STEEL PIPES

WELDED STEEL PIPE

IN ACCORDANCE TO BS 1387: 1985

GENERAL INFORMATION ON BS 1387: 1985 WELDED STEEL TUBE

Descriptions	Maruichi BS 1387: 1985 welded steel tube is produced in three thickness classes-Light, Medium and Heavy-and available in black finish or hot dipped galvanized finish in 6-meter uniform mill lengths.		
Applications	For ordinary conveyance of steam, gas, water, etc.		
End finish & End Protection	Plain-end Square-cut (PE) or threaded and fixed with coupling (T/C). PE tubes are shipped without any protection on both ends. T/C tubes are supplied screwed with taper threads to BS 21 and fitted with one taper-threaded malleable iron socket, as required under this specification.		
Identification Marking	Tubes are marked by color bands about 50mm wide, painted about 300mm from each end, as follows:		
	Light Tubes-Brown	Medium Tubes-Blue	Heavy Tubes-Red

PERTINENT EXCERPTS FROM 1387: 1985 SPECIFICATION

Chemical Composition	The chemical composition of the steel, by ladle analysis, shall comply with the table below:			
	C max.	**Mn max.**	**P max.**	**S max.**
	0.20%	1.20%	0.045%	0.045%
Mechanical Properties	The mechanical properties at room temperature shall be as given in table below:			
	Tensile Strength (N/mm^2)	320 to 460		
	Yield Strength (N/mm^2)	195min		
	Elongation on Gauge Length (L_o)	5.60 So (%): 20 min		
Tolerances on Dimensions & Mass	Outside Diameter	As shown in following tables		
	Wall Thickness	Light tubes Medium and Heavy tubes	-8% + not specified -10% +not specified	
	Mass	The mean consignment mass for quantities of 150m & over of one size shall not deviate by more than ± 4% from the mass of consignment calculated from the mass given in tables as appropriate. No single tube shall deviate by more than +10%, -8% from the mass given in table as appropriate.		
Hot-Dip Zinc Coating Test (if required)	After the four successive one-minute immersions in the copper-sulphate solution, the test sample shall not show any adherent red deposits of metallic copper.			
Bend Test	Black tubes up to and including DN 50 shall be bent cold without any signs of fracture, through 180°C round a former having a radius at the bottom of the groove equal to 6 times the outside diameter of the tubes as given in table. Hot-Dip-Zinc coated tubes shall be bent cold without cracking of the steel, through 90°C round a former having a radius at the bottom of the groove equal to 8 times the outside diameter of tube.			
Flattening Test	The flattening test applies to tubes greater than DN 50. A ring not less than 40mm in length taken from one end of each selected tube shall be flattened cold between parallel flat plates without showing either crack or flaw until the distance between the plates, measured under load, is not greater that 75% of original outside diameter of the tube, and no cracks or flaws in the metal elsewhere than in the weld shall occur until the distance between the plates is less than 60% of original diameter. The weld shall be placed at 90°C to the direction of flattening.			
Leak Tightness Test	The test shall be either a hydraulic test at a pressure of 50 bar (50×10^5 N/M^2), or alternatively, an eddy current test.			
Bore Test For Hot-Dip Coated Tubes	Hot-Dip-Zinc coated tubes up to and including DN 25 shall have a rod 230mm in length, of the appropriate diameter specified below, passed though them and shall have a free bore			
	Rod Diameters			
	Nominal Size (DN)	Diameter of rod (mm)		
	15 20 25	9.5 14.3 20.6		

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WELDED STEEL PIPE

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CLASS LIGHT

MS 863/BS 1387: 1985/ MANUFATURER'S STANDARD

Nominal Size		Outside Diameter		Wall Thickness	Calculated Weight				No. of Threads Per Inch	Socket		Test Pressure	
		Max.	Min.		Plain Ends		Threads & coupling			Outer Dia.	Min. Length		
mm	in	mm	mm	mm	kg/ m	kg/ ft	kg/ m	kg/ ft		mm	mm	Bar	psi
15	½	21.4	21.0	2.0	0.947	0.289	0.956	0.291	14	27.8	38.1	50	700
20	¾	26.9	26.4	2.3	1.380	0.421	1.390	0.424	14	34.1	41.3	50	700
25	1	33.8	33.2	2.6	1.980	0.604	2.000	0.610	11	42.1	47.6	50	700
32	1¼	42.5	41.9	2.6	2.540	0.774	2.570	0.783	11	51.6	54.0	50	700
40	1½	48.4	47.8	2.9	3.230	0.985	3.270	0.997	11	57.9	57.2	50	700
50	2	60.2	59.6	2.9	4.080	1.240	4.150	1.260	11	70.6	63.5	50	700
65	2½	76.0	75.2	3.2	5.710	1.740	5.830	1.780	11	87.3	69.9	50	700
80	3	88.7	87.9	3.2	6.720	2.050	6.890	2.100	11	101.6	76.2	50	700
100	4	113.9	113.0	3.6	9.750	2.970	10.00	3.050	11	128.6	88.9	50	700

CLASS LIGHT

MS 863/BS 1387: 1985/ MANUFATURER'S STANDARD

Nominal Size		Outside Diameter		Wall Thickness	Calculated Weight				No. of Threads Per Inch	Socket		Test Pressure	
		Max.	Min.		Plain Ends		Threads & coupling			Outer Dia.	Min. Length		
mm	in	mm	mm	mm	kg/ m	kg/ ft	kg/ m	kg/ ft		mm	mm	Bar	psi
15	½	21.7	21.1	2.6	1.21	0.369	1.22	0.372	14	27.8	38.1	50	700
20	¾	27.2	26.6	2.6	1.56	0.475	1.57	0.479	14	34.1	41.3	50	700
25	1	34.2	33.4	3.2	2.41	0.735	2.43	0.741	11	42.1	47.6	50	700
32	1¼	42.9	42.1	3.2	3.10	0.945	3.13	0.954	11	51.6	54.0	50	700
40	1½	48.8	48.0	3.2	3.57	1.090	3.61	1.100	11	57.9	57.2	50	700
50	2	60.8	59.8	3.6	5.03	1.530	5.10	1.550	11	70.6	63.5	50	700
65	2½	76.6	75.4	3.6	6.43	1.960	6.55	2.000	11	87.3	69.9	50	700
80	3	89.5	88.1	4.0	8.37	2.550	8.54	2.600	11	101.6	76.2	50	700
100	4	114.9	113.3	4.5	12.20	3.720	12.5	3.810	11	128.6	88.9	50	700
125	5	140.6	138.7	4.85	16.60	5.060	17.1	5.210	11	155.6	95.3	50	700
150	6	166.1	164.1	5.0	19.70	6.000	20.3	6.190	11	184.2	95.3	50	700

CLASS HEAVY

MS 863/BS 1387: 1985/ MANUFATURER'S STANDARD

Nominal Size		Outside Diameter		Wall Thickness	Calculated Weight				No. of Threads Per Inch	Socket		Test Pressure	
		Max.	Min.		Plain Ends		Threads & coupling			Outer Dia.	Min. Length		
mm	in	mm	mm	mm	kg/ m	kg/ ft	kg/ m	kg/ ft		mm	mm	Bar	psi
15	½	21.7	21.1	3.2	1.44	0.439	1.45	0.442	14	27.8	38.1	50	700
20	¾	27.2	26.6	3.2	1.87	0.570	1.88	0.573	14	34.1	41.3	50	700
25	1	34.2	33.4	4.0	2.94	0.896	2.96	0.902	11	42.1	47.6	50	700
32	1¼	42.9	42.1	4.0	3.80	1.160	3.83	1.170	11	51.6	54.0	50	700
40	1½	48.8	48.0	4.0	4.38	1.340	4.42	1.350	11	57.9	57.2	50	700
50	2	60.8	59.8	4.5	6.19	1.890	6.26	1.910	11	70.6	63.5	50	700
65	2½	76.6	75.4	4.5	7.93	2.420	8.05	2.450	11	87.3	69.9	50	700
80	3	89.5	88.1	5.0	10.3	3.140	10.5	3.200	11	101.6	76.2	50	700
100	4	114.9	113.3	5.4	14.5	4.420	14.8	4.510	11	128.6	88.9	50	700
125	5	140.6	138.7	5.4	17.9	5.460	18.4	5.610	11	155.6	95.3	50	700
150	6	166.1	164.1	5.4	21.3	6.490	21.9	6.680	11	184.2	95.3	50	700

WELDED STEEL PIPE

IN ACCORDANCE TO JIS G 3452: 1988/ MANUFATURER'S STANDARD

Nominal Size		Outside Diameter		Wall Thickness		Weight (Plain Ends)					Test Pressure	
mm	in	mm	in	mm	in	kg/m	kg/6m	kg/ft	lb/ft	lb/20ft	kg/cm^2	psi
100	4	114.3	4.500	4.5	0.177	12.2	73.2	3.72	8.20	164.0	25	360
125	5	139.8	5.504	4.5	0.177	15.0	90.0	4.57	10.1	202.0	25	360
150	6	165.2	6.504	5.0	0.197	19.8	118.8	6.04	13.3	266.0	25	360
175	7	190.7	7.508	5.3	0.209	24.2	145.2	7.38	16.3	326.0	25	360
200	8	216.3	8.516	5.8	0.228	30.1	180.6	9.17	20.2	404.0	25	360
225	9	241.8	9.520	6.2	0.244	36.0	216.0	11.0	24.2	484.0	25	360
250	10	267.4	10.528	6.6	0.260	42.4	254.5	12.9	28.5	570.0	25	360
300	12	318.5	12.539	6.9	0.272	53.0	318.0	16.2	35.6	712.0	25	360
350	14	355.6	14.000	7.9	0.311	67.7	406.2	20.6	45.5	910.0	25	360
400	16	406.4	16.000	7.9	0.311	77.6	465.6	23.7	52.1	1042.0	25	360

TOLERANCE

Wall thickness	-12.50% / not specified
Outside Diameter	± 1%

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SEAMLESS CARBON STEEL PIPE

Standards: API / ASTM / ASME

Available sizes: NPS 1/8” ~ 24” (OD 10.3mm~610.0mm)

Nominal Pipe Size (DN)	(inch)	OD	Wall Thickness	SCHEDULE NUMBER												
		(mm)	Unit Weight	10	20	30	STD	40	60	XH	80	100	120	140	160	XXH
6	1/8	10.3	mm kg/m				1.73 0.37	1.73 0.37		2.41 0.47	2.41 0.47				-	
8	1/4	13.7	mm kg/m				2.24 0.63	2.24 0.63		3.02 0.80	3.02 0.80				-	
10	3/8	17.1	mm kg/m				2.31 0.84	2.31 0.84		3.20 1.10	3.20 1.10				-	
15	1/2	21.3	mm kg/m				2.77 1.27	2.77 1.27		3.73 1.62	3.73 1.62				4.78 1.95	7.47 2.55
20	3/4	26.7	mm kg/m				2.87 1.69	2.87 1.69		3.91 2.20	3.91 2.20				5.56 2.90	7.82 3.64
25	1	33.4	mm kg/m				3.38 2.50	3.38 2.50		4.55 3.24	4.55 3.24				6.35 4.24	9.09 5.45
32	1¼	42.2	mm kg/m				3.56 3.39	3.56 3.39		4.85 4.47	4.85 4.47				6.35 5.61	9.70 7.77
40	1½	48.3	mm kg/m				3.68 4.05	3.68 4.05		5.08 5.41	5.08 5.41				7.14 7.25	10.16 9.56
50	2	60.3	mm kg/m				3.91 5.44	3.91 5.44		5.54 7.48	5.54 7.48				8.74 11.11	11.07 13.44
65	2½	73.0	mm kg/m				5.16 8.63	5.16 8.63		7.01 11.41	7.01 11.41				9.52 14.90	14.02 20.39
80	3	88.9	mm kg/m				5.49 11.29	5.49 11.29		7.62 15.27	7.62 15.27				11.13 21.35	15.24 27.68
90	3½	101.6	mm kg/m				5.74 13.57	5.74 13.57		8.08 18.63	8.08 18.63				-	-
100	4	114.3	mm kg/m				6.02 16.07	6.02 16.07		8.56 22.32	8.56 22.32		11.13 28.32		13.49 33.54	17.12 41.03
125	5	141.3	mm kg/m				6.55 21.77	6.55 21.77		9.52 30.94	9.52 30.94		12.70 40.28		15.88 49.11	19.05 57.43
150	6	168.3	mm kg/m				7.11 28.26	7.11 28.26		10.97 42.56	10.97 42.56		14.27 54.20		18.26 67.56	21.95 79.22
200	8	219.1	mm kg/m		6.35 33.31	7.04 36.31	8.18 42.55	8.18 42.55	10.31 53.08	12.70 64.64	12.70 64.64	15.09 75.92	18.26 90.44	20.62 100.92	23.01 111.27	22.22 107.88
250	10	273.0	mm kg/m		6.35 41.75	7.80 51.01	9.27 60.29	9.27 60.29	12.70 81.52	12.70 81.52	15.09 95.97	18.26 114.70	21.44 133.00	25.40 155.09	28.57 172.21	25.40 155.09
300	12	323.8	mm kg/m		6.35 49.71	8.38 65.18	9.52 73.78	10.31 79.70	14.27 108.92	12.70 97.43	17.48 132.04	21.44 159.86	25.40 186.91	28.57 208.00	33.32 238.68	25.40 186.91
350	14	355.6	mm kg/m	6.35 54.69	7.92 67.90	9.52 81.25	9.52 81.25	11.13 94.55	15.09 126.71	12.70 107.39	19.05 158.10	23.83 194.96	27.79 224.65	31.75 253.56	35.71 281.70	
400	16	406.4	mm kg/m	6.35 62.64	7.92 77.83	9.52 93.17	9.52 93.17	12.70 123.30	16.66 160.12	12.70 123.30	21.44 203.53	26.19 245.56	30.96 286.64	36.53 333.19	40.49 365.35	
450	18	457.0	mm kg/m	6.35 70.60	7.92 87.75	11.13 122.43	9.52 105.10	14.27 155.87	19.05 205.83	12.70 139.20	23.83 254.67	29.36 309.76	34.92 363.64	39.67 408.45	45.24 459.59	
500	20	508.0	mm kg/m	6.35 78.55	9.52 117.02	12.70 155.12	9.52 117.02	15.09 183.42	20.62 247.83	12.70 155.12	26.19 311.17	32.54 381.53	38.1 441.49	44.45 508.11	50.01 564.81	
550	22	559.0	mm kg/m	6.35 86.54	9.53 129.13	12.70 171.09	9.5 129.13	-	22.2 294.25	12.70 171.09	28.6 373.83	34.9 451.42	41.3 527.02	47.6 600.63	54.0 672.26	
600	24	610.0	mm kg/m	6.35 94.46	9.52 140.88	14.27 209.50	9.52 140.88	17.48 255.24	24.61 355.02	12.70 186.94	30.96 441.78	38.89 547.33	46.02 639.58	52.37 719.63	59.54 807.63	
650	26	660.4	mm kg/m	7.92 127.36	12.70 202.72	-	9.50 152.87	-		12.70 202.72						
700	28	711.2	mm kg/m	7.92 137.32	12.70 218.69	15.88 271.21	9.50 164.85	-		12.70 218.69						

API SPECIFICATIONS

TOLERANCES FOR SEAMLESS API PIPE

Pipe Specification		API 5L		
Outside Diameter	Pipe Body	<60.3mm	+0.4mm	-0.8mm
		>60.3mm to <610mm	+0.0075D	-0.0075D
	Pipe Ends	60.3mm & smaller	+1.6mm (measured with ring gage)	-0.4mm
		>60.3mm to 168.3mm	+1.6mm (measured with ring gage)	-0.4mm
		>168.3mm to 610mm	±0.005D but maximum of ±1.6mm (measured with diameter gage)	
Wall Thickness		Seamless Pipe: 4mm thickness & smaller >4mm to <25mm 25mm & above	Grade A & B	
			+6mm +0.15T +3.7mm or +0.1T, whichever is greater	-0.5mm -0.125T -3.0mm or -0.1T, whichever is greater

TOLERANCES FOR WELDED API PIPE

Pipe Specification		API 5L		
Outside Diameter	Pipe Body	<60.3mm	+0.4mm	-0.8mm
		60.3mm to 168.3mm	+0.0075D	-0.0075D
		>168.3mm to <610mm	±0.0075D with maximum of ±3.2mm	
		>610mm to <1422mm	±0.005D with maximum of ±4.0mm	
	Pipe Ends	up to 168.3mm	+1.6mm	-0.4mm
		>168.3mm to <610mm	±0.005D but maximum of ±1.6mm (measured with ring gage)	
		>610mm to <1422mm	+1.6mm (measured with ring gage)	-1.6mm
Wall Thickness		Welded Pipe: 5mm thickness & smaller >5mm to <15mm 15mm & above	Grade A & B	
			+0.5mm +0.1T +1.5mm	-0.5mm -0.1T -1.5mm

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SEAMLESS API PIPES SPECIFICATIONS

Specification			API 5L											API 5CT			
Classification			A25 Class I	A25 Class II	A	B	x42	x46	x52	x56	x60	x65	x70	x80	H40	J55	K55	N80
Application			Line pipe												Casing Tubing			
Chemical Composition	C(Max.)		0.21	0.21	0.21	0.26	0.28	0.3	0.3	0.26	0.26	0.26	0.23	0.18	-			
	Si(Max.)		-	-	-	-	-	-	-	-	-	-	-	-	-			
	Mn(Max.)		0.30-0.60	0.30-0.61	0.9	1.15	1.25	1.35	1.35	1.35	1.35	1.35	1.6	1.8	-			
	P(Max.)		0.030	0.045-0.080	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030			
	S(Max.)		0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.018	0.030			
	Others		-	-	-	-	-	-	-	-	-	-	-	-	-			
Mechanical Properties.	Tensile Strength (Min.)	PSI	45000		48000	60000	60000	63000	66000	71000	75000	77000	82000	80000-120000	60000	75000	95000	120000
		Mpa	310		331	413	413	434	455	489	517	530	565	620-827	414	517	655	689
		kgf/mm²	31.7		33.7	42.2	42.2	44.3	46.5	50.0	52.6	54.2	57.7	63.3-84.5	42.2	52.7	66.8	70.3
	Yield point (Min.)	PSI	25000		30000	35000	42000	46000	52000	56000	60000	65000	70000	80000	40000-80000	55000-80000		80000-110000
		Mpa	172		207	241	289	317	358	386	413	448	482	551	276-552	379-552		552-758
		kgf/mm²	17.6		21.1	24.6	29.5	32.3	36.6	39.4	42.2	45.7	49.2	56.3	28.1-56.2	38.7-56.2		56.2-77.3
	Elongation (Min.) (%)		• U.S. customary Equation e = 625,000 ($A^{0.2}$/ $U^{0.9}$) • Metric Equation e = 1942,57 ($A^{0.2}$/ $U^{0.9}$) e: Minimum elongation in 2 in. (50.80mm) in percent to nearest 1/2 percent A: Cross-sectional area of the tensile test specimen in sq. in. (mm) U: Specified minimum ultimate tensile strength, PSI (Mpa)												e: Mfinimum elongation in 50.80mm in percent rounded to nearest 0.5% A: Cross-sectional area of the tensile test specimen in sq.mm U: Specified tensile strength in N/mm²			
Flattening	H:Distance between flattening plates (mm) D:Outside diameter of the pipe (mm) Wall thickness of the pipe		Welded part H=3/4D base metal H=0.6D		• Flattening test Welded part H=2/3D base metal H=1/3D • weld ductility test H= 3.07t / (0.07+3t/D) (Grades less than x 52) H= 3.05t / (0.05+3t/D) (Grades x 52 or higher)										• D/t ≥ 16 H= 0.5D • D/t < 16 H= D (0.83-0.0206D/t)	• D/t ≥ 16 H= 0.65D • 3.93 ≤ D/t < 16 H= D(0.98-0.0206D/t) • D/t < 3.93 H= D(1.104-0.0518D/t)		9 ≤ D/t <28 H= D (1.074-0.0194D/t)
Bending test	Bending angle x Inside diameter (D: Outside diameter of the pipe)		90°x 12D (Nominal size 2 or below)		-													
Hydrostatic Test	P: Test pressure, PSI (Kpa) S: Fiber stress, PSI (Mpa) t: Wall thickness, in. (mm) D: Outside diameter, in. (mm)		U.S. Customary Formula P= 2st / D • Metric formula P= 2000st / D												P=2st/D			

Grade	Size Designation	Percent of specified minimum yield strength (%) STD	Percent of specified minimum yield strength (%) ALT
A25	5 9/16	60	-
A	2 3/8 over	60	75
B	2 3/8 over	60	75
C	5 9/16 below	60	75
x42-x80	6 5/8 - 8 5/8	75	-
	10 3/4 - 18	85	-
	20 over	90	-

Grade	F factor STD Smaller than 10 3/4	F factor STD 10 3/4 and larger	F factor ALT All Sizes
H 40	0.8	0.6	0.8
J 55	0.8	0.6	0.8
K 55	0.8	0.6	0.8
N80	0.8	0.8	-

NDT (Non-destructive Test)	-	Electric resistance welded pipe: Ultrasonic Test or Electromagnetic Test (Eddy Current test) Submerged-arc weld pipe: Radiographic test	Ultrasonic Test or Electromagnetic Test
Others	-		-

BOILER AND HEAT EXCHANGER TUBES

SPECIFICATIONS

1. STANDARDS	**ASTM A 106** **ASTM A 192** **ASTM A 210** **ASTM A 213** **ASTM A 335**	**DIN 17175 / 2448**	**BS 3059/1** **BS 3059/2**	**NF A 40-211**	**JIS G 3461**

2. TOLERANCES

Standard	Outside Diameter	Wall Thickness	Weight
ASTM A106	O.D. ≤ 48.3mm ±0.40mm 48.3mm < O.D. ≤ 114.3mm ±0.79mm	-12.5%	+10/ -3.5% for any ength of pipe
ASTM A192 **ASTM A213** **ASTM A210**	H O.D. ≤ 101.6mm ±0.4/ -0.8mm O.D. < 101.6mm ±0.4/ -1.2mm	H S ≤ 2.4mm +40/ 0% 2.4 < S ≤ 3.8mm +35/ 0% 3.8 < S ≤ 4.6mm +33/ 0% S > 4.6mm +28/ 0%	H +16/ 0%
	C O.D. < 25.4mm ±0.10mm 25.4 ≤ O.D. < 38.1mm ±0.15mm 38.1 < O.D. ≤ 50.8mm ±0.20mm 50.8 < O.D. ≤ 63.5mm ±0.25mm	C O.D. ≤ 38.1mm +20/ 0% O.D. > 38.1mm +22/ 0%	C O.D. ≤ 38.1mm +12/ 0% O.D. > 38.1mm +13/ 0%
ASTM A335	O.D. ≤ 48.3mm +0.4/ -0.8mm O.D. > 48.3mm ±0.8mm	-12.5%	-10/ -3.5% for any length of pipe
JIS G3461	H O.D. < 100mm ±0.4/ -0.8mm O.D. ≥ 100mm ±0.4/ -1.2mm	H 2 ≤ S < 2.4mm +40/ 0% 2.4 ≤ S < 3.8mm +35/ 0% 3.8 ≤ S < 4.6mm +33/ 0% S ≥ 4.6mm +28/ 0%	
	C O.D. < 25mm ±0.10mm 25 ≤ O.D. < 40mm ±0.15mm 40 ≤ O.D. < 50mm ±0.20mm 50 ≤ O.D. < 60mm ±0.25mm	C O.D. <40mm S<2mm +0.4/0mm S>2mm +20/0% O.D. ≥40mm +22/0%	
NFA 49-211	O.D. ≤ 48.3mm +0.4/ -0.8mm 60.3 ≤ O.D. ≤ 114.3mm ±0.8mm	S ≤ 3.2mm +0.5mm/ -0.15S S > 3.2mm +0.15S/ -0.125S	+10/ -3.5% for each tube -1.75% for lots over 18t
BS 3059/1	H ±1% (admissible 0.5mm)	H ±12.5%	
	C ±0.5% (admissible 0.10mm)	C ±7.5%	
BS 3059/2	Seamless Class 2 (S2)		
	H ±0.75% (admissible ±0.3mm)	H ±10%	
	C ±0.5% (admissible ±0.15mm)	C S ≤ 3.25mm ±10% S > 3.25mm ±7.5%	
DIN 17175	H O.D. ≤ 100mm ±0.75% (admissible 0.5mm) O.D. > 100mm ±0.90%	S ≤ 2Sn +15/ -10% 2Sn < S ≤ 4Sn +12.5/ -10% 4Sn < S ±9%	+10* -8% for each tube ±7.5% for lots over 10t
	C ±0.6% (admissible ±0.25mm)		

H – Hot Rolled
C – Cold Drawn
Sn – Nominal Wall Thickness according to DIN 2448
S – Wall Thickness

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BOILER AND HEAT EXCHANGER TUBES

3. CHEMICAL REQUIREMENTS (%)

Standard	Grade	C	Si	Mn	Cr	Mo	Al max.	P max.	S max.
DIN 17175	ST 35.8	max. 0.17	0.10-0.35	0.40-0.80	-	-	-	0.040	0.040
	ST 45.8	max. 0.21	0.10-0.35	0.40-1.20	-	-	-	0.040	0.040
	15 Mo 3	0.12-0.20	0.10-0.35	0.40-0.80	-	0.25-0.35	-	0.035	0.035
	13 CrMo 4 4	0.10-0.18	0.10-0.35	0.40-0.70	0.70-1.10	0.45-0.65	-	0.035	0.035
	10 CrMo 9 10	0.08-0.15	max. 0.50	0.40-0.70	2.00-2.50	0.90-1.20	-	0.035	0.035
ASTM A 106	Grade A*	max. 0.25	min.0.10	0.27-0.93	-	-	-	0.035	0.035
	Brade B*	max. 0.30	min.0.10	0.29-1.06	-	-	-	0.035	0.035
ASTM A192		0.06-0.18	max. 0.25	0.27-0.63	-	-	-	0.035	0.035
ASTM A210	Grade A-1	max. 0.27	min.0.10	max. 0.93	-	-	-	0.035	0.035
	Grade C	max. 0.35	min.0.10	0.29-1.06	-	-	-	0.035	0.035
ASTM A213	T 12	0.05-0.15	max. 0.50	0.30-0.61	0.80-1.25	0.44-0.65	-	0.025	0.025
	T 22	0.05-0.15	max. 0.50	0.30-0.60	1.90-2.60	0.87-1.13	-	0.025	0.025
ASTM A335	P 22	0.05-0.15	max. 0.50	0.30-0.60	1.90-2.60	0.87-1.13	-	0.025	0.025
BS 3059/ 1	320	max. 0.16	0.10-0.35	0.30-0.70	-	-	-	0.040	0.040
BS 3059/ 2	360	max. 0.17	max. 0.35	0.40-0.80	-	-	-	0.045	0.045
	243	0.12-0.20	0.10-0.35	0.40-0.80	-	0.25-0.35	0.012	0.040	0.040
	440	0.12-0.18	0.10-0.35	0.90-1.20	-	-	-	0.040	0.035
	620	0.10-0.15	0.10-0.35	0.40-0.70	0.70-1.10	0.45-0.65	0.020	0.040	0.040
	622-440	0.08-0.15	max. 0.50	0.40-0.70	2.00-2.50	0.90-1.20	0.020	0.040	0.040
NF A49-211	TU E 220	max. 0.15	max. 0.30	max. 0.80	-	-	-	0.025	0.025
	TU E 250	max. 0.21	max. 0.35	max. 1.00	-	-	-	0.025	0.025
	TU E 270	max. 0.23	max. 0.40	max. 1.35	-	-	-	0.025	0.025
JIS G3461	STB 340	max. 0.18	max. 0.35	0.30-0.60	-	-	-	0.035	0.035
	STB 410	max. 0.32	max. 0.35	0.30-0.80	-	-	-	0.035	0.035

*The sum of Cu, Cr, Mo, Ni and V not axceed 1%
Cu = max. 0.40%; Cr = max. 0.40%; Mo = max. 0.15%; Ni = max. 0.40%; V = max. 0.08%

BOILER AND HEAT EXCHANGER TUBES

4. MECHANICAL REQUIREMENTS

Standard	Steel Grade	Yiedl Strength N.mm² ; min.	Tensile Strength N/mm²	Elongation min. (%)
DIN 17175	ST 35.8 ST 45.8 15 Mo 3 13 CrMo 4 4 10 CrMo 9 10	235 255 270 290 280	360-480 410-560 450-600 440-590 450-600	25 21 22 22 20
BS 3059/ 1	320	195	320-480	25
BS 3059/ 2	360 243 440 620 622-440	215 250 245 180 175	360-500 450-600 440-580 460-610 440-590	24 22 21 22 20
NF A49-211	TU E 220 TU E 250 TU E 270	220 250 275	370-490 410-530 470-590	26 23 20
JIS G3461	STB 340 STB 410	175 255	MIN. 340 MIN. 410	35 25

Standard	Grade	Yield Strength min. PSI (MPa)	Tensile Strength min. PSI (MPa)	Elongation	Hardness HRB Max.
ASTM A106	Grade A* Grade B*	30000 (205) 35000 (240)	48000 (330) 60000 (415)	Calculation acc. To the wall thickness	- -
ASTM A192		26000 (180)	47000 (325)	min. 35	77
ASTM A210	Grade A-1 Grade C	37000 (255) 40000 (275)	60000 (415) 70000 (485)	min. 30 min. 30	79 89
ASTM A213	T 12 T 22	32000 (220) 30000 (205)	60000 (415) 60000 (415)	min. 30 min. 30	85 85
ASTM 1335	P 22	30000 (205)	60000 (415)	Calculation	-

*The sum of Cu, Cr, Mo, Ni and V not exceed 1%
Cu = max.0.40%; Cr = max.0.40%; Mo = max.0.15%; Ni = max.0.40%; V = max.0.08%

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