

KUMSOO CONNECTING SAW PIPE

Pressure Pipe | Structure Pipe | Line Pipe



KUMSOO CONNECTING CO.,LTD.

Change the flow of the world

Kumsoo Connecting

Kumsoo Connecting was established in 1990 and have sustained continuous growth through ceaseless management innovation, technical development and quality renovation every year.

In 2002, we got a foothold as a global corporation with the completion of a plant in Busan, which would mainly produce Butt Welding Fittings.

Kumsoo Connecting is now on the verge of a new leap forward since we installed the cutting-edge production facilities for Submerged Arc Welded Pipe in 2014.

Kumsoo Connecting has acquired certificates of API 5L for Line pipe, API 2B for Structure pipe and other international certificates for management and system such as ISO 9001, ISO 14001 and OHSAS 18001. Kumsoo Connecting also acquired 4 patents on the auto-pipe welding system since welding is the most critical technique for the quality of pipe products.

Kumsoo Connecting provides the products and services that meet the international standards such as API, JIS, ASTM and KS and strict compliance requirements of customers based on more than 27years know-how and experiences. Kumsoo Connecting can produce large diameter pipes and fittings that other companies can hardly manufacture, by the advanced forming skills and the high-powered press bending machine.

We, Kumsoo Connecting promise that we will gain greater insight into how our customers use our products by sincerely listening to customers and understanding their needs and objectives.

► The Best Partner Kumsoo Connecting



Kumsoo Connecting is your Best Partner exerting itself to supply the superior quality products in time at a competitive price

CERTIFICATES & PATENTS



API 5L API 2B ISO 9001 ISO 14001 OHSAS 18001

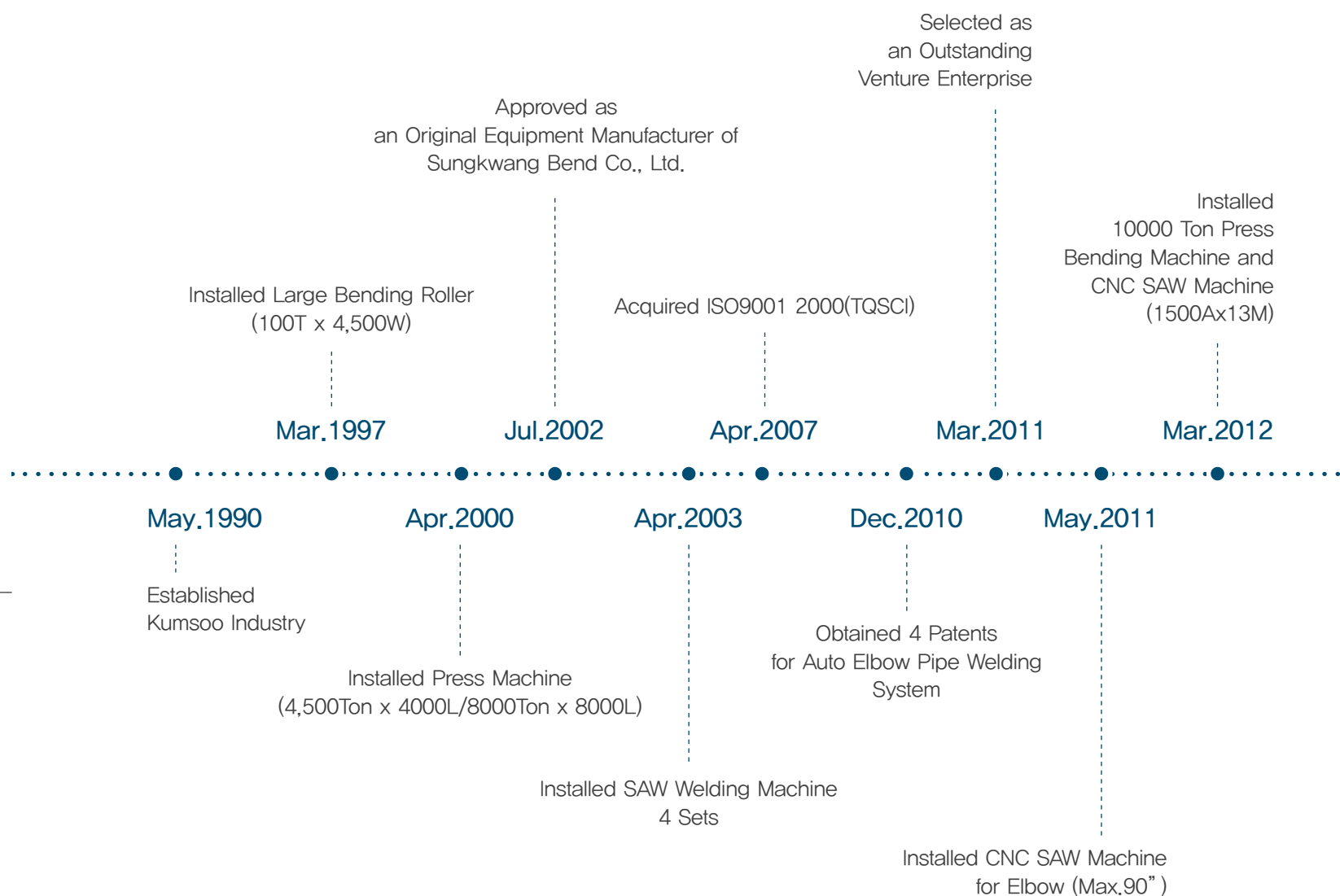


JIS G 3457 DNV GL 4 Patents for Auto Elbow Pipe Welding System

MAJOR CUSTOMERS



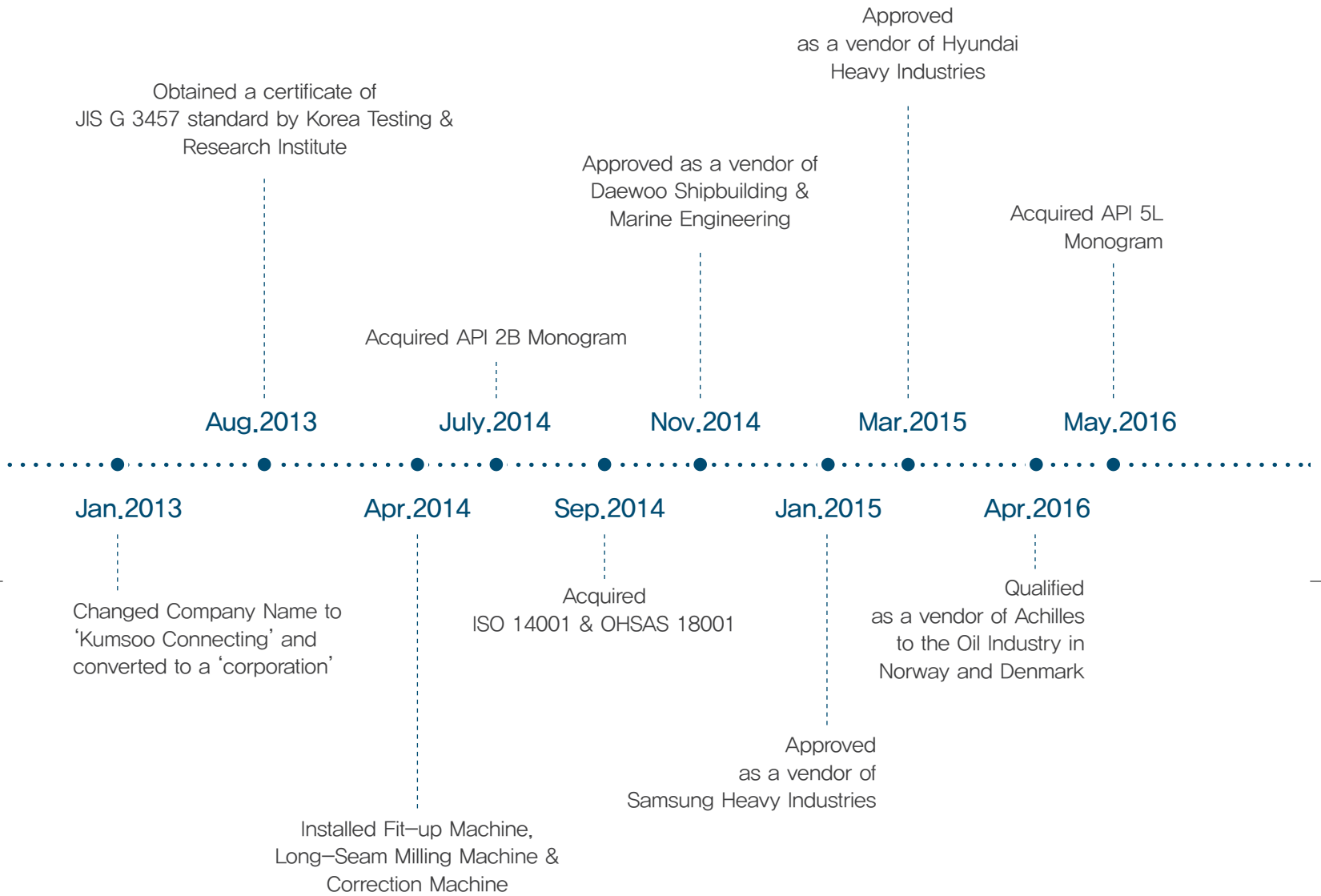
Company History



Change the flow of the world

Kumsoo Connecting





Main Product

SAW PIPE (Submerged Arc Welded Pipe)

- CARBON STEEL PIPE
- STAINLESS STEEL PIPE
- ALLOY STEEL PIPE

OFFSHORE OIL&GAS CONSTRUCTIONS
HARBOUR, JETTY CONSTRUCTIONS

OIL&GAS, POWER PLANT CONSTRUCTIONS

MACHINERY AND PRESSURE VESSEL CONSTRUCTIONS

LINE PIPES AND ACCESSORIES



STRUCTURE PIPE



PRESSURE PIPE



LINE PIPE

▶ PRESSURE PIPE

ITEM	CARBON STEEL AND ALLOY STEEL PIPE FOR PIPING
USE	Carbon steel pipe and alloy steel pipe for piping of steam, air, water, oil and gas with relatively low pressure
PLATE SPEC	JIS G 3457 STPY400, ASTM/ASME A515(A516) GR.60, 65, 70 ASTM/ASME A387 GR2, 11, 12, 22, 5, 9, 91 ETC.
APPLICATION	PROCESSING PIPE ASTM
PURPOSE	PETROCHEMICAL INDUSTRY POWER PLANT

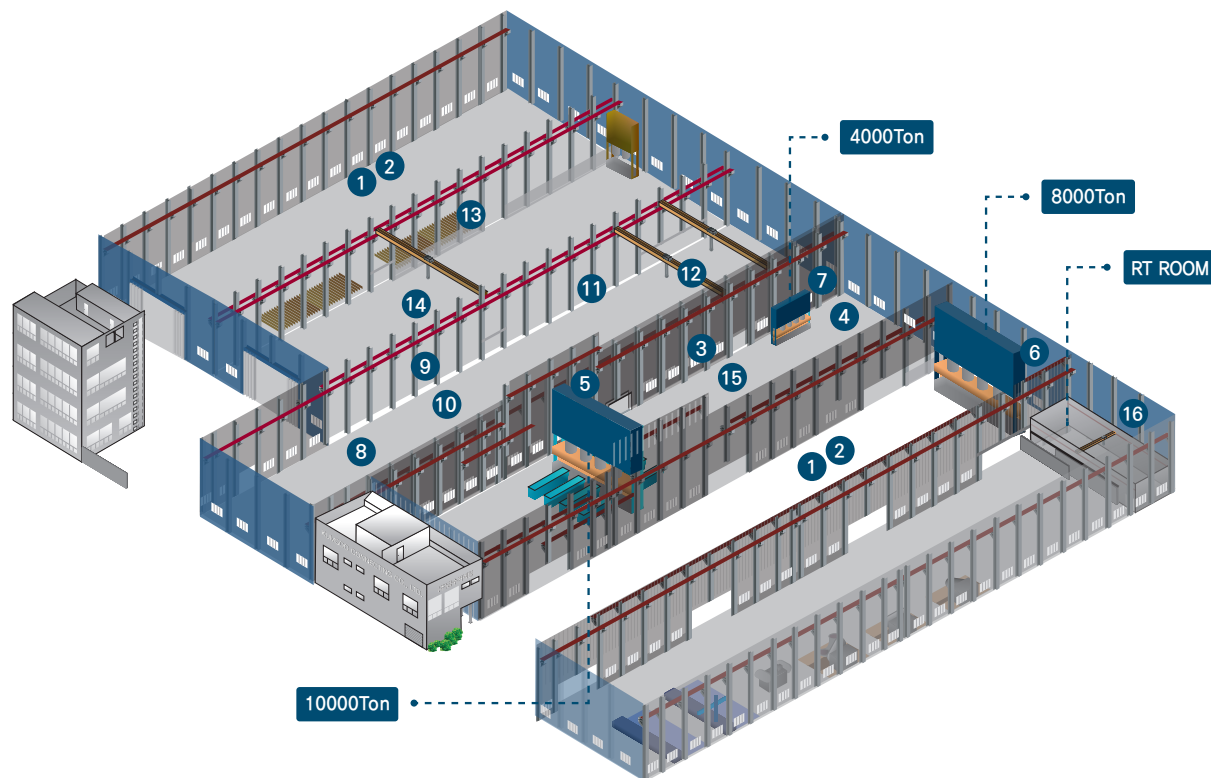
▶ STRUCTURE PIPE

ITEM	CARBON STEEL PIPE FOR STRUCTURE
USE	Steel pipe for regular structures including engineering works, buildings, steel towers, piles, rails, fences and pillars Structures in the ocean including drilling facilities and quay facilities.
PLATE SPEC	API 2W GR42, 50, 60 / API 2H GR42,50 / A572 GR50 EN10025/10225/10113/10219 JIS G 3444 STK 400, 490 ETC
APPLICATION	OFFSHORE STRUCTURES API 2W, API 2H, ASTM
PURPOSE	STEEL FOR RESOURCE RECOVERY FACILITIES IN OR ABOVE THE SEA - LEG CANS, BRACINGS - JACKET, PILES, CAISSONS - CONDUCTOR PIPES - CONSTRUCTION PIPES

▶ LINE PIPE

ITEM	LINE PIPE
USE	Steel pipe for transferring oil and natural gas
PLATE SPEC	API 5L GR. A, B, X42~X80
APPLICATION	LINE PIPES API 5L
PURPOSE	TRANSPORT(CRUDE OIL, NATURAL GAS) FROM OIL FIELD TO REFINERY

Manufacturing Process



Main Product



▶ SAW Pipe & Tubular

Production Scope	
O.D	355.6mm (14") ~ 1,524mm (60")
Thickness	12.7T ~ 80T
Length	Max.12,500mm

▶ Capacity : 24,000Ton/year



▶ Structure

Production Scope	
O.D	355.6mm (14") ~ 4,064mm (160")
Thickness	9.5T ~ 100T

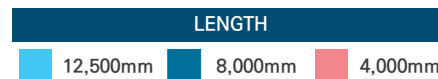
▶ Capacity : 2,000Ton/year

▶ Girth Welding



Main Production Facilities

Press Bending M/C Production range



OD		Thickness(mm)															
mm	inch	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	
355.6	14	12,500	12,500	12,500	12,500												
406.4	16	12,500	12,500	12,500	12,500	12,500											
457.2	18	12,500	12,500	12,500	12,500	12,500	4,000										
508	20	12,500	12,500	12,500	12,500	12,500	12,500	8,000									
558.8	22	12,500	12,500	12,500	12,500	12,500	12,500	12,500	8,000	4,000							
609.6	24	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	8,000	4,000					
660.4	26	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	8,000	4,000			
711.2	28	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	8,000	4,000	
762	30	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	8,000	
812.8	32	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
863.6	34	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
914.4	36	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
965.2	38	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
1,016	40	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
1,066.8	42	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
1,117.6	44	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
1,168.4	46	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
1,219.2	48	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
1,270	50	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	
1,524	60	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	

Roll Bending M/C Production range



OD		Thickness(mm)																				
mm	inch	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
304.8-660.4	12-26	3,000	3,000	3,000	3,000	3,000																
711.2-812.8	28-32	4,000	4,000	4,000	4,000	4,000	4,000															
863.6-965.2	34-38	4,000	4,000	4,000	4,000	4,000	4,000	4,000														
1,016-1,219.2	40-48	6,000	6,000	6,000	6,000	6,000	6,000	6,000														
1,270-1,473.2	50-58	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000													
1,524-1,778	60-70	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000												
1,828.8-1,930.4	72-76	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000											
1,981.2-2,082.8	78-82	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000										
2,133.6-2,184.4	84-86	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000									
2,235.2-2,286	88-90	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000								
2,336.8-2,387.6	92-94	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000							
2,438.4-2,489.2	96-98	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000						
2,540-2,641.6	100-104	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000					
2,692.4-2,794	106-110	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000				
2,844.8-2,946.4	112-116	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000			
2,997.2-3,048	118-120	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000		
3,098.8-3,251.2	122-128	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	
3,302-3,403.6	130-134	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
3,454.4-3,556	136-140	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
3,606.8-5,080	142-200	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000

Press Bending M/C 10,000Ton



Division	Production Scope
Outside Diameter	355.6mm (14") ~ 1,524mm (60")
Thickness	Max.60T
Length	Max.12,500mm

Press Bending M/C 8,000Ton



Division	Production Scope
Outside Diameter	355.6mm (14") ~ 1,016mm (40")
Thickness	Max.80T
Length	Max.8,000mm

Press Bending M/C 4,000Ton



Division	Production Scope
Outside Diameter	355.6mm (14") ~ 812.8mm (32")
Thickness	Max.65T
Length	Max.4,000mm

Roll Bending M/C 6,000L X 40T



Division	Production Scope
Outside Diameter	711.2mm (28") ~ 5,080mm (200")
Thickness	Max.40T
Length	Max.6,000mm

Roll Bending M/C 4,000L X 110T



Division	Production Scope
Outside Diameter	1,219.2mm (48") ~ 3,048mm (120")
Thickness	Max.110T
Length	Max.4,000mm


Roll Bending M/C 4,500L X 40T



Division	Production Scope
Outside Diameter	660.4mm (26") ~ 3,048mm (120")
Thickness	Max.30T
Length	Max.4,500mm

Main Production Facilities

Tack Welding M/C



Outside Diameter	Min.355.6mm (14") ~ Max.1,524mm (60")
Thickness	Min.9T ~ Max.60T
Length	Max.15,000mm
Workable Weight	Max.30Ton

Long-seam Milling M/C



Outside Diameter	Min.355.6mm (14") ~ Max.1,524mm (60")
Thickness	Min.9T
Length	Max.15,000mm
Workable Weight	Max.30Ton

SAW Inside Welding M/C



Outside Diameter	Min.355.6mm (14") ~ Max.1,524mm (60")
Thickness	Min.9T
Length	Max.15,000mm
Workable Weight	Max.30Ton

SAW Inside & Outside Welding M/C



Outside Diameter	Min.355.6mm (14") ~ Max.1,524mm (60")
Thickness	Min.9T
Length	Max.15,000mm
Workable Weight	Max.30Ton

SAW Outside Welding M/C



Outside Diameter	Min.355.6mm (14") ~ Max.1,524mm (60")
Thickness	Min.9T
Length	Max.15,000mm
Workable Weight	Max.30Ton

Correction Press M/C



Outside Diameter	Min.355.6mm (14") ~ Max.1,524mm (60")		
Thickness	Min.9T		
Length	Max.15,000mm		
Press power	Max.1,500Ton	Workable Weight	Max.30Ton

End Facing



Inspection Scope

Outside Diameter	Min.355.6mm (14") ~ Max.1,524mm (60")
Thickness	Min.9T ~ Max.50T
Length	Min.1,000mm ~ Max.15,000mm
Workable Weight	Max.30Ton

Hydro Test M/C



Inspection Scope

O.D	355.6mm (14")~ 812.8mm (32")
Length	6,000mm ~12,500mm
Pressure	Max.250Bar
Main Cylinder Press	210Kg/cm ²
Main Cylinder Power	350Ton

NDE Inspection



Inspection Scope

Sort of Test	UT , RT , PT , MT
Testable height	5,000mm
Testable width	10,000mm
Testable length	20,000mm

Specification

JIS_G 3457_G 3454_G 3444_A 5525

Application		Arc welded carbon steel pipes	Carbon steel pipes for pressure services		Carbon steel tubes for general structural purposes				Steel pipe piles		
Specification		JIS G 3457 (KS D 3583)	JIS G 3454 (KS D 3562)		JIS G 3444 (KS D 3566)				JIS A 5525 (KS F 4602)		
		STPY 400 (SPW 400)	STPG 370 (SPPS 38)	STPG 410 (SPPS 42)	STK 290 (STK 290)	STK 400 (STK 400)	STK 500 (STK 500)	STK490 (STK 490)	SKK 400 (SPS 400)	SKK 490 (SPS 490)	
Chemical composition (%)	C(Max.)	0.25	0.25	0.3	-	0.25	0.24	0.18	0.25	0.18	
	Si(Max.)	-	0.35	0.35	-	-	0.35	0.55	-	0.55	
	Mn(Max.)	-	0.30 - 0.90	0.30 - 1.00	-	-	0.30-1.30	1.5	-	1.5	
	P(Max.)	0.04	0.04	0.04	0.05	0.04	0.04	0.04	0.04	0.04	
	S(Max.)	0.04	0.04	0.04	0.05	0.04	0.04	0.04	0.04	0.04	
	Others	-	-	-	-	-	-	-	-	-	
Mechanical properties	Tensile strength (Min.)	kgf/mm ²	41	38	42	30	41	51	50	41	50
		N/mm ²	400	373	472	290	400	500	490	400	490
	Yield point (Min.)	kgf/mm ²	23	22	25	-	24	36	32	24	32
		N/mm ²	225	216	245	-	235	356	315	235	315
Elongation (Min.) (%)	No.11 specimen No.12 Specimen	-	30	25	30	23	15	23	23	23	
	No. 5 specimen	18	25	20	25	18	10	18	18	18	
Flattening test	H : Distance between Flattening plates(mm)	-	Welded part H = 2/3D		H = 2/3D	H = 2/3D	H = 7/8D	H = 7/8D	H = 2/3D	H = 7/8D	
	D : Outside diameter of the pipe(mm)	-	Base metal H = 1/3D		-				-		
Bending test	Bending angle X Inside radius (D : Outside diameter of the pipe)	-	90° X 6D (Pipes of 40A or below, substitute with flattening test)		90° X 6D	90° X 6D	90° X 8D	90° X 6D	-		
		Pipes of 50mm or below, substitute with flattening test									
Hydrostatic test	Hydrostatic test pressure (kgf/cm ²)	25	-		By agreement				By agreement		
Non-destructive Test	Ultrasonic test or Radiographic test	substitute with hydrostatic test	substitute with hydrostatic test		By agreement				By agreement		
Others		Tensile strength test for welded part	-		Tensile strength test for welded part (Arc welded steel pipes 350mm or above)				Tensile strength test for welded part (Arc welded steel pipes)		



API 5L

Application		Line Pipes																																			
Specification		API 5L (PSL I / PSL II)																																			
		A25	A25P	A	B	X42	X46	X52	X56	X60	X65	X70	X80																								
Chemical composition (%)	C(Max.)	0.21	0.21	0.21	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26																								
	Si(Max.)	-	-	-	-	-	-	-	-	-	-	-	-																								
	Mn(Max.)	0.60	0.60	0.90	1.20	1.30	1.40	1.40	1.40	1.40	1.45	1.65	-																								
	P(Max.)	0.030	0.080	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	-																								
	Others	-	-	-	-	-	-	-	-	-	-	-	-																								
Mechanical properties	Tensile strength (Min.)	PSI	45,000	48,000	60,000	60,000	63,000	66,000	71,000	75,000	77,000	82,000	-																								
		Mpa	310	331	414	414	434	455	490	517	531	565	-																								
	Yield point (Min.)	PSI	25,000	30,000	35,000	42,000	46,000	52,000	56,000	60,000	65,000	70,000	-																								
		Mpa	172	331	414	414	434	455	490	517	531	565	-																								
Elongation (min.) (%)	· U.S. Customary Equation $e=625.000(A^{0.2} / U^{0.9})$ · Metric Equation $e=1.944(A^{0.2} / U^{0.9})$ e : Minimum elongation in 2 in. (50.80mm) in percent rounded 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)																																				
Flattening	H : Distance between latching plates(mm)	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 $H = \frac{0.07t}{(0.07+3t/D)}$ (Grade less than X52) $H = \frac{3.05t}{(0.05+3t/D)}$ (Grade X52 or higher)																									
	D : Outside diameter of the pipe(mm) t : Wall thickness of the pipe(mm)		$A = \frac{(1.15(D-2t)}{(e^D - 2e - 1)}$ RA=1/2A B(in.)=A+2t+0.125in. B(mm)=A+2t+3.2mm RB=1/2B									<table border="1"> <thead> <tr> <th rowspan="2">Grade</th> <th>e</th> <th rowspan="2">Grade</th> <th>e</th> </tr> <tr> <th>in./in.(mm/mm)</th> <th>in./in.(mm/mm)</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>0.1675</td> <td>X56</td> <td>0.1175</td> </tr> <tr> <td>B</td> <td>0.1375</td> <td>X60</td> <td>0.1125</td> </tr> <tr> <td>X42</td> <td>0.1375</td> <td>X65</td> <td>0.1100</td> </tr> <tr> <td>X46</td> <td>0.1325</td> <td>X70</td> <td>0.1025</td> </tr> <tr> <td>X52</td> <td>0.125</td> <td>X80</td> <td>0.0900</td> </tr> </tbody> </table>		Grade	e	Grade	e	in./in.(mm/mm)	in./in.(mm/mm)	A	0.1675	X56	0.1175	B	0.1375	X60	0.1125	X42	0.1375	X65	0.1100	X46	0.1325	X70	0.1025	X52	0.125
Grade	e	Grade	e																																		
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X52	0.125	X80	0.0900																																		
Bending test	Bending angle X Inside radius D : Outside diameter T : Wall thickness e : Strain	90°X 12D (Nominal size 2 or below)																																			
NDT (Non-Destructive Test)		UT : Ultrasonic Test RT : Radiographic Test																																			
Hydrostatic test	P : Test pressure, PSI (MPa) S : Fiber stress, PSI (MPa) T : Wall thickness, in. (mm) D : Outside diameter, in. (mm)	· U.S. Customary Formula $P = \frac{2St}{D}$ · Metric Formula $P = \frac{2,000St}{D}$							<table border="1"> <thead> <tr> <th rowspan="2">Grade</th> <th>Size</th> <th colspan="2">Percent of specified minimum yield strength(%)</th> </tr> <tr> <th>Designation</th> <th>STD</th> <th>ALT</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>≥ 2 3/8 over</td> <td>60</td> <td>75</td> </tr> <tr> <td>B</td> <td>≥ 2 3/8 over</td> <td>60</td> <td>75</td> </tr> <tr> <td>X42-X80</td> <td>≥ 20 over</td> <td>90</td> <td>90</td> </tr> </tbody> </table>				Grade	Size	Percent of specified minimum yield strength(%)		Designation	STD	ALT	A	≥ 2 3/8 over	60	75	B	≥ 2 3/8 over	60	75	X42-X80	≥ 20 over	90	90						
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Designation		STD	ALT																																		
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B	≥ 2 3/8 over	60	75																																		
X42-X80	≥ 20 over	90	90																																		
Others		Residual Magnetism Measurement																																			

Specification

ASTM A671

Application		Electric Fusion Welded Steel Pipes for Atmospheric and Lower Temperature																								
Specification		ASTM A671																								
Classification		CA55	CB60	CB65	CB70	CC60	CC65	CC70	CD70	CD80	CF65	CF70	CF65	CF70	CG100	CH115	CJA115	CJB115	CJE115	CJF115	CJH115	CJP115	CK75	CP85		
Chemical composition(%)	C(Max.)	0.28	0.24	0.28	0.31	0.21	0.24	0.27	0.24	0.24	0.17	0.21	0.31	0.21	0.13	0.13	0.15 ~ 0.21	0.15 ~ 0.21	0.24	0.28	0.31	0.21	0.26	0.07		
	Si(Max.)	-	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.50	0.15 ~ 0.50	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.35	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.40	
	Mn(Max.)	0.9	0.9	0.9	1.2	0.60 ~ 0.90	0.85 ~ 1.20	0.85 ~ 1.20	0.70 ~ 1.35	0.70 ~ 1.35	0.7	0.7	0.7	0.7	0.9	0.9	0.80 ~ 1.10	0.70 ~ 1.10	0.9	0.9	1.2	0.60 ~ 0.90	0.90 ~ 1.40	0.40 ~ 0.70	0.40	
	P(Max.)	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.015	0.015	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
	S(Max.)	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.015	0.015	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
	Ni(Max.)	-	-	-	-	-	-	-	-	-	-	2.10 ~ 2.50	2.10 ~ 2.50	3.25 ~ 3.75	3.25 ~ 3.75	8.50 ~ 9.50	8.50 ~ 9.50	-	-	-	-	-	-	-	0.70 ~ 1.00	
	Cr(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.50 ~ 0.80	0.40 ~ 0.65	1.40 ~ 2.00	0.40 ~ 0.65	0.40 ~ 0.65	0.85 ~ 1.20	-	0.60 ~ 0.90	
	Mo(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.18 ~ 0.28	0.15 ~ 0.40	0.40 ~ 0.60	0.40 ~ 0.60	0.20 ~ 0.30	0.45 ~ 0.60	-	0.15 ~ 0.25	
	Br(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.025	0.0005 ~ 0.005	0.001 ~ 0.006	0.0005 ~ 0.006	0.005 min	0.001 ~ 0.005	-	-	
	Va(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03 ~ 0.08	-	0.03 ~ 0.08	0.03 ~ 0.08	-	-	-	
	Ti(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01 ~ 0.04	0.01 ~ 0.10	0.10	0.10	0.10	-	-	
	Zi(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05 ~ 0.15	-	-	-	-	-	-	-	
	Cu(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15 ~ 0.50	-	-	-	1.00 ~ 1.30	
	Others	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Mechanical properties	Tensile strength (min.)	Ksi	55 ~ 75	60 ~ 80	65 ~ 85	70 ~ 90	55 ~ 75	65 ~ 85	70 ~ 90	70 ~ 90	80 ~ 100	65 ~ 85	70 ~ 90	65 ~ 85	70 ~ 90	100 ~ 120	100 ~ 120	115 ~ 135	115 ~ 135	105 ~ 135	105 ~ 135	115 ~ 135	105 ~ 135	75 ~ 95	85 ~ 105	
		MPa	380 ~ 515	415 ~ 550	450 ~ 585	485 ~ 620	415 ~ 550	450 ~ 585	485 ~ 620	485 ~ 620	550 ~ 690	450 ~ 585	485 ~ 620	450 ~ 585	485 ~ 620	690 ~ 825	690 ~ 825	795 ~ 930	795 ~ 930	725 ~ 930	725 ~ 930	795 ~ 930	725 ~ 930	515 ~ 655	585 ~ 725	
Yield point (min.)	Ksi	30	32	35	38	30	35	38	50	60	37	40	37	40	75	75	100	100	90	90	100	90	42	75		
	MPa	205	220	240	260	220	240	260	345	415	255	275	255	275	515	515	690	690	620	620	690	620	290	515		
Material Code		A258 Gr.C	A515 Gr 60	A515 Gr 65	A515 Gr 70	A516 Gr 60	A516 Gr 65	A516 Gr 70	A537 Cl1	A537 Cl2	A203 Gr A	A203 Gr B	A203 Gr D	A203 Gr E	A353	A353 Ty1	A517 Gr A	A517 Gr B	A517 Gr E	A517 Gr F	A517 Gr H	A517 Gr P	A299 Gr.A	A736 Gr a, Class 3		
Number of Test test		1Pipe/ 60M Fabrication of heat Number(Lot)																								
Flattening test		-																								
Bending test		No cracks or other defects exceeding 1/8 in. [3 mm], less than 1/4 in. [6 mm] measured in any direction																								
Hydrostatic test		Heat treatment Type : Classes X2, X3 Pipe : P=2St/D(hydrostatic pressure which will produce in the pipe wall a stress not less that 60 % of the minimum specified yield strength for carbon and ferritic alloy steel pipe, or 50 % of the specified minimum yield strength for austenitic alloy steel pipe)																								
NDT (Non-Destructive Test)		Heat treatment Type :Classes X1, X2 Pipe : RT 100%																								
Dimension, Mass and Permissible Variations		Outside Diameter : circumferential measurement : 0.5 % of the specified outside diameter. Out-of-Roundness : major and minor outside diameters, 1 %. Alignment: Max 3 mm. Thickness : normal Thickness-0.3mm. Length: -0, +13mm																								
Others		-																								



▶ ASTM A672

Application		Electric Fusion Welded Steel Pipes for High Pressure Service at Moderate Temperatures																					
Specification		ASTM A672																					
		A45	A50	A55	B60	B65	B70	C55	C60	C65	C70	D70	D80	H70	H80	J80	J90	J100	L65	L70	L75	N75	
Classification																							
		Chemical composition(%)	C(Max.)	0.17	0.22	0.28	0.24	0.28	0.31	0.18	0.21	0.24	0.27	0.24	0.24	0.20	0.20	0.25	0.25	0.25	0.18	0.2	0.23
Si(Max.)	-		-	-	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.50	0.15 ~ 0.50	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	0.15 ~ 0.40	
Mn(Max.)	0.9		0.9	0.9	0.9	0.9	1.2	0.60 ~ 0.90	0.60 ~ 0.90	0.85 ~ 1.20	0.85 ~ 1.20	0.70 ~ 1.35	0.70 ~ 1.35	0.95 ~ 1.30	1.15 ~ 1.20	1.15 ~ 1.50	1.15 ~ 1.50	1.15 ~ 1.50	0.90	0.90	0.90	0.90 ~ 1.40	
P(Max.)	0.035		0.035	0.035	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
S(Max.)	0.04		0.04	0.04	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Ni(Max)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	0.40 ~ 1.00 (b,c)	0.60 (E)	0.60 (E)	0.60 (E)	-	-	-	-
Cr(Max)	-		-	-	-	-	-	-	-	-	-	-	-	-	0.45 ~ 0.60	0.45 ~ 0.60	-	-	-	0.45 ~ 0.60	0.45 ~ 0.60	0.45 ~ 0.60	-
Mo(Max)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Br(Max)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Va(Max)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ti(Max)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zi(Max)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cu(Max)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mechanical properties	Tensile strength (min.)	Ksi	-	-	-	60 ~ 80	65 ~ 85	70 ~ 90	55 ~ 75	55 ~ 75	65 ~ 85	70 ~ 90	70 ~ 90	80 ~ 100	75 ~ 95	80 ~ 100	80 ~ 100	90 ~ 115	100 ~ 125	65 ~ 85	70 ~ 90	75 ~ 95	75 ~ 95
		MPa	315 ~ 450	345 ~ 485	380 ~ 515	415 ~ 550	450 ~ 585	485 ~ 620	380 ~ 515	415 ~ 550	450 ~ 585	485 ~ 620	485 ~ 620	550 ~ 690	515 ~ 655	550 ~ 690	550 ~ 690	620 ~ 795	690 ~ 860	450 ~ 585	485 ~ 620	515 ~ 655	515 ~ 655
	Yield point (min.)	Ksi	-	-	-	32	35	38	20	30	35	38	50	60	45	50	50	70	83	37	49	43	42
		MPa	165	185	205	220	240	260	205	220	240	260	345	415	310	345	345	485	570	255	275	295	290
Elongation (min.)		30	28	27	21	19	17	23	21	19	17	22	22	15	15 ~ 17	18	16	16	19	17	16	16	
Material Code		A285 GrA	A285 GrB	A285 GrC	A515 Gr 60	A515 Gr 65	A515 Gr.70	A616 Gr 55	A516 Gr 60	A516 Gr 65	A516 Gr 70	A537 Cl1	A537 Cl2	A302 Gr A	A302 Gr B,C,D	A533 Cl1	A533 Cl2	A533 Cl3	A203 Gr A	A203 Gr B	A203 Gr D	A299 Gr.A	
Number of Test test		1Pipe/ 60M Fabrication of heat Number(Lot)																					
Flattening test		-																					
Bending test		No cracks or other defects exceeding 1/8 in. [3 mm], less than 1/4 in. [6 mm] measured in any direction																					
Hydrostatic test		Heat treatment Type : Classes X2, X3 Pipe : P=2St/D(hydrostatic pressure which will produce in the pipe wall a stress not less that 60 % of the minimum specified yield strength for carbon and ferritic alloy steel pipe, or 50 % of the specified minimum yield strength for austenitic alloy steel pipe)																					
NDT (Non-Destructive Test)		Heat treatment Type :Classes X1, X2 Pipe : RT 100%																					
Dimension, Mass and Permissible Variations		Outside Diameter : circumferential measurement : 0,5 % of the specified outside diameter. Out-of-Roundness : major and minor outside diameters, 1 %. Alignment: Max 3 mm. Thickness : normal Thickness=0.3mm. Length: -0, +13mm																					
Others		-																					

Specification

ASTM A53_A135_A178_A333/A334

Application		Ordinary Piping		Carbon Steel Piping		Boiler and Superheater Tubes			Steel Pipes for Low-Temperature Service									
Specification		ASTM A53		ASTM A135		ASTM A178			ASTM A333 / A334									
Classification		A	B	A	B	A	C	D	1	3	4	6	7	8	9	10	11	
Chemical composition(%)	C(Max.)	0.25	0.3	0.25	0.3	0.06 ~ 0.18	0.35	0.27	0.30	0.19	0.12	0.30	0.19	0.13	0.20	0.20	0.10	
	Si(Max.)	-	-	-	-	-	-	0.10	-	0.18 ~ 0.37	0.08 ~ 0.37	0.10	0.13 ~ 0.32	0.13 ~ 0.32	-	-	0.35	
	Mn(Max.)	0.95	1.2	0.95	1.2	0.27 ~ 0.63	0.80	1.00 ~ 1.50	0.31 ~ 0.64	0.40 ~ 1.06	0.50 ~ 1.05	0.29 ~ 1.06	0.90	0.90	0.40 ~ 1.06	1.15 ~ 1.50	0.6	
	P(Max.)	0.05	0.05	0.035	0.035	0.035	0.035	0.03	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.035	0.035
	S(Max.)	0.045	0.045	0.035	0.035	0.035	0.035	0.015	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.015	0.035
	Others	Mo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cr		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ni		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Mechanical properties	Tensile strength (Min.)	ksi	48	60	70	70	46	60	70	55	65	60	60	65	100	63	80	65
		MPa	330	415	485	485	325	325	485	380	450	415	415	450	690	435	550	450
	Yield point (Min.)	ksi	30	35	36	36	26	26	40	30	35	35	35	35	75	46	65	35
		MPa	205	240	250	250	180	180	275	205	240	240	240	240	517	315	450	240
Elongation (Min.)	-	-	22	22	35	35	30	35	30	30	30	30	30	22	28	30	18	
Test Spec	ASTM A530		ASTM A530		ASTM A450			ASTM A671 & ASTM A999										
Inspection Lot	2pipe/500M length		6"-20" : 2pcs/200 Pipe Over 20"-30 : 2pcs/100 pipe		ASTM A 450 31.1.4 2 pcs/ each Lot			6mm Over: 2 pipe from each heat 100pipe(Lot)										
Flattening Test	H=(1-e)t/(e=t/d) (0.09 for Grade A, and 0.07 for Grade B)		H=(1-e)t/(e=t/d) (0.09 for Grade A, and 0.07 for Grade B)		H=(1-e)t/(e=t/d). (e: 0.07 for medium-carbon steel (maximum specified carbon 0.19 % or greater), 0.08 for low alloy steel, and 0.09 for low-carbon steel)			H=(1-e)t/(e=t/d) (e: 0.07 for medium-carbon steel (maximum specified carbon 0.19 % or greater), 0.08 for low alloy steel, and 0.09 for low-carbon steel)										
Flaring Test	over NPS 2 [DN 50] in extra-strong weight or lighter		-		ASTM A 450 Table 5 Flaring Test Requirements			-										
Reverse flattening test	-		-		450 m of finished tubing			-										
Bending Test	NPS2 below 90° X 12D, close coiling 180° X 8D		-		-			One test (two specimens) shall be made to represent each lot of finished pipe; Side Bend test										
Hydrostatic test	P=2St/D, 0.60 times the specified minimum yield strength, psi [kPa],		P=2St/D, 0.60 times the specified minimum yield strength, psi [kPa],		P=220.6t/d			P=2St/D, 0.60 times the specified minimum yield strength, psi [kPa],										
Impact Test	-		-		-			5 % of the pipe from each lot, TABLE 3 Impact Requirements for Grades 1, 3, 4, 6, 7, 9, 10, and 11										



▶ ASTM_A356_A500_A501

Application		Steel Castings, Carbon, Low Alloy, and Stainless Steel, Heavy-Walled for Steam Turbines						Cold-Formed Welded Carbon Steel Structural Tubing				Hot-Formed Welded Carbon Steel Structural Tubing			
Specification		ASTM A356						ASTM A500				ASTM A501			
Classification		1	2	5	6	8	9	10	A	B	C	D	A	B	
Chemical composition(%)	C(Max.)	0.35	0.25	0.25	0.20	0.20	0.20	0.20	0.26	0.26	0.23	0.26	0.26	0.22	
	Si(Max.)	0.60	0.60	0.60	0.60	0.20 ~ 0.60	0.20 ~ 0.60	0.6	-	-	-	-	-	-	
	Mn(Max.)	0.70	0.70	0.70	0.50 ~ 0.80	0.50 ~ 0.90	0.50 ~ 0.90	0.50 ~ 0.80	1.35	1.35	1.35	1.35	-	1.4	
	P(Max.)	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.030	
	S(Max.)	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.035	0.035	0.035	0.035	0.035	0%	
	Others	Mo	-	0.45 ~ 0.65	0.40 ~ 0.60	0.45 ~ 0.65	0.90 ~ 1.20	0.90 ~ 1.20	0.90 ~ 1.20	Cu 0.20	Cu 0.20	Cu 0.20	Cu 0.20	Cu 0.20	Cu 0.20
Cr		-	-	0.40 ~ 0.70	1.00 ~ 1.50	1.00 ~ 1.50	1.00 ~ 1.50	2.00 ~ 2.75	(Min.)	(Min.)	(Min.)	(Min.)	(Min.)	(Min.)	
Ni		-	-	-	-	-	-	-	-	-	-	-	-	-	
Mechanical properties	Tensile strength (Min.)	ksi	70	65	70	70	80	85	85	45	58	62	58	70	
		MPa	485	450	485	485	550	585	585	310	400	425	400	483	
	Yield point (Min.)	ksi	36	35	40	45	50	60	55	33	42	46	36	36	50
		MPa	250	240	275	310	345	415	380	230	290	315	250	250	345
Elongation (Min.)		22	22	22	22	18	15	20	25	23	21	23	25	23	
Test Spec		ASTM A370						ASTM A370				ASTM A370			
Inspection Lot		1 Pipe /each heat in each heat-treatment charge						1 Pipe /each heat in each heat-treatment charge				1 Pipe /each heat in each heat-treatment charge			
Flattening Test		-						$H=(1-e)t/(e=t/d)$, (e= 0.09 for Grade A, 0.07 for Grade B, and 0.06 for Grade C),				$H=(1-e)t/(e=t/d)$, (e= 0.09 for Grade A, 0.07 for Grade B, and 0.06 for Grade C),			
Flaring Test		-						-				-			
Reverse flattening test		-						-				-			
Bending Test		-						-				-			
Hydrostatic test		-						-				-			
Impact Test		-						-				-			

Specification

ASTM A513_A589

Application		Carbon and Alloy Steel Mechanical Tubing										Carbon Steel Water-Well Pipe		
Specification		ASTM A513										ASTM A589		
		MT1010	MT1015	MTX1015	MT1020	MTX1020	1025	1026	1030	1035	4140	A	B	
Classification		Chemical composition(%)												
		C(Max.)	0.02 ~ 0.15	0.10 ~ 0.20	0.10 ~ 0.20	0.15 ~ 0.25	0.15 ~ 0.25	0.22 ~ 0.28	0.22 ~ 0.28	0.30 ~ 0.36	0.32 ~ 0.38	0.38 ~ 0.43	-	-
Si(Max.)	-	-	-	-	-	-	-	-	-	-	-	-		
Mn(Max.)	0.30 ~ 0.60	0.30 ~ 0.60	0.30 ~ 0.60	0.30 ~ 0.60	0.30 ~ 0.60	0.30 ~ 0.60	0.60 ~ 0.90	0.60 ~ 0.90	0.60 ~ 0.90	0.75 ~ 1.00	-	-		
P(Max.)	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.050	0.035		
S(Max.)	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.04	0.06	0.035		
Others	Mo	-	-	-	-	-	-	-	-	-	-	-		
	Cr	-	-	-	-	-	-	-	-	-	-	-		
	Ni	-	-	-	-	-	-	-	-	-	-	-		
Mechanical properties	Tensile strength (Min.)	ksi	45	48	48	52	52	56	62	62	66	90	48	60
		MPa	310	330	330	360	360	385	425	425	455	620	330	415
	Yield point (Min.)	ksi	32	35	35	38	38	40	45	45	50	70	30	35
		MPa	220	240	240	260	260	275	310	310	345	485	205	240
Elongation (Min.)		15	15	15	12	12	12	12	10	10	10	-	-	
Test Spec		ASTM A370										ASTM A370		
Inspection Lot		1 Pipe /each heat in each heat-treatment charge										1 Pipe /each heat in each heat-treatment charge		
Flattening Test		-										-		
Flaring Test		-										-		
Reverse flattening test		-										-		
Bending Test		-										-		
Hydrostatic test		-										-		
Impact Test		-										-		

▶ ASTM A369_A860

Application		Steel Castings, Carbon, Low Alloy, and Stainless Steel, Heavy-Walled for Steam Turbines											High-Strength Ferritic Steel Butt-Welding Fittings							
Specification		ASTM A369											ASTM A860							
		FPA	FPB	FP1	FP2	FP5	FP9	FP11	FP12	FP21	FP22	FP91	FP92	WPHY 42	WPHY 46	WPHY 52	WPHY 60	WPHY 65	WPHY 70	
Classification		Chemical composition(%)																		
		C(Max.)	0.25	0.30	0.10 ~ 0.20	0.10 ~ 0.20	0.15	0.15	0.05 ~ 0.15	0.05 ~ 0.15	0.05 ~ 0.15	0.05 ~ 0.15	0.08 ~ 0.12	0.07 ~ 0.13	0.20	0.20	0.20	0.20	0.20	0.20
Si(Max.)	0.10	0.10	0.10 ~ 0.50	0.10 ~ 0.30	0.50	0.50 ~ 1.00	0.50 ~ 1.00	0.50	0.50	0.50	0.20 ~ 0.50	0.50	0.15 ~ 0.45	0.15 ~ 0.45	0.15 ~ 0.45	0.15 ~ 0.45	0.15 ~ 0.45	0.15 ~ 0.45		
Mn(Max.)	0.27 ~ 0.93	0.29 ~ 1.06	0.30 ~ 0.80	0.30 ~ 0.60	0.3 ~ 0.60	0.30 ~ 0.60	0.3 ~ 0.60	0.3 ~ 0.61	0.3 ~ 0.60	0.3 ~ 0.60	0.3 ~ 0.60	0.3 ~ 0.60	1.00 ~ 1.25	1.00 ~ 1.25	1.00 ~ 1.25	1.00 ~ 1.25	1.00 ~ 1.25	1.00 ~ 1.25		
P(Max.)	0.035	0.035	0.025	0.025	0.025	0.030	0.025	0.025	0.025	0.025	0.025	0.025	0.03	0.03	0.03	0.03	0.03	0.03		
S(Max.)	0.035	0.030	0.025	0.025	0.025	0.030	0.025	0.025	0.025	0.025	0.025	0.010	0.010	0.010	0.010	0.010	0.010	0.010		
Others	Mo	-	-	0.44 ~ 0.65	0.44 ~ 0.65	0.45 ~ 0.65	0.90 ~ 1.10	0.44 ~ 0.65	0.80 ~ 1.25	0.80 ~ 1.06	0.87 ~ 1.13	0.80 ~ 1.05	0.30 ~ 0.60	0.24	0.24	0.24	0.24	0.24		
	Cr	-	-	-	0.50 ~ 0.81	4.00 ~ 6.00	8.00 ~ 10.00	1.00 ~ 1.50	0.44 ~ 0.65	2.65 ~ 3.35	0.87 ~ 2.60	8.00 ~ 9.50	8.50 ~ 9.50	0.30	0.30	0.30	0.30	0.30		
	Ni	-	-	-	-	-	-	-	-	-	-	0.40	0.40	0.50	0.50	0.50	0.50	0.50		
Mechanical properties	Tensile strength (Min.)	ksi	48	60	55	55	60	60	60	60	60	60	85	90	60	63	66	75	77	80
		MPa	330	415	380	380	415	415	415	415	415	415	415	585	620	415	435	455	515	530
	Yield point (Min.)	ksi	30	35	30	30	30	30	30	32	30	30	60	64	42	46	52	60	65	70
		MPa	210	240	210	210	210	210	210	220	210	210	210	415	440	290	315	360	415	450
Elongation (Min.)	35	30	30	30	30	30	30	30	30	30	30	27	27	25	25	25	20	20	20	
Test Spec	ASTM A999											ASTM A960								
Inspection Lot	one end of one length of pipe representing each heat in each heat-treatment lot.											1 Pipe /each heat in each heat-treatment charge								
Flattening Test	H=(1-e)t/(e=t/d) For pipe NPS 14 or less, and diameter to wall thickness ratios of more than 7.0											-								
Flaring Test	-											-								
Reverse flattening test	-											-								
Bending Test	For pipe larger than NPS 14 or NPS where For pipe larger than NPS 14 or NPS where diameters to wall thickness ratio is 7.0 or less											-								
Hydrostatic test	-											P=2St/D								
Impact Test	-											-								

Specification

ASTM A249_A268

Application		Boiler, Superheater, Heat Exchanger & Condenser Tubes						Ferritic and Martensitic Stainless Steel Tubing for General Service							
Specification		ASTM A249						ASTM A268							
		TP304	TP304L	TP316	TP316L	TP321	TP347	TP410	TP430	TP439	TPXM-27	18Cr-2Mo	29-4-2.0	28-2-3.5	
UNS Designation		S30400	S30403	S31600	S31603	S32100	S34700	S41000	S43000	S43035	S44627	S44400	S44800	S32803	
Chemical composition (%)	C(Max.)	0.080	0.030	0.080	0.030	0.080	0.080	0.150	0.120	0.070	0.010	0.025	0.010	0.015	
	Mn(Max.)	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	0.40	1.00	0.30	0.50	
	P(Max.)	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.020	0.040	0.025	0.020	
	S(Max.)	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.020	0.030	0.020	0.005	
	Si(Max.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.40	1.00	0.20	0.50	
	Cr(Max.)	18.0 ~ 20.0	18.0 ~ 20.0	16.0 ~ 18.0	16.0 ~ 18.0	17.0 ~ 19.0	17.0 ~ 19.0	11.5 ~ 13.5	16.0 ~ 18.0	17.0 ~ 19.0	25.0 ~ 27.5	17.5 ~ 19.5	28.0 ~ 30.0	28.0 ~ 29.0	
	Ni(Max.)	8.00 ~ 11.0	8.00 ~ 12.0	10.0 ~ 14.0	10.0 ~ 14.0	9.0 ~ 12.0	9.0 ~ 12.0	-	-	0.50	0.050	1.00	2.0 ~ 2.5	3.0 ~ 4.0	
	Mo(Max.)	-	-	2.00 ~ 3.00	2.00 ~ 3.00	-	-	-	-	2.00 ~ 3.00	0.75 ~ 1.50	1.75 ~ 2.50	3.5 ~ 4.2	1.8 ~ 2.5	
	N(Max.)	-	-	-	-	0.100	-	-	-	0.040	0.015	0.035	0.020	0.020	
	Cu(Max.)	-	-	-	-	-	-	-	-	-	0.20	-	-	-	
	Al(Max)	-	-	-	-	-	-	-	-	0.150	-	-	-	-	
	Ti(Max)	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Co(Max)	-	-	-	-	-	-	-	-	-	-	-	-	-	
Mechanical properties	Tensile strength (Min.)	ksi	75	70	75	70	75	75	60	60	60	65	60	80	87
		MPa	515	485	515	485	515	515	415	415	415	450	415	550	600
	Yield point (Min.)	ksi	30	25	30	25	30	30	30	35	30	40	40	60	72
		MPa	205	170	205	170	205	205	205	240	205	275	275	415	500
Elongation (Min.)		35	35	35	35	35	35	20	20	20	20	20	20	16	
Inspection Lot		1pcs/50 pipe						1pcs/50 pipe							
Flattening Test		2pcs/lot, H=(1=e)t/(e=t/d)(e=0.09)						2pcs/lot, H=(1=e)t/(e=t/d)(e=0.09)							
Flaring Test		Only seamless pipe						Only seamless pipe							
Reverse flattening test		1pcs/450m, TP304L, TP316L, TP321, TP347, and TP348						1pcs/460M							
Bending Test		-						-							
Hydrostatic test		(On customer request) P=220.6t/D						P=220.6t/D							
Hardness test		Max 90HRB						Max 95HRB							



▶ ASTM A269

Application		Austenitic Stainless Steel Tubing																				
Specification		ASTM A269																				
		TP201	TP201LN	TP304	TP304L	TP304LN	TP316	TP316L	TP316LN	TP317	TP321	TP347	TP348	TP410	TP430	TP439	TPXM-10	TPXM-11	TPXM-15	TPXM-19	TPXM-29	
UNS Designation		S20100	S20153	S30400	S30403	S30453	S31600	S31603	S31653	S31700	S32100	S34700	S34800	S41000	S43000	S43035	S21900	S21904	S38100	S20910	S24000	
Chemical composition(%)	C(Max.)	0.150	0.030	0.080	0.030	0.030	0.080	0.030	0.030	0.080	0.080	0.080	0.080	0.150	0.120	0.070	0.080	0.080	0.080	0.060	0.080	
	Mn(Max.)	5.5 ~ 7.5	6.5 ~ 7.5	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	8.0 ~ 10.0	8.0 ~ 10.0	2.00	4.0 ~ 6.0	11.5 ~ 14.5
	P(Max.)	0.060	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.040	0.045	0.045	0.030	0.045	0.060
	S(Max.)	0.030	0.015	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
	Si(Max.)	1.00	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.5~2.5	1.00	1.00
	Cr(Max.)	16.0 ~ 18.0	16.0 ~ 17.0	18.0 ~ 20.0	18.0 ~ 20.0	18.0 ~ 20.0	16.0 ~ 18.0	16.0 ~ 18.0	16.0 ~ 18.0	16.0 ~ 18.0	18.0 ~ 20.0	17.0 ~ 19.0	17.0 ~ 19.0	17.0 ~ 19.0	11.5 ~ 13.5	16.0 ~ 18.0	17.0 ~ 19.0	19.0 ~ 21.5	19.0 ~ 21.5	17.0 ~ 19.0	20.5 ~ 23.5	17.0 ~ 19.0
	Ni(Max.)	3.5 ~ 4.5	4.0 ~ 5.0	8.00 ~ 11.0	8.00 ~ 12.0	8.00 ~ 11.0	10.0 ~ 14.0	10.0 ~ 14.0	10.0 ~ 14.0	10.0 ~ 15.0	11.0 ~ 12.0	9.0 ~ 12.0	9.0 ~ 12.0	9.0 ~ 12.0	-	-	0.50	5.5 ~ 7.5	5.5 ~ 7.5	17.5 ~ 18.5	11.5 ~ 13.5	2.3 ~ 3.7
	Mo(Max.)	-	-	-	-	-	2.00 ~ 3.00	2.00 ~ 3.00	2.00 ~ 3.00	3.0 ~ 4.0	-	-	-	-	-	-	2.00 ~ 3.00	-	-	-	1.50 ~ 3.00	-
	N(Max.)	0.250	0.10 ~ 0.25	-	0.10 ~ -0.16	-	-	-	-	0.10 ~ 0.16	-	0.100	-	-	-	-	0.040	0.15 ~ 0.40	0.15 ~ 0.40	-	0.15 ~ 0.40	0.20 ~ 0.40
	Cu(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Al(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.150	-	-	-	-	-
	Ti(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.150	-	-	-	-	-
	Co(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.150	-	-	-	-	-
Mechanical properties	Tensile strength (Min.)	ksi	95	95	75	70	75	75	70	75	75	75	75	75	60	60	60	90	90	75	100	100
		MPa	655	655	515	485	515	515	485	515	515	515	515	515	415	415	415	620	620	515	690	690
	Yield point (Min.)	ksi	38	45	30	25	30	30	25	30	30	30	30	30	30	35	30	40	50	30	55	55
MPa		260	310	205	170	205	205	170	205	205	205	205	205	205	240	205	275	345	205	380	380	
Elongation (Min.)		35	45	35	35	35	35	35	35	35	35	35	35	20	20	20	45	45	40	35	40	
Inspection Lot	1pcs/50 pipe																					
Flattening Test	2pcs/lot, H=(1-e)t/(e=t/d)(e=0.09)																					
Flaring Test	Only seamless pipe																					
Reverse flattening test	1pcs/460M																					
Bending Test	-																					
Hydrostatic test	P=220.6t/D																					
Hardness test	Max 95HRB																					

Specification

ASTM A270_A312 / A358 / A409

Application		Austenitic and Ferritic/ Austenitic Stainless Steel Sanitary Tubing					ASTM A312 : Heavily Cold Worked Austenitic Stainless Steel Pipes ASTM A358 : Stainless Steel Pipes for High-Temperature ASTM A409 : Welded Large Diameter Austenitic Steel Pipes for Corrosive or High-Temperature Service																			
Specification	ASTM A270					ASTM A312 / A358 / A409																				
	TP 304	TP 304L	TP 316	TP 316L	-	TP 201	TP 201LN	TP 304	TP 304L	TP 304LN	TP 316	TP 316L	TP 316LN	TP 317	TP 321	TP 347	TP 348	TP 410	TP 430	TP 439	TPXM -10	TPXM -11	TPXM -15	TPXM -19	TPXM -29	
UNS Designation	S30400	S30403	S31600	S31603	S31803	S20100	S20153	S30400	S30403	S30453	S31600	S31603	S31653	S31700	S32100	S34700	S34800	S41000	S43000	S43035	S21900	S21904	S38100	S20910	S24000	
Chemical composition(%)	C(Max.)	0.080	0.030	0.080	0.030	0.030	0.150	0.030	0.080	0.030	0.030	0.080	0.030	0.080	0.080	0.080	0.080	0.150	0.120	0.070	0.080	0.080	0.080	0.060	0.080	
	Mn(Max.)	2.00	2.00	2.00	2.00	2.00	5.5 ~ 7.5	6.5 ~ 7.5	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	8.0 ~ 10.0	8.0 ~ 10.0	2.00	4.0 ~ 6.0	11.5 ~ 14.5	
	P(Max.)	0.045	0.045	0.045	0.045	0.030	0.060	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.040	0.040	0.040	0.045	0.045	0.030	0.045	0.060
	S(Max.)	0.030	0.030	0.030	0.030	0.020	0.030	0.015	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
	Si(Max.)	1.00	1.00	1.00	1.00	1.00	1.00	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.5 ~ 2.5	1.00	1.00
	Cr(Max.)	18.0 ~ 20.0	18.0 ~ 20.0	16.0 ~ 18.0	16.0 ~ 18.0	21.0 ~ 23.0	16.0 ~ 18.0	16.0 ~ 17.0	18.0 ~ 20.0	18.0 ~ 20.0	18.0 ~ 20.0	16.0 ~ 18.0	16.0 ~ 18.0	16.0 ~ 18.0	18.0 ~ 20.0	17.0 ~ 19.0	17.0 ~ 19.0	17.0 ~ 19.0	11.5 ~ 13.5	16.0 ~ 18.0	17.0 ~ 19.0	19.0 ~ 21.5	19.0 ~ 21.5	17.0 ~ 19.0	20.5 ~ 23.5	17.0 ~ 19.0
	Ni(Max.)	8.00 ~ 11.0	8.00 ~ 12.0	10.0 ~ 14.0	10.0 ~ 14.0	4.5 ~ 6.5	3.5 ~ 4.5	4.0 ~ 5.0	8.00 ~ 11.0	8.00 ~ 12.0	8.00 ~ 11.0	10.0 ~ 14.0	10.0 ~ 14.0	10.0 ~ 14.0	11.0 ~ 15.0	9.0 ~ 12.0	9.0 ~ 12.0	9.0 ~ 12.0	-	-	0.50	5.5 ~ 7.5	5.5 ~ 7.5	17.5 ~ 18.5	11.5 ~ 13.5	2.3 ~ 3.7
	Mo(Max.)	-	-	2.00 ~ 3.00	2.00 ~ 3.00	2.5 ~ 3.5	-	-	-	-	-	2.00 ~ 3.00	2.00 ~ 3.00	2.00 ~ 3.00	3.0 ~ 4.0	-	-	-	-	-	2.00 ~ 3.00	-	-	-	1.50 ~ 3.00	-
	N(Max.)	-	0.10 ~ 0.16	-	-	0.08 ~ 0.20	0.250	0.10 ~ 0.25	-	0.10 ~ 0.16	-	-	-	0.10 ~ 0.16	-	0.100	-	-	-	-	0.040	0.15 ~ 0.40	0.15 ~ 0.40	-	0.15 ~ 0.40	0.20 ~ 0.40
	Cu(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Al(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.150	-	-	-	-	-
	Ti(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.100	-	-	-	-	-	-	-	-
	Co(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10 ~ 0.30	-
	Mechanical properties	Tensile strength (Min.)	ksi	75	70	75	70	90	95	95	75	70	75	75	70	75	75	75	60	60	60	90	90	75	100	100
MPa			515	485	515	485	620	655	655	515	485	515	515	485	515	515	515	515	415	415	415	620	620	515	690	690
Yield point (Min.)		ksi	30	25	30	25	65	38	45	30	25	30	30	25	30	30	30	30	35	30	30	40	50	30	55	55
		MPa	205	170	205	170	450	260	310	205	170	205	205	170	205	205	205	205	205	240	205	205	275	345	205	380
Elongation (Min.)		35	35	35	35	25	35	45	35	35	35	35	35	35	35	35	35	20	20	20	45	45	40	35	40	
Inspection Lot	1pcs/50 pipe					1pcs/50 pipe																				
Flattening Test	2pcs/lot, H=(1-e)t/(e=t/d)(e=0.09)					2pcs/lot, H=(1-e)t/(e=t/d)(e=0.09)																				
Flaring Test	Only seamless pipe					Only seamless pipe																				
Reverse flattening test	1pcs/460M					1pcs/460M																				
Bending Test	-					2pcs/lot, (Pace. Root)																				
Hydrostatic test	P=220.6t/D					P=220.6t/D																				
Hardness test	Max 95HRB					-																				



JIS G 3459

Application		Stainless Steel Pipes																																
Specification		JIS G 3459 (KS D 3576)																																
		STS 304 TP	STS 304 HTP	STS 304 LTP	TP 309 TP	STS 309 STP	STS 310 TP	STS 310 STP	STS 316 TP	STS 316 HTP	STS 316 LTP	STS 316 TiTP	STS 317 TP	STS 317 LTP	STS 836 LTP	STS 890 STP	STS 321 TP	STS 321 HTP	STS 347 TP	STS 347 HTP	STS 350 TP	STS 329 J1TP	STS 329 J3LTP	STS 329 J4LTP	STS 329 LDTP	STS 405 TP	STS 409 LTP	STS 430 TP	STS 430 LXTP	STS 430 J1LTP	STS 436 LTP	STS 444 TP		
Chemical composition(%)	C(Max.)	0.080	0.04 ~ 0.10	0.030	0.150	0.080	0.150	0.080	0.080	0.04 ~ 0.10	0.030	0.080	0.080	0.030	0.030	0.020	0.080	0.04 ~ 0.10	0.080	0.04 ~ 0.10	0.030	0.080	0.030	0.030	0.030	0.030	0.080	0.030	0.120	0.030	0.025	0.025	0.025	
	Si(Max.)	1.00	0.75	1.00	1.00	1.00	1.50	1.50	1.00	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.75	1.00	1.00	1.00		
	Mn(Max.)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.50	1.50	1.50	1.50	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
	P(Max.)	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.030	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.030	0.040	0.030	0.035	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400
	S(Max.)	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.020	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	
	Ni(Max.)	8.00 ~ 11.0	8.00 ~ 11.0	9.00 ~ 11.0	12.0 ~ 15.0	12.0 ~ 15.0	19.0 ~ 22.0	19.0 ~ 22.0	10.0 ~ 14.0	11.0 ~ 14.0	12.0 ~ 16.0	10.0 ~ 14.0	11.0 ~ 15.0	11.0 ~ 15.0	24.0 ~ 26.0	24.0 ~ 26.0	9.0 ~ 12.0	9.0 ~ 12.0	9.0 ~ 12.0	9.0 ~ 12.0	20.0 ~ 23.0	3.0 ~ 6.0	4.5 ~ 6.5	5.5 ~ 7.5	2.0 ~ 4.0	-	-	-	-	-	-	-		
	Cr(Max.)	18.0 ~ 20.0	18.0 ~ 20.0	18.0 ~ 20.0	22.0 ~ 24.0	22.0 ~ 24.0	24.0 ~ 26.0	24.0 ~ 26.0	16.0 ~ 18.0	16.0 ~ 18.0	16.0 ~ 18.0	16.0 ~ 18.0	18.0 ~ 20.0	18.0 ~ 20.0	19.0 ~ 24.0	19.0 ~ 24.0	17.0 ~ 19.0	17.0 ~ 19.0	17.0 ~ 19.0	17.0 ~ 19.0	22.0 ~ 28.0	23.0 ~ 28.0	21.0 ~ 24.0	24.0 ~ 26.0	19.0 ~ 22.0	10.5 ~ 11.75	10.5 ~ 11.75	16.0 ~ 18.0	16.0 ~ 18.0	16.0 ~ 20.0	16.0 ~ 19.0	17.0 ~ 20.0		
	Mo(Max.)	-	-	-	-	-	-	-	2.00 ~ 3.00	2.00 ~ 3.00	2.00 ~ 3.00	2.00 ~ 3.00	3.0 ~ 4.0	3.0 ~ 4.0	5.0 ~ 7.0	4.0 ~ 5.0	-	-	-	-	6.0 ~ 6.8	1.0 ~ 3.0	2.5 ~ 3.5	2.5 ~ 3.5	1.0 ~ 2.0	-	-	-	-	-	-	0.75 ~ 1.25	1.75 ~ 2.50	
	N(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.250	-	-	-	-	-	0.21 ~ 0.32	-	0.08 ~ 0.20	0.08 ~ 0.20	0.14 ~ 0.20	-	-	-	-	0.025	-	-		
	Cu(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00 ~ 2.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Al(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Ti(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Co(Max.)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10 ~ 0.30	-	-	-	-	-	-		
	Mechanical properties	Tensile strength (Min.)	ksi	75	75	70	75	75	75	75	75	70	75	75	70	75	70	75	75	75	75	98	85	90	90	90	60	53	60	53	57	60	60	
MPa			520	520	480	520	520	520	520	520	480	520	520	480	520	490	520	520	520	520	674	590	620	620	620	410	360	410	360	390	410	410		
Yield point (Min.)		ksi	30	30	25	30	30	30	30	30	25	30	30	25	30	30	30	30	30	30	48	57	65	65	65	30	25	35	25	30	35	35		
	MPa	205	205	175	205	205	205	205	205	175	205	205	175	205	215	205	205	205	205	330	390	450	450	450	205	175	245	175	205	245	245			
Elongation (Min.)		35	35	35	35	35	35	35	35	35	35	35	35	35	25	35	35	35	35	40	18	18	18	18	20	20	20	20	20	20	20			
Inspection Lot	1pcs/50 pipe																																	
Flattening Test	2pcs/Lot, H=(1+e)t/(e+t/d)(e=0.9)(e=0.07 for 329J1)																																	
Flaring Test	-																																	
Reverse flattening test	-																																	
Bending Test	-																																	
Hydrostatic test	Each pipe: unless otherwise secified :20Mpa P=200st/d(S: Y.Sx0.6)																																	

Specification

JIS G 3463

Application		Stainless Steel for Boiler and Heat Exchanger Tubes																											
Specification		JIS G 3463 (KS D 3577)																											
		STS 304 TB	STS 304 HTB	STS 304 LTB	TP 309 TB	STS 309 STB	STS 310 TB	STS 310 STB	STS 316 TB	STS 316 HTB	STS 316 LTB	STS 317 TB	STS 317 LTB	STS 321 TB	STS 321 HTB	STS 347 TB	STS 347 HTB	STSXM 15J1 TB	STS 329J1 TB	STS 329J2 LTB	STS 405 TB	STS 409 TB	STS 410 TB	STS 410 TTB	STS 430 TB	STS 444 TB	STS XM8 TB	STS XM27 TB	
Classification																													
		Chemical composition(%)	C(Max.)	0.080	0.04 ~ 0.10	0.030	0.150	0.080	0.150	0.080	0.080	0.04 ~ 0.10	0.030	0.080	0.030	0.080	0.04 ~ 0.10	0.080	0.04 ~ 0.10	0.080	0.080	0.030	0.080	0.080	0.150	0.080	0.120	0.025	0.080
Si(Max.)	1.00		0.75	1.00	1.00	1.00	1.50	1.50	1.00	0.75	1.00	1.00	1.00	1.00	0.75	1.00	1.00	3.0 ~ 5.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	1.00	1.00	0.04	
Mn(Max.)	2.00		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.50	1.50	1.00	1.00	1.50	1.00	1.00	1.00	1.00	0.04	
P(Max.)	0.040		0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.030	0.040	0.040	0.040	0.040	0.030	0.040	0.030	0.040	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	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	0.030	0.030	0.030	0.030	0.030	0.040	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.020
Ni(Max.)	8.00 ~ 11.0		8.00 ~ 11.0	9.00 ~ 11.0	12.0 ~ 15.0	12.0 ~ 15.0	19.0 ~ 22.0	19.0 ~ 22.0	10.0 ~ 14.0	11.0 ~ 14.0	12.0 ~ 16.0	11.0 ~ 15.0	11.0 ~ 15.0	9.0 ~ 12.0	9.0 ~ 12.0	9.0 ~ 12.0	9.0 ~ 12.0	11.5 ~ 15.0	3.0 ~ 6.0	4.5 ~ 6.5	-	-	-	-	-	-	-	-	
Cr(Max.)	18.0 ~ 20.0		18.0 ~ 20.0	18.0 ~ 20.0	22.0 ~ 24.0	22.0 ~ 24.0	24.0 ~ 26.0	24.0 ~ 26.0	16.0 ~ 18.0	16.0 ~ 18.0	16.0 ~ 18.0	18.0 ~ 20.0	18.0 ~ 20.0	17.0 ~ 19.0	17.0 ~ 19.0	17.0 ~ 19.0	17.0 ~ 19.0	15.0 ~ 20.0	23.0 ~ 28.0	21.0 ~ 26.0	10.5 ~ 11.75	10.5 ~ 11.75	11.5 ~ 13.5	11.5 ~ 13.5	16.0 ~ 18.0	17.0 ~ 20.0	17.0 ~ 19.0	25.0 ~ 27.5	
Mo(Max.)	-		-	-	-	-	-	-	2.00 ~ 3.00	2.00 ~ 3.00	2.00 ~ 3.00	3.0 ~ 4.0	3.0 ~ 4.0	-	-	-	-	-	1.0 ~ 3.0	2.5 ~ 4.0	-	-	-	-	-	1.75 ~ 2.50	-	0.75 ~ 1.50	
N(Max.)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.08 ~ 0.20	-	-	-	-	-	-	-	-	
Cu(Max.)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Al(Max.)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ti(Max.)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Co(Max.)	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Mechanical properties	Tensile strength (Min.)	ksi	75	75	70	75	75	75	75	75	70	75	70	75	75	75	75	75	85	90	60	60	60	60	60	60	60	60	
		MPa	520	520	481	520	520	520	520	520	520	481	520	481	520	520	520	520	520	588	618	412	412	412	412	412	412	412	
	Yield point (Min.)	ksi	30	30	25	30	30	30	30	30	25	30	25	30	30	30	30	30	30	55	64	30	30	30	30	35	35	30	35
MPa		206	206	177	206	206	206	206	206	177	206	177	206	206	206	206	206	206	392	441	209	209	209	209	245	245	209	245	
Elongation (Min.)		35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	18	18	20	20	20	20	20	20	20	20	
Inspection Lot	1pcs/50 pipe																												
Flattening Test	2pcs/Lot, H=(1+e)t/e+t/d(e=0.9)(e=0.07 for 329J1, 410, 430)																												
Flaring Test	2pcs/Lot, other than 329Ji, 410, 430 = DX1.2																												
Reverse flattening test	1pcs/Lot, Automatic arc welding bending test																												
Bending Test	-																												
Hydrostatic test	Each pipe: unless otherwise secified :20Mpa P=200st/d(S: Y.Sx0.6)																												



JIS G 3447_G 3468_G 3448

Application		Stainless Steel sanitary Pipes				Arc Welded Large Diameter Stainless Steel Pipes					Light Gauge Stainless Steel Pipes for Ordinary Piping		
Specification		JIS G 3447 (KS D 3585)				JIS G 3468 (KS D 3588)					JIS G 3448 (KS D 3595)		
Classification		STS304TB	STS304LTP	STS316TB	STS316LTB	STS304	STS304L	STS316	STS316L	STS347	STS304TPD	STS316TPD	
Chemical composition(%)	C(Max.)	0.080	0.030	0.080	0.030	0.080	0.030	0.080	0.030	0.080	0.080	0.080	
	Si(Max.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
	Mn(Max.)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
	P(Max.)	0.040	0.040	0.040	0.040	0.045	0.045	0.045	0.045	0.045	0.045	0.045	
	S(Max.)	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	
	Ni(Max.)	8.00 ~ 11.0	9.00 ~ 11.0	10.0 ~ 14.0	12.0 ~ 16.0	8.00 ~ 11.0	9.00 ~ 11.0	10.0 ~ 14.0	12.0 ~ 16.0	9.0 ~ 12.0	8.00 ~ 11.0	10.0 ~ 14.0	
	Cr(Max.)	18.0 ~ 20.0	18.0 ~ 20.0	16.0 ~ 18.0	16.0 ~ 18.0	18.0 ~ 20.0	18.0 ~ 20.0	16.0 ~ 18.0	16.0 ~ 18.0	17.0 ~ 19.0	18.0 ~ 20.0	16.0 ~ 18.0	
	Mo(Max.)	-	-	2.00 ~ 3.00	2.00 ~ 3.00	-	-	2.00 ~ 3.00	2.00 ~ 3.00	-	-	-	2.00 ~ 3.00
	N(Max.)	-	-	-	-	-	-	-	-	-	-	-	
	Cu(Max.)	-	-	-	-	-	-	-	-	-	-	-	
	Al(Max.)	-	-	-	-	-	-	-	-	-	-	-	
	Ti(Max.)	-	-	-	-	-	-	-	-	-	-	-	
	Co(Max.)	-	-	-	-	-	-	-	-	-	-	-	
	Mechanical properties	Tensile strength (Min.)	ksi	75	70	75	70	75	70	75	70	75	75
MPa			520	480	520	480	520	480	520	480	520	520	
Yield point (Min.)		ksi	-	-	-	-	30	25	30	25	30	30	
		MPa	-	-	-	-	205	175	205	175	205	205	
Elongation (Min.)	-	-	-	-	35	35	35	35	35	35	35		
Inspection Lot	1pcs/1 Heat Lot				1pcs/120M					1pcs/250 pipe			
Flattening Test	-				-					1pcs/Lot			
Flaring Test	-				-					-			
Reverse flattening test	1pcs/Lot				-					-			
Bending Test	-				-					-			
Hydrostatic test	-				S5S:1.5 Mpa, S10S: 2.0Mpa, S20S,S40S: 2.5Mpa					3.5Mpa			