

ISO 2604/2-75 STEEL PRODUCTS FOR PRESSURE PURPOSES PRAT2 WROUGHT SEAMLESS TUBES

1. Chemical Composition

Grade	Mfg. Process	Chemical Composition (%)								
		C	Si	Mn	P	S	Ni	Cr	Mo	Others
TS1	S	0.16Max	-	0.30~0.70	0.050Max	0.050Max	-	-	-	-
TS2	S	0.16Max	-	0.40~0.70	0.050Max	0.050Max	-	-	-	-
TS4	S	0.17Max	0.35Max	0.40~0.80	0.045Max	0.045Max	-	-	-	-
TS5	S	0.17Max	0.35Max	0.40~0.80	0.045Max	0.045Max	-	-	-	-
TS6	S	0.17Max	0.35Max	0.40~1.00	0.045Max	0.045Max	-	-	-	Al: >0.015
TS9	S	0.21Max	0.35Max	0.40~1.20	0.045Max	0.045Max	-	-	-	-
TS9H	S	0.21Max	0.35Max	0.40~1.20	0.045Max	0.045Max	-	-	-	-
TS10	S	0.19Max	0.35Max	0.60~1.20	0.045Max	0.045Max	-	-	-	Al: >0.015
TS13	S	0.22Max	0.35Max	0.60~1.40	0.045Max	0.045Max	-	-	-	-
TS14	S	0.22Max	0.35Max	0.80~1.40	0.045Max	0.045Max	-	-	-	-
TS15	S	0.20Max	0.35Max	0.80~1.40	0.045Max	0.045Max	-	-	-	Al: >0.015
TS18	S	0.23Max	0.35Max	0.80~1.50	0.045Max	0.045Max	-	-	-	-
TS26	S	0.12~0.20	0.10~0.35	0.40~0.80	0.040Max	0.040Max	-	-	0.25~0.35	Al: 0.012Max
TS32	S	0.10~0.18	0.10~0.35	0.40~0.70	0.040Max	0.040Max	-	0.70~1.10	0.45~0.65	Al: 0.02Max
TS33	S	0.10~0.18	0.10~0.35	0.40~0.70	0.040Max	0.040Max	-	0.30~0.80	0.50~0.70	V: 0.22~0.32 Al: 0.02Max
TS34	S	0.08~0.15	0.50Max	0.40~0.70	0.040Max	0.045Max	-	2.00~2.50	0.90~1.20	Al: 0.02Max
TS37	S	0.15Max	0.50Max	0.30~0.60	0.030Max	0.030Max	-	4.00~6.00	0.45~0.65	Al: 0.02Max
TS38	S	0.15Max	0.25~1.00	0.30~0.60	0.030Max	0.030Max	-	8.00~10.00	0.90~1.10	Al: 0.02Max
TS39	S	0.08Max	1.00Max	1.00Max	0.040Max	0.030Max	0.50Max	11.5~14.0	-	-
TS40	S	0.17~0.23	0.50Max	1.00Max	0.030Max	0.030Max	0.30~0.80	10.00~12.50	0.80~1.20	V: 0.25~0.35
TS43	S	0.15Max	0.15~0.35	0.30~0.80	0.040Max	0.040Max	3.25~3.75	-	-	-
TS45	S	0.13Max	0.15~0.35	0.30~0.80	0.040Max	0.040Max	8.50~9.50	-	-	-

TS46	S	0.03Max	1.00Max	2.00Max	0.045Max	0.030Max	9.00` 13.00	17.00~19.00	-	-
TS47	S	0.07Max	1.00Max	2.00Max	0.045Max	0.030Max	8.00~12.00	17.00~19.00	-	-
TS48	S	0.04~0.09	0.75Max	2.00Max	0.045Max	0.030Max	8.00~12.00	8.00~12.00	-	-
TS50	S	0.08Max	1.00Max	2.00Max	0.045Max	0.030Max	9.00~13.00	9.00~13.00	-	Nb: 10×C~1.00
TS53	S	0.08Max	1.00Max	2.00Max	0.045Max	0.030Max	9.00~13.00	9.00~13.00	-	Ti: 5×C~0.80
TS54	S	0.04~0.10	0.20~0.80	2.00Max	0.045Max	0.030Max	9.00~13.00	9.00~13.00	-	Ti: 4×C~0.60
TS56	S	0.04~0.10	0.20~0.80	2.00Max	0.045Max	0.030Max	11.00~14.00	11.00~14.00	-	Nb: 10×C~1.4
TS57	S	0.03Max	1.00Max	2.00Max	0.045Max	0.030Max	11.00~14.00	11.00~14.00	2.00~2.50	-
TS58	S	0.03Max	1.00Max	2.00Max	0.045Max	0.030Max	11.50~14.50	11.50~14.50	2.00~3.00	-
TS60	S	0.07Max	1.00Max	2.00Max	0.045Max	0.030Max	11.00~14.00	11.00~14.00	2.00~2.50	-
TS61	S	0.07Max	1.00Max	2.00Max	0.045Max	0.030Max	11.00~14.50	11.00~14.50	2.50~3.00	-
TS63	S	0.04~0.09	0.75Max	1.00~2.00	0.045Max	0.030Max	12.00~14.00	12.00~14.00	2.00~2.75	-
TS67	S	0.04~0.10	0.30~0.60	1.00~1.50	0.045Max	0.030Max	15.50~17.50	15.50~17.50	1.60~2.00	Nb:10×C~10×+0.4
TS68	S	0.15Max	0.75Max	2.00Max	0.045Max	0.030Max	19.00~22.00	19.00~22.00	-	-
TS69	S	0.12Max	1.00Max	1.50Max	0.045Max	0.030Max	30.00~35.00	30.00~35.00	-	Ti: 0.15~0.60 Al: 0.15~0.60

2. Mechanical Properties

Grade	Tensile Test MPa or N/mm ²		Remarks (Similar to JIS)
	Min Yield point	Tensile Strength	
TS1	195	320~440	-
TS2	195	320~440	-
TS4	215	360~480	(STPG370) (STS370)
TS5	215	360~480	(STPT370) (STF370)
TS6	215	360~480	(STPL380)

			(STBL380)
TS9	235		410-530 (STS410)
TS9H	235		410-530 (STB410) (STF410)
TS10	235		410-530 -
TS13	265		460-580 (STS480)
TS14	265		460-580 (STS480)
TS15	265		460-580 -
TS18	285		490-610 (STB510)
TS26	255		450-600 -
TS32	275		440-590 -
TS33	275		460-610 -
TS34	A	140	410-560 -
	N+T	275	490-640
TS37	205		410-560 (STPA25) (STBA25) (STFA25)
TS38	A	140	410-560 -
	N+T	390	590-
TS39	A	245	440-590 -
	Q+T	390	590-750
TS40	430		- -
TS43	245		440-590 (STPL450) (STBL450)
TS45	510		690-850 (STPL690) (SPBL690)
TS46	180		490-690 (SUS304LTP) (SUS304LT)

TS47	195	490-690	(SUS304TP) (SUS304TB) (SUS304TF)
TS48	195	490-690	(SUS304HTP) (SUS304HTB) (SUS347HTF)
TS50	205	510-720	(SUS347HTP) (SUS347HTB) (SUS347HF)
TS53	235	510-720	(SUS321TP) (SUS321TB) (SUS321TC)
TS54	160 195	490-690 500-720	Q1070-1140°C Q950-1070°C
TS56	205	510-720	(SUS347HTP) (SUS347HTB)
TS57	185	490-690	(SUS316LTP) (SUS316LTB)
TS58	185	490-690	(SUS316LTP) (SUS316LTB)
TS60	205	510-720	(SUS316TP) (SUS316TB) (SUS316TF)
TS61	205	510-720	(SUS316TP) (SUS316TB) (SUS316TF)
TS63	205	510-720	(SUS316HTP) (SUS316HTB) (SUS316HTF)
TS67	215	510-720	-

TS68	205	510-720	(SUS316TP) (SUS310TB) (SUS310TF)
TS69	205	480-690	-

Material Comparison Tables (ASTM, KS, JIS, DIN, BS, NF, UNI)

ASTM Standard	UNS NO.	KOREA/JAPANESE			GERMAN				BRITISH			FRENCH			ITALIAN		
		KS/JIS Symbol	KS/JIS Number	Remarks	DIN Type	DIN Number	Material Number	Remarks	B.S Number	B.S Grade	Remarks	AFNOR Type	NF Number	Remarks	UNI Type	UNI Number	Remarks
A 333 Seamless and Welded Pipe for Low-Temperature Service																	
Grade 1	K03008	SPLT 39 / STPL 380	D3569 / G 3460	(16)	TT St 41N		1.0437	WBL-680(3b)			(3)	TU 42 BT	A49-230		C 15	5949	(6)Seamless Only
Grade 3	K31918	SPLT 46 / STPL 450	D3569 / G 3460	(16)	10 Ni 14		1.5637	WBL-680(3b)	3603	HFS 503 LT 100	CAT.2	TU 16 Ni 14	A49-230	(3c)	18 Ni 14	5949	Seamless Only
Grade 6	K03006			(3)	TT St 45 N		1.0456	WBL-680(3b)	3603	HFS 410 LT 50	CAT.2	TU 42 BT	A49-230		C 20	5949	Seamless Only
Grade 8	K81340	SPLT 70 / STPL 690	D3569 / G 3460	(16)	X8 Ni 9		1.5662	WBL-680(3b)	3603	HFS 590 LT 196	CAT.2	TU Z 11 N 9	A49-230	(6)	12 X Ni 09	5949	Seamless Only

JIS Number and Corresponding Foreign Standards

JIS			ASTM			BS			DIN			NF			ISO			Index Number	
Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type		
G3454	STPG370 (STPG38)	C	A135	Gr A	C	3601	ERW360	C	1626	St37.0	C	A49-112	TS27b	C	559	TS4	C	C002	
			A587	-	C	"	S360	C	1629	St37.0	C	A49-141	TS37a	C	2604/2	TS4	C		
										17172	StE210.7	C	A49-142	TS37a	C	2604/3	TW4		C
													"	TS37b	C				

	SUS																	
	309STB	SUS	A213	TP309S	SUS													
	SUS													2604/2	TS68	SUS		
	310TB	SUS	A632	TP310	SUS													
	SUS																	
	310STB	SUS	A213	TP310S	SUS													
	SUS		A213	TP316	SUS			2462	X5CrNiMo 1810	SUS	A49-230	TUZ6CN 18.09	SUS	2604/2	TS60	SUS		
	316TB	SUS	A249	TP316	SUS	3605	316S18	SUS	2463	X5CrNiMo 1810	SUS							
			A269	TP316	SUS				"	X5CrNiMo 1812								
			A632	TP316	SUS	3606	LWHT316S25	SUS	17455	X5CrNiMo 17122								
			A688	TP316	SUS	"	LWCF316S25	SUS	17456	X2CrNiMo 17132								
						"	LWBC316S25	SUS	17457	X5CrNiMo 17122								
						"	CFS316S25	SUS	17458	X2CrNiMo 17132								
						"	LWHT316S30	SUS										
						"	LWCF316S30	SUS										
						"	LWBC316S30	SUS										
						"	CFS316S30	SUS										
	SUS		A213	TP316H	SUS	3059	CFS316S59	SUS	17455	X5CrNiMo 17122				2604/2	TS52	SUS		
	316HTB	SUS	A249	TP316H	SUS				17456					"	TS61	SUS		
	SUS		A213	TP316L	SUS	3605	316S14	SUS	2462	X2CrNiMo	SUS			2604/2	TS57	SUS		

	SUS		A271	TP316	SUS	A49-218	TUZ6CND 17.11		2604/2	TS61	SUS	
	316TF	SUS										
	SUS		A271	TP316H	SUS				2604/2	TS63	SUS	
	316HTF	SUS										
	SUS		A271	TP321	SUS				2604/2	TS53	SUS	
	321TF	SUS										
	SUS		A271	TP321H	SUS	A49-218	TUZ6CNT 18.10	SUS				
	321HTF	SUS										
	SUS		A271	TP347	SUS	A49-218	TUZ6CNNb 18.10	SUS	2604/2	TS50	SUS	
	347TF	SUS										
	SUS		A271	TP347H	SUS							
	347HTF	SUS										
	NCF8000TF	NiCr										
	NCF8000HTF	NiCr										

JIS Number and Corresponding Foreign Standards

JIS			ASTM			BS			DIN			NF			ISO			Index Number
Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	
G3464	STBL380	C	A334	Gr1	C	3603	HFS410LT50	C	17173	FONi14	Ni				2604/2	TS6	C	C014
	(STBL39)					"	CFS410LT50	C	17174	X8Ni9	Ni							
						"	ERW410LT50	C										
						"	CEW410LT50	C										
	STBL450	Ni	A334	Gr3	Ni	3603	HF503LT100	Ni				A49-230	TU10N14	Ni	2604/2	TS43	Ni	

	(STBL46)					"	CF503LT100	Ni				A49-213	TU10N14	Ni			
	STBL690	Ni	A334	Gr8	Ni	3603	HFS509LT196	Ni				A49-230	TUZ6N9	Ni	2604/2	TS45	Ni
	(STBL70)					"	CFS509LT196	Ni				A49-215	TUZ6N9	Ni			