15.08	126.68
		80			19.05	158.10
		100			23.82	194.92
		120			27.78	224.62
		140	XXS		31.75	253.55
		160			35.71	281.71
16 400	16.000 406.4	10s			4.77	47.29
		10			6.35	62.64
		20			7.92	77.87
		STD			9.52	93.21
		XS	40s		12.70	123.29
		60	30	80s	16.66	160.13
		80	40		21.43	203.50
		100			26.18	245.53
		120			30.96	286.65
		140			36.52	333.14
		160			40.48	365.33
		18 450	18.000 457.2	10s			4.77	53.27
10					6.35	70.59
20					7.92	87.79
STD					9.52	105.15
30	40s				11.12	122.37
XS					12.70	139.20
40	80s				14.27	155.91
60					19.05	205.82
80					23.82	254.61
100					29.36	309.78
120					34.92	363.67
140					39.67	408.49
160			45.23	459.56		
20 500	20.000 508.0	10s			5.53	68.60
		10			6.35	78.55
		STD	20	40s	9.52	117.08
		XS	30	80s	12.70	155.11
		40			15.08	183.39
		60			20.62	247.87
		80			26.18	311.14
		100			32.53	381.49
		120			38.10	441.48
		140			44.45	508.10
		160			50.01	564.83
		24 600	24.000 609.6	10	10s		6.35	94.46
STD	20			40s	9.52	140.94
XS				80s	12.70	186.93
30					14.27	209.56
40					17.47	255.16
60					24.61	355.05
80					30.96	441.80
100					38.88	547.28
120					46.02	639.63
140					52.37	719.68
160					59.53	807.58



**M.S / G.I. ERW / EFW Tubes / Pipes Confirming to IS : 1239 Part 1 Plain End. /
IS3589 Gr. 330 / 410 / 450 Bevelled End**



Nominal Pipe	Light		Medium		Heavy	
	Thick	Weight	Thick	Weight	Thick	Weight
	mm	kg/mtr.	mm	kg/mtr.	mm	kg/mtr.
1/4"	1.80	0.51	2.30	0.64	2.90	0.76
3/8"	1.80	0.67	2.30	0.84	2.90	1.02
1/2"	2.00	0.94	2.60	1.21	3.20	1.44
3/4"	2.30	1.38	2.60	1.56	3.20	1.87
1"	2.60	1.98	3.20	2.41	4.00	2.93
1 1/4"	2.60	2.54	3.20	3.10	4.00	3.79
1 1/2"	2.90	3.23	3.20	3.56	4.00	4.37
2"	2.90	4.08	3.60	5.03	4.50	6.19
2 1/2"	3.20	5.71	3.60	6.42	4.50	7.93
3"	3.20	6.72	4.0	8.36	4.80	9.90
3 1/2"	-	-	-	-	-	-
4"	3.60	9.75	4.50	12.20	5.40	14.50
5"	-	-	4.85	15.90	5.40	17.90
6"	-	-	4.85	18.90	5.40	21.30

Weight : 2% Extra for Screwed & Socket, End.								
Large Dia. ERW Pipes Confirm to IS 3589								
Wall Thick. in	Nominal Bore							
	7" NB 193.7 mm OD	8" NB 219.1 mm OD	10" NB 273 mm OD	12" NB 323.7 mm OD	14" NB 355.6 mm OD	16" NB 406.4 mm OD	18" NB 457 mm OD	20" NB 508 mm OD
mm	kg/mtr.	kg/mtr.	kg/mtr.	kg/mtr.	kg/mtr.	kg/mtr.	kg/mtr.	kg/mtr.
4.85	22.59	25.62	32.07	38.13	-	-	-	-
5.60	25.98	29.48	36.93	43.93	48.33	-	-	-
6.00	27.77	31.53	39.51	47.01	51.73	59.24	66.73	-
6.35	29.34	33.28	41.73	49.67	54.43	62.35	70.50	78.50
7.94	-	41.35	51.90	61.83	68.07	78.02	87.93	-
9.53	-	49.25	61.83	73.83	81.33	93.27	105.16	117.15
12.70	-	-	-	-	107.39	123.30	139.15	155.12



STANDARD TYPES OF STAINLESS STEEL GAUGE PIPES

Standard Types of Stainless Steel Gauge Pipes

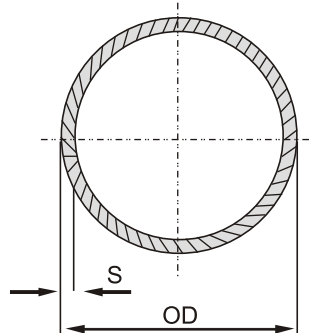
Size	O.D in mm	10G (3.25) (0.120")	12G (2.64) (0.104")	14G (2.03) (0.080")	16G (1.65) (0.065")	186G (1.21) (0.049")	20G (0.91) (0.035")	22G (0.71) (0.028")
1/4	6.35	0.075	0.070	0.065	0.058	0.046	0.037	0.030
5/16"	7.93	0.114	0.105	0.089	0.079	0.060	0.048	0.038
3/8"	9.52	0.152	0.135	0.113	0.097	0.080	0.058	0.046
1/2"	12.7	0.226	0.200	0.157	0.134	0.105	0.079	0.063
5/8"	15.87	0.310	0.264	0.212	0.174	0.134	0.103	0.081
3/4"	19.05	0.386	0.326	0.256	0.215	0.161	0.124	0.097
7/8"	22.25	0.465	0.390	0.310	0.252	0.192	0.145	0.113
1"	25.4	0.541	0.450	0.351	0.294	0.218	0.167	0.131
1 1/4"	31.750	0.696	0.580	0.448	0.375	0.275	0.200	0.162
1 1/2"	38.1	0.851	0.700	0.542	0.452	0.332	0.250	0.196
1 3/4"	44.45	1.020	0.832	0.646	0.530	0.390	0.294	0.230
2"	50.8	1.161	0.960	0.733	0.607	0.447	0.336	0.263
2 1/4"	57.15	1.315	1.085	0.828	0.687	0.504	-	-
2 1/2"	63.5	1.472	1.210	0.924	0.792	0.562	All Schedule size pipes are available in (+-) Tolerance Thickness Length as requirement and gauges pipes & tubes also available in various outside diameter & thickness & length as requirement Finishing : Aluminium, Bright, Polished, Matt, EP as requirement.	
2 3/4"	69.85	1.630	1.338	1.022	0.847	0.619		
3"	76.2	1.782	1.460	1.115	0.924	0.676		
3 1/2"	88.9	2.092	1.718	1.306	1.082	0.791		
4"	101.6	2.403	1.971	1.497	1.239	0.905		
4 1/2"	114.3	2.713	2.224	1.608	1.397	1.020		
5"	127.0	3.023	2.477	1.879	1.554	1.134		
5 1/2"	139.7	3.336	2.730	2.070	1.713	1.250		
6"	152.4	3.654	2.983	2.261	1.875	1.364		



CuNi Pipe (10 bar)

European Standard
10 Bar
DIN 86019 / BS 2871 CN102

90/10CuNi



10 bar

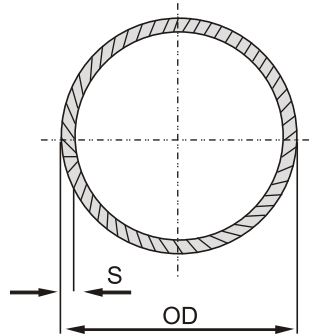
Outside diameter of pipe		Wall Thickness		Weight (theoretical)	
Inch	Nominal ND	Actual mm	Actual mm	kg/m	Availability
0.125		10	1.0	0.26	
0.25		12	1.0	0.31	
0.38	10	16	1.0	0.42	•
0.5	15	20	1.0	0.53	•
0.75	20	25	1.5	0.99	•
1	25	30	1.5	1.20	•
1.25	32	38	1.5	1.54	•
1.5	40	44.5	1.5	1.81	•
2	50	57	1.5	2.34	•
2.5	65	76.1	2.0	4.16	•
3	80	88.9	2.0	4.88	•
4	100	108	2.5	7.41	•
5	125	133	2.5	9.16	•
6	150	159	2.5	10.99	•
7	175	193.7	2.5	13.43	
8	200	219.1	3.0	18.21	•
10	250	267	3.0	22.24	•
12	300	323.9	4.0	35.94	•
14	350	368	4.0	40.9	
16	400	419.1	4.0	46.62	
18	450	457.2	4.0	50.91	
20	500	508	4.5	63.63	
24	600	610	5.0	84.96	
28	700	711	6.0	118.80	
32	800	813	6.0	135.99	
36	900	914	8.0	203.57	



CuNi Pipe (14 bar)

European Standard
14 Bar
DIN 86019 / BS 2871 CN102

90/10CuNi



14 bar

Outside diameter of pipe			Wall Thickness	Weight (theoretical)	
Inch	Nominal ND	Actual mm	Actual mm	kg/m	Availability
0.125		10	1.0	0.26	
0.25		12	1.0	0.31	
0.38	10	16	1.0	0.42	
0.5	15	20	1.0	0.53	
0.75	20	25	1.5	0.99	
1	25	30	1.5	1.20	
1.25	32	38	1.5	1.54	
1.5	40	44.5	1.5	1.81	
2	50	57	1.5	2.34	
2.5	65	76.1	2.0	4.16	
3	80	88.9	2.5	6.07	
4	100	108	2.5	7.41	
5	125	133	3.0	10.95	
6	150	159	3.0	13.14	
7	175	193.7	3.5	18.70	
8	200	219.1	3.5	21.19	
10	250	267	4.0	29.55	
12	300	323.9	5.0	44.78	
14	350	368	5.5	56.00	
16	400	419.1	6.0	69.60	
18	450	457.2	6.0	76.03	
20	500	508	6.5	91.55	
24	600	610	8.0	135.26	
28	700	711	9.0	177.45	
32	800	813	10.0	225.53	
36	900	914	11.0	278.98	



CARBON STEEL, ALLOY STEEL, LOW TEMP, PIPE AND TUBES SPECIFICATION

CHEMICAL ANALYSIS									MECHANICAL PROPERTIES			SPECIFIC REQUIREMENT
									TENSILE STRENGTH	YIELD TRESS	ELONGA-TION	
SPECIFICATION	WT	C%	Mn %	P % MAX	S% MAX	Si%	Cr%	Mo%	Mpa	Mpa	50mm MIN	
ASTM A 53/A	AW	0.25MAX	0.95MAX	0.050	0.060	-	-	-	330MIN	205MIN	36	Cr Mo Cu Ni Va 40 15 40 40 08 Five elements not to exceed 1%
ASTM A 53/B	AW	0.30MAX	1.20MAX	0.050	0.060	-	-	-	415MIN	240MIIN	29/5	
ASTM A 106/A	AW	0.25MAX	0.27-0.93	0.035	0.025	0.10MIN	0.40MAX	0.15MAX	330MIN	205MIN	35/2	
ASTM A 106/B	AW	0.35MAX	0.29-1.06	0.035	0.025	0.10MIN	0.40MAX	0.15MAX	415 MIN	240MIN	30/22	
ASTM A 106/C	AW	0.35MAX	0.29-1.06	0.035	0.025	0.10MIN	0.40MAX	0.15MAX	485MIN	275MIN	30/22	
ASTM A 179	MW	0.06-0.18	0.27-0.63	0.035	0.035	-	-	-	325MIN	180MIN	35.0	Hardness 72 HRB Max
ASTM A 214	MW	0.18MAX	0.27-0.63	0.035	0.035	-	-	-	385MIN	180MIN	35.0	Hardness 72 HRB Max
ASTM A 192	MW	0.06-0.18	0.27-0.63	0.035	0.035	0.25MAX	-	-	325MIN	180MIN	35.0	Hardness 77 HRB Max
ASTM A 209/T1	MW	0.10-0.20	0.30-0.80	0.025	0.025	0.10-0.50	-	0.44-0.65	380MIN	205MIN	30/22	Hardness 80 HRB Max
ASTM A 209/T1a	MW	0.15-0.25	0.30-0.80	0.025	0.025	0.10-0.50	-	0.44-0.65	365MIN	195MIN	30/22	Hardness 81 HRB Max
ASTM A 209/T1b	MW	0.14MAX	0.30-0.80	0.025	0.025	0.10MIN	-	0.44-0.65	415MIN	220MIN	30/22	Hardness 77 HRB Max
ASTM A 210/A-1	MW	0.27max	0.93max	0.048	0.035	0.10MIN	-	-	415MIN	255MIN	30/22	Hardness 79 HRB Max
ASTM A 210/C	MW	0.35MAX	0.29-1.06	0.048	0.035	0.10MIN	-	-	485MIN	275MIN	30/22	Hardness 89 HRB Max
ASTM A 213/T2	MW	0.10/0.20	0.30-0.61	0.025	0.025	0.10-0.30	0.50-0.81	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A 213/T5	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	4.00-6.00	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A 213/T11	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A 213/T12	MW	0.15MAX	0.30-0.61	0.025	0.025	0.50MAX	0.80-1.25	0.44-0.65	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A 213/T22	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	1.90-2.60	0.87-1.13	415MIN	205MIN	30/22	Hardness 85 HRB Max
ASTM A 333/3	AW	0.19MAX	0.31-1.64	0.025	0.025	0.18-0.37	Ni	3.18-3.82	380MIN	205MIN	35/25	IMPACT AS -50F FOR 40X10/18/1490 MRB -50F40X10/18/14 90 HRB MAX
ASTM A 333/6	AW	0.30MAX	0.29-1.06	0.025	0.025	0.10MIN	-	-	415MIN	240MIN	30/22	
ASTM A 334/3	AW	0.19MAX	0.31-1.64	0.025	0.025	0.18-0.37	Ni	3.18-3.82	380MIN	205MIN	35/28	
ASTM A 334/6	MW	0.30MAX	0.9-1.06	0.025	0.025	0.10MIN	-	-	415MIN	240MIN	30/22	
ASTM A 335/P1	AW	0.10-0.20	0.30-0.80	0.025	0.025	0.10-0.50	-	0.40-0.65	380MIN	205MIN	30/22	
ASTM A 335/P2	AW	0.10-0.20	0.30-0.61	0.025	0.025	0.10-0.30	0.50-0.81	0.40-0.65	380MIN	205MIN	30/22	
ASTM A 335/P5	AW	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	4.00-6.00	0.40-0.65	415MIN	205MIN	30/22	
ASTM A 335/P11	AW	0.15MAX	0.30-0.61	0.025	0.025	0.50MAX	0.80-1.25	0.40-0.65	415MIN	205MIN	50/22	
ASTM A 335/P12	AW	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	1.90-2.60	0.87-1.13	415MIN	205MIN	30/22	
ASTM A 335/P22	AW	0.15MAX	0.30-0.60	0.025	0.025	0.50MAX	1.90-2.60	0.87-1.13	415MIN	205MIN	30/22	
BS/3059/1/33		0.15Max	0.30-0.70	0.050	0.050	-	-	-	324-441	186MIN	25	
BS/3059/2/33		0.15MAX	0.40-0.70	0.050	0.050	0.10-0.35	-	-	324-441	186MIN	21	
BS/3059/245		0.12-0.18	0.90-1.20	0.035	0.035	0.10-0.35	-	-	441-560	245MIN	22	
DIN/17175/ST35.8		0.17MAX	0.40MIN	0.040	0.040	0.35MAX	-	-	340-441	235MIN	25	
DIN/17175/ST45.8		0.22MAX	0.45MIN	0.040	0.040	0.10-0.35	-	-	441-540	255 MIN	25	
DIN/17175/15MO3		0.12-0.20	0.50-0.80	0.040	0.040	0.10-0.35	-	0.25-0.35	441-540	284MIN	21	
DIN/17175/13CrMO44		0.10-0.18	0.40-0.60	0.040	0.040	0.10-0.35	0.70-1.60	0.40-0.50	441-570	294MIN	22	
DIN/17175/10CrM910		0.15MAX	0.40-0.60	0.040	0.040	0.15-0.50	2.0-2.5	0.9-1.10	441-570	249MIN	22	
ASTM A 199/T5	MW	0.50-0.15	0.30-0.60	0.025	0.025	0.50MAX	4.00-6.00	0.45-0.65	415MIN	170MIN	30/22	
ASTM A 199/T11	MW	0.05-0.15	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	0.44-0.65	415MIN	170MIN	30/22	
ASTM A 199/T22	MW	0.05-0.15	0.30-0.60	0.025	0.025	0.50MAX	1.90-2.60	0.87-1.13	415MIN	170MIN	30/22	
ASTM A 199/T4	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	2.15-2.85	0.44-0.65	415MIN	170MIN	30/22	
ASTM A 199/T7	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	6.00-8.00	0.45-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 200/T5	MW	0.15MAX	0.30-0.60	0.025	0.025	0.50-1.00	4.00-6.00	0.45-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 200/T11	MW	0.05-0.15	0.30-0.60	0.025	0.025	0.50-1.00	1.00-1.50	0.44-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 200/T22	MW	0.05-0.15	0.30-0.60	0.030	0.030	0.50MAX	1.90-2.60	0.87-1.13	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 200/T4	MW	0.05-0.15	0.30-0.60	0.030	0.030	0.50-1.00	2.15-2.85	0.44-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 200/T7	MW	0.15MAX	0.30-0.60	0.030	0.030	0.50-1.00	6.00-8.00	0.45-0.65	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A 199/T9	MW	0.15MAX	0.30-0.60	0.030	0.030	0.25-1.00	8.00-10.00	0.90-1.10	415MIN	170MIN	30/22	HARDNESS 85 HRB MAX
ASTM A335/P9	MW	0.15MAX	0.30-0.60	0.025	0.025	0.25-1.00	8.00-10.00	0.09-1.10	415MIN	172MIN	30/22	HARDNESS 85 HRB MAX
ASTM A178A	MW	0.06-0.18	0.30-0.60	0.035	0.035	-	-	-	325MIN	160MIN	35	HARDNESS 89 HRB MAX
ASTM A178C	MW	0.35MAX	0.27-0.63	0.035	0.035	-	-	-	415MIN	170MIN	30	HARDNESS 89 HRB MAX
ASTM A178B	MW	0.27MAX	0.80 MAX	0.030	0.015	0.10MIN	-	-	485MIN	275MIN	30	HARDNESS 89 HRB MAX



CHEMICAL COMPOSITION OF STAINLESS STEEL

Stainless Steel is essentially a low carbon steel which contains chromium at 10% or more by weight. It is this addition of chromium that gives the steel its unique stainless corrosion resisting Properties. The corrosion resistance and other useful properties of the steel are enhanced by increased chromium content and the addition of other elements such as molybdenum, nickel and nitrogen

Chemical Composition of Stainless Steel											Nearest Equivalent Specification		
UNS NO.	EN	BS	AISI Grade	C Max	Mn Max	P Max	S Max	Si Max	Cr	Ni	Mo	Cu	I.S.

Austenitic

S30100	-	301S21	301	0.15	2.0max	0.045	0.040	1.0	16.0/18.0	6.0/8.0	-	-	10Cr17Ni7
S30200	-	-	302	0.15	2.0	0.045	0.030	1.0	17.0/19.0	8.0/10.0	-	-	07Cr18Ni9
S30300	-	303S31	303	0.15	2.0	0.045	0.15min	1.0	17.0/19.0	8.0/10.0	-	-	15Cr18
S30400	1.4301	-	304	0.08	2.0	0.045	0.030	1.0	18.0/20.0	8.0/10.0	-	-	04Cr18Ni10
S30403	1.4307	304S11	304L	0.030	2.0	0.045	0.030	1.0	18.0/20.0	8.0/12.0	-	-	02Cr18Ni11
S30453	1.4306	304S61	304LN	0.030	2.0	0.045	0.030	0.75	18.0/20.0	8.0/11.0	-	-	-
S30409	-	-	304H	0.05	2.0	0.045	0.03	1	18.0/20.0	8.5/9.5	-	-	-
S30900	-	309S16	309	0.20	2.0	0.045	0.030	1.0	22.0/24.0	12.0/15.0	-	-	20Cr24Ni12
S30908	1.4833	-	309S	0.08	2.0	0.045	0.030	1.0	22.0/24.0	12.0/15.0	-	-	-
S31009	-	-	310H	0.25	2.0	0.045	0.030	1.50	24.0/26.0	19.0/22.0	-	-	10Cr25Ni12
S31008	1.4845	-	310S	0.08	2.0	0.045	0.030	1.50	24.0/26.0	19.0/22.0	-	-	-
S31600	-	316S31	316	0.08	2.0	0.045	0.030	1.0	16.0/18.0	10.0/14.0	2.0/3.0	-	04Cr17Ni12Mo2
S31603	1.4404	316S11	316L	0.030	2.0	0.045	0.030	1.0	16.0/18.0	10.0/14.0	2.0/3.0	-	03Cr17Ni12Mo2
S31653	-	316S61	316LN	0.030	2.0	0.045	0.030	0.75	16.0/18.0	10.0/14.0	2.0/3.0	-	-
S31635	1.4571	320S31	316Ti	0.080	2.0	0.045	0.030	1.0	16.0/18.0	10.0/14.0	2.0/3.0	-	-
S31700	-	-	317	0.08	2.0	0.045	0.030	1.0	18.0/2.0	11.0/15.0	3.0/4.0	-	-
S31703	-	317S12	317L	0.030	2.0	0.045	0.030	1.0	18.0/20.0	11.0/15.0	3.0/4.0	-	-
S31753	-	-	317LN	0.03	2.0	0.045	0.03	1	18.0/2.0	11.0/15.0	3.0/4.0	-	-
S32100	1.4541	321S31	321	0.08	2.0	0.045	0.030	1.0	17.0/19.0	9.0/12.0	-	-	04Cr18Ni10Ti20
S34700	-	347S31	347	0.08	2.0	0.045	0.030	1.0	17.0/19.0	9.0/12.0	-	-	04Cr18Ni10Nb-40
N08904	1.4539	-	904L	0.02	2.0	0.045	0.035	1	19.0/23.0	23.0/28.0	4.0-5.0	-	-

Ferritic

S41100	-	410S21	410	0.15	1.00	0.040	0.030	1.0	11.50-13.50	0.75	...	...	...
S41008	1.4000	403S17	410S	0.08	1.00	0.040	0.030	1.0	11.50-13.50	0.60	...	...	...
S42900	-	-	429 ^G	0.12	1.00	0.040	0.030	1.0	14.00-16.00	...	...	...	...
S43000	1.4016	430S17	430	0.12	1.00	0.040	0.030	1.0	16.00-18.00	0.75	...	...	...
S43035	-	-	439	0.07	1.00	0.040	0.030	1.0	17.00-19.00	0.050	...	0.04	...
S44400	-	-	444	0.025	1.00	0.040	0.030	1.0	17.5-19.5	1.00	1.75-2.50	0.035	...
			446	0.20	1.50	0.040	0.030	0.50	11.40/13.00	-			...
	-	-	409L	≤ 0.030	≤ 1.00	≤ 1.00	-	-	-	10.50-11.75	-	-	-

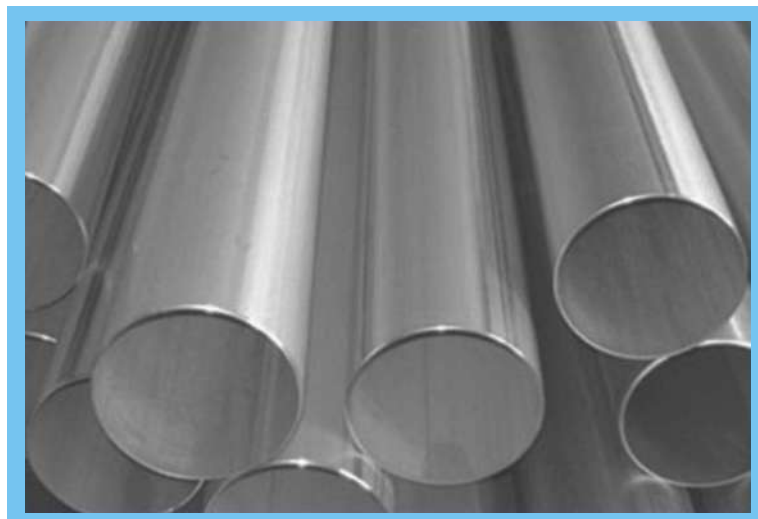
Duplex & Super Duplex

S31803	1.4462	-	-	0.030	2.0	0.030	0.020	1.0	21.0-23.0	4.5-6.5	2.5-3.5	-	0.08-0.20
S32250	-	-	255 ^G	0.040	1.50	0.040	0.030	1.0	24.0-27.0	4.5-6.5	2.9-3.9	1.50-2.50	0.10-0.25
S32750	1.441	-	2507	0.030	1.20	0.035	0.020	0.8	24.0-26.0	6.0-8.0	3.0-5.0	0.50	0.24-0.32
S32760	-	-	-	0.030	1.0	0.030	0.010	1.0	24.0-26.0	6.0-8.0	3.0-4.0	0.50-1.00	0.20-0.30



TOLERANCE : ASTM SPECIFICATION FOR TUBING & PIPING

Specification	Allowable Outside Diameter Variation in mm			Allowable Wall Thickness Variation		Exact Length Tolerance in mm		Testing
	Nominal Diameter	Over	Under	%Over	%Under	Over	Under	
ASTM-A213 Seamless Boiler Superheater and Heat Exchanger Tubes	Under 25.4	.1016	.1016	+20	-0	3.175	0	Tension Test Flattening Test Flare Test Hardness Test 100% Hydrostatic test Refer to ASTM A-450
	25.4-38.1 incl	.1524	.1524	+22	-0	3.175	0	
	38.1-50.8 excl	.2032	.2032	+22	-0	3.176	0	
	50.8-63.5 excl	.254	.254	+2	-0	4.46	0	
	63.5-76.2 excl	.3048	.3048	+22	-0	4.76	0	
76.2-101.6 incl	.381	.381	+22	-0	4.76	0		
ASTM-A249 Welded Boiler Superheater , Heat Exchanger And Condenser T ubes	Under 25.4	.1016	.1016	+10	-10	3.175	0	Tension Test Flattening Test Flare Test Reverse Bend Test Hardness Test 100% Hydrostatic Test *Reverse flattening Test Refer to ASTM A-450 *Wherever applicable
	25.4 - 38.1 incl	.1524	.1524	+10	-10	3.175	0	
	38.1-50.8 Excl	.2032	.2032	+10	-10	3.175	0	
	50.0-63.5 excl	.254	.254	+10	-10	4.76	0	
	63.5-76.2 excl	.3848	.3048	+10	-10	4.76	0	
76.2-101.6 incl	.381	.381	+10	-10	4.76	0		
				Minimum Wall tubes + 18% 0 available On request				
ASTM-A269 Seamless & W elded Tubing for General Service	Upto 12.7	.13	.13	+15	-15	3.2	0	Flare Test Flange Test (Welded Only) Hardness Test Reverse Flattening Test (Welded only) 100% Hydrostatic Test Refer to ASTM-A269
	12.7- 38.1 excl	.13	.13	+10	-10	3.2	0	
	38.3 - 88.9 excl	.25	.25	+10	-10	4.8	0	
	88.9 -139.7 excl	.38	.38	+10	-10	4.8	0	
	139.7-203.2 excl	.76	.76	+10	-10	4.8	0	
ASTM-A270 Seamless & Welded Sanitary Tubing	25.4	.05	.20	+12.5	-12.5	3.2	0	Reverse flattening Test 100% Hydrostatic Test External polish on all tubes Refer to ASTM A-270
	38.1	.05	.20	+12.5	-12.5	3.2	0	
	50.8	.05	.28	+12.5	-12.5	3.2	0	
	60.5	.05	.28	+12.5	-12.5	3.2	0	
	76.2	.08	.30	+12.5	-12.5	4.8	0	
	101.6	.08	.38	+12.5	-12.5	4.8	0	
ASTM-A312 Seamless & Welded pipe	3.175-38.1 Incl	.79	.79	12.5% under Minimum Wall Nominal Wall Specified		6.4	0	Tension Test Flattening Test 100% Hydrostatic Test Refer to ASTM A-530
	38.1-1016 Incl	.4	.79			6.4	0	
	101.6-203.2 Incl	1.59	.79			6.4	0	
		+0.5%				(Normally Random Lengths ordered)		
			-0.3		6.0			
ASTM A-358 Welded Pipe	219.06-750mm or 0.01 Inch							Refer to ASTM A-530



FORMULAE OF CALCULATING WEIGHT

- WEIGHT OF STAINLESS STEEL / CARBON STEEL PIPES & TUBES
 $OD (mm) - W.T. (mm) \times W.T. (mm) \times 0.02466 = KG/MTR$
- WEIGHT OF COPPER PIPES & TUBES
 $O.D. (mm) - W.T. (mm) \times W.T. (mm) \times 0.0285 = kG/MTR$
- WEIGHT OF ALUMINIUM PIPES & TUBES
 $O.D. (mm) - W.T. (mm) \times W.T. (mm) \times 0.0082 = KG/MTR$
- WEIGHT OF LEAD PIPES & TUBES
 $O.D. (mm) - W.T. (mm) \times W.T. (mm) \times 0.0345 = KG/MTR$
- SHEET WIDTH REQD FOR ROLLED & WELDED PIPES
 $O.D. (mm) - Thk. (mm) \times 3.14 = SHEET WIDTH (mm)$
- WEIGHT FOR SQUARE / RECTANGLE PIPES
 $Length From 4 Angle (OD)/3.14 - Thk (mm) \times Thk. (mm) \times 0.00756 = KG/PER FEET$
- WEIGHT OF STAINLESS STEEL CIRCLE & BLANKS
 $O.D. (mm) \times O.D. (mm) \times Thk (mm) / 160 / 1000 = KG/PCS.$
- WEIGHT OF STAINLESS STEEL SHEETS & PLATES
 $Length (mtr) \times Width (mtr) \times Thk. (mm) \times 8 = KG/SHEET$
- WEIGHT OF CARBON STEEL SHEETS & PLATES
 $Length (mtr) \times Width (mtr) \times Thk. (mm) \times 7.85 = KG/SHEET$
- WEIGHT OF ALUMINIUM SHEETS & PLATES
 $Length (mtr) \times Width (mtr) \times Thk. (mm) \times 2.66 = KG/SHEET$
- WEIGHT OF LEAD SHEETS & PLATES
 $Length (mtr) \times Width (mtr) \times Thk. (mm) \times 11.2 = KG/SHEET$
- WEIGHT OF STAINLESS STEEL ROUNDS / ROUND BAR
 $Dia. (mm) \times Dia. (mm) \times 0.00623 = KG/MTR$
- WEIGHT OF STAINLESS STEEL HEXAGONAL RODS
 $Dia. (mm) \times Dia. (mm) \times 0.00679 = KG/MTR$
- WEIGHT OF STAINLESS STEEL SQUARE RODS
 $Dia. (mm) \times Dia. (mm) \times 0.00787 = KG/MTR$



ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 & PED 2014/68/EU Certified Manufacturing Company

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