BS 3606-78 STEEL TUBES FOR HEAT EXCHANGERS

Specification for steel tubes for heat exchangers

Requirements for plain end seamless and welded tubes in carbon, alloy and stainless steel, up to 50mm outside diameter, for use in heat exchangers.

Grade	Mfg. Process	Chemical Composition (%)								
		C	Si	Mn	P	S	Ni	Cr	Mo	Others
ERW320	E	0.16Max (Rimmed 0.19Max)	-	0.030~0.070	0.050Max	0.050Max	-	-	-	-
CEW320	E									
CFS320	S	0.16Max								
ERW440	E	0.12~0.18	0.10~0.35	0.90~1.20	0.040Max	0.035Max	-	-	-	-
CEW440	E									
CFS440	S									
ERW243	E	0.12~0.20	0.10~0.35	0.40~~0.80	0.040Max	0.040Max	-	-	0.25~0.35	Al: 0.012Max
CEW243	E									
CFS243	S									
ERW245	E	0.10~0.20	0.10~0.30	0.30~0.80	0.045Max	0.045Max	-	-	0.45~0.65	Al: 0.012Max
CEW245	E									
CFS245	S									
CEW261	E	0.06~0.10	0.10~0.35	0.60~0.80	0.020Max	0.020Max	-	0.20Max	0.40~0.60	B: 0.02Min Ti: 0.06Max Al: 0.06Max
CFS261	S									
ERW620	E	0.10~0.15	0.10~0.35	0.40~0.70	0.040Max	0.040Max	-	0.70~1.10	0.45~0.65	Al: 0.020Max
CEW620	E									
CFS620	S									
ERW621	E	0.10~0.15	0.50~1.00	0.30~0.60	0.040Max	0.040Max	-	1.00~1.50	0.45~0.65	Al: 0.020Max
CEW621	E									
CFS621	S									
CFS622	S	0.08~0.15	0.50Max	0.40~0.70	0.040Max	0.040Max	-	2.00~2.50	0.90~1.20	Al: 0.020Max

CFS625	S	0.15Max	0.50Max	0.30~0.60	0.030Max	0.030Max	-	4.00~6.00	0.45~0.65	Al: 0.020Max
LWHT304S22	W	0.03Max	0.20~1.00	0.50~2.00	0.045Max	0.030Max	9.0~12.0	17.0~19.0	-	-
LWCF304S22	W									
LWBC304S22	W									
CFS 304S22	S									
LWHT304S25	W	0.06Max	0.20~1.00	0.50~2.00	0.045Max	0.030Max	8.0~11.0	17.0~19.0	-	-
LWCF304S25	W									
LWBC304S25	W									
CFS304S25	S									
LWHT316S24	W	0.03Max	0.20~1.00	0.50~2.00	0.045Max	0.030Max	11.0~14.0	16.5~18.5	2.00~2.50	-
LWCF316S24	W									
LWBC316S24	W									
CFS316S24	S									
LWHT316S25	W	0.07Max	0.20~1.00	0.50~2.00	0.045Max	0.030Max	10.5~13.5	16.5~18.5	2.00~2.50	-
LWCF316F25	W									
LWBC316S25	W									
CFS 316S25	S									
LWHT316S29	W	0.03Max	0.20~1.00	0.50~2.00	0.045Max	0.030Max	11.5~14.5	16.5~18.5	2.50~3.00	-
LWCF316S29	W									
LWBC316S29	W									
CFS 316S29	S									
LWTH316S30	W	0.07Max	0.20~1.00	0.50~2.00	0.045Max	0.030Max	11.0~14.0	16.5~18.5	2.50~3.00	-
LWCF316S30	W									
LWBC316S30	W									
CFS 316S30	S									
LWHT321S22	W	0.08Max	0.20~1.00	0.50~2.00	0.045Max	0.030Max	9.0~12.0	17.0~19.0	-	Ti:5×C~0.60

LWCF321S22	W									
LWC321S22	W									
CFS321S22	S									
LWHT347S17	W	0.08Max	0.20~1.00	0.50~2.00	0.045Max	0.030Max	9.0~12.0	17.0~19.0	-	Nb: 10×C~1.00
LWCF347S17	W									
LWBC347S17	W									
CFS 347S17	S									

Grade	Tensile Test MPa or N/mm^2		Remarks
	Min Yield point	Tensile Strength	(Similar to JIS)
ERW320	(195)	-	(STB35) (N)
CEW320			
CFS320			
ERW440	265	440Min	(STB42) (N)
CEW440			
CFS440			
ERW243	245	450Min	- (N, NT)
CEW243			
CFS243			
ERW245	245	450Min	(STBA12) (N, NT)
CEW245			
CFS245			
CEW261	405	540~690	- (N)
CFS261			
ERW620	180	460Min	(STBA22) (N, NT)
CEW620			
CFS620			
ERW621	275	420Min	(STBA23) (N, NT)
CEW621			

CFS621			
CFS622	275	490Min	(STBA24) (N, NT)
CFS625	170	46Min	(STBA25) (N, NT)
LWHT304S22	205	490~690	(SUS304LTB) (Q)
LWCF304S22			
LWBC304S22			
CFS304S22			
LWHT304S25	235	490~690	(SUS304TB) (Q)
LWCF304S25			
LWBC304S25			
CFS304S25			
LWHT316S24	205	490~690	(SUS316LTB) (Q)
LWCF316S24			
LWBC316S24			
CFS316S24			
LWHT316S25	245	510~710	(SUS316 TB) (Q)
LWCF316F25			
LWBC316S25			
CFS316S25			
LWHT316S29	205	490~690	(SUS316LTB) (Q)
LWCF316S29			
LWBC316S29			
CFS316S29			
LWTH316S30	245	510~710	(SUS316 TB) (Q)
LWCF316S30			
LWBC316S30			

CFS316S30			
LWHT321S22	235	510~710	(SUS321 TB) (Q)
LWCF321S22			
LWC321S22			
CFS321S22			
LWHT347S17	245	510~710	(SUS347 TB) (Q)
LWCF347S17			
LWBC347S17			
CFS 347S17			

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

ASTM Standard	UNS NO.	KOREA/JAPANES			GERMAN				BRITISH			BELGIAN			FRENCH			ITALIAN		
		KS/JIS Symbol	KS/JIS Number	Remarks	DIN Type	DIN Number	Material Number	Remarks	B.S Number	B.S Grade	Remarks	NBN Type	NBN Grade	Remarks	AFNOR Type	NF Number	Remarks	UNI Type	UNI Number	Remarks
A 179 Seamless Cold Drawn Low-C Steel Heat Exchanger and Condenser Tubes	K01200	STBH 340 / STB 35	D3563 / G3461		St35.4	1629	1.0309		3606	CFS 320		D 37-2	629	(3b)	TU 37 C	A49-215	(3a)	C 14	5462	
					St35.8	17175	1.0305	Plus DIN 2391 (18) Gutegard C.NBK												

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

ASTM Standard	UNS NO.	KOREA/JAPANES			GERMAN				BRITISH			BELGIAN			FRENCH			ITALIAN		
		KS/JIS Symbol	KS/JIS Number	Remarks	DIN Type	DIN Number	Material Number	Remarks	B.S Number	B.S Grade	Remarks	NBN Type	NBN Grade	Remarks	AFNOR Type	NF Number	Remarks	UNI Type	UNI Number	Remarks
A 199 Seamless Cold Drawn Intermediate Alloy Steel Heat Exchange and Condenser																				

Tubes																				
T5	K41545	STHA 24 / STBA 25	D3572 / G3462	(35)	12CrMo 19 5		1.7362	(3a)	3606	CFS 625	(35)	X 12 CrMo 5	837	(35)	Z 12 CD 5.05		(3a)			(3); dalmine 234
T11	K11597	STHA 22 / STBA 23	D3572 / G3462	(35)	13CrMo 44	17175	1.7335	(8)	3606	CFS 621	(35)				10 CD 5.05		(3a)			(3); dalmine 227(10)
T22	K21590	STHA 23 / STBA 24	D3572 / G3462	(35)	10CrMo 9 10	17175	1.7380		3606	CFS 622	(35)	10Cr Mo 9 10	837	(35)	10 CD 9.10		(3a)	12CrMo 9 10	5462	(10)0

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

ASTM Standard	UNS NO.	KOREA/JAPANES			GERMAN				BRITISH			BELGIAN			FRENCH		
		KS/JIS Symbol	KS/JIS Number	Remarks	DIN Type	DIN Number	Material Number	Remarks	B.S Number	B.S Grade	Remarks	NBN Type	NBN Grade	Remarks	AFNOR Type	NF Number	Remarks
A 214 Electric Resistance Welded Heat Exchange and Condenser Tubes	K01807	STBH 340 / STB 35	D3563 / G3461	(24)	St37-2	1626	1.0036	(3b)ERW Only	3606	ERW30		D37-1	629	(3b)	TS34e	A49-245	
		STBH 410 / STB 42	D3563 / G3461	(24)													
		STBH 510 / STB 52	D3563 / G3461	(24)													

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	

G3461	STB340	C	A161	LC	C	3059	HFS320	C				A49-245	TS34e	C				C010
	(STB35)		A192	-	C	"	CFS320	C				"	TS34c	C				
			A226	-	C	"	ERW320	C										
			A556	GrA2	C	"	CEW320	C										
			A557	GrA2	C	"	S1 360	C										
						"	S2 360	C										
						"	ERW 360	C										
						"	CEW360	C										
						3606	ERW320	C										
						"	CEW320	C										
						"	CFS320	C										
	STB410	C	A179	GrC	C	3059	S1 440	C	17175	St45.8	C	A49-213	TU42c	C	2604/2	TS9H	C	
	(STB42)		A210	GrA1	C	"	S2 440	C	17177	St42.8	C	A49-215	TU42c	C	"	TW9H	C	
			A556	GrB2	C	"	ERW 440	C				A49-243	TS42c					
			A557	GrB2	C	"	CEW 440	C				A49-245	TS42c					
						3602	HFS 410	C				"	TS42c					
						"	CFS 410	C										
						"	ERW 410	C										
						"	CEW 410	C										
						3606	ERW 440	C										
						"	CEW 440	C										
						"	CFS 440	C										
STB510	C							C	17175	19Mn5	C	A49-213	TU52C	C	2604/2	TS18	C	
(STB52)								C				A49-248	TU52C	C				

JIS Number and Corresponding Foreign Standards

JIS	ASTM	BS	DIN	NF	ISO	

Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Standard Number	Grade	Type	Index Number
G3462	STBA12	Mo	A209	T1	Mo	3606	ERW245	Mo										C011
			A250	T1	Mo	"	CEW245	Mo										
						"	CFS245	Mo										
	STBA13	Mo	A209	T1-A	Mo													
			A250	T1-a	Mo													
			A629	-	Mo													
	STBA20	CrMo	A213	T2	CrMo													
	STBA22	CrMo	A213	T12	CrMo	3059	S1 620	CrMo	17175	13CrMo44	CrMo							
						"	S2 620	CrMo										
						3059	ERW620	CrMo										
						"	CEW620	CrMo										
						3604	HFS620-460	CrMo										
						"	CFS620-460	CrMo										
						"	ERW620-460	CrMo										
						"	CEW620-460	CrMo										
						"	HFS620-440	CrMo										
						"	CFS620-440	CrMo										
						"	ERW620-440	CrMo										
						"	CEW620-440	CrMo										
						3606	ERW620	CrMo										
						"	CEW620	CrMo										
						"	CFW620	CrMo										
	STBA23	CrMo	A199	T11	CrMo	3604	HF621	CrMo				A49-213	TU10CD	CrMo				
			A213	T11	CrMo	"	CFS621	CrMo				A49-215	TU10CD5.05	CrMo				
						"	ERW621	CrMo										
						"	CEW621	CrMo										

						3606	ERW621	CrMo										
						"	CEW621	CrMo										
						"	CFS621	CrMo										
	STBA24	CrMo	A199	T22	CrMo	3059	S1-622-440	CrMo	17175	10CrMo910	CrMo	A49-213	Tu10CD9.10	CrMo				
			A213	T22	CrMo	"	S2-622-440	CrMo				A49-215	Tu!0CD9.10	CrMo				
						"	S1-622-490	CrMo										
						"	S2-622-490	CrMo										
	STBA25	CrMo	A199	T5	CrMo	3604	HFS625	CrMo							260 4/2	TS37	CrMo	
			A213	T5	CrMo	"	CFS625	CrMo										
						3606	CFS625	CrMo										
	STBA26	CrMo	A199	T9	CrMo	3059	S1-629-470	CrMo				A49-213	TUZ10CD9	CrMo				
			A213	T9	CrMo	"	S2-629-470	CrMo				A49-215	TUZ10CD9	CrMo				
						"	S1-629-470S2-629-590	CrMo										
						"	S2-629-590	CrMo										
						3604	HFS629-470	CrMo										

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	
G3463			A213	TP304	SUS	3605	304s18	SUS	2462	X5CrNi189	SUS	A49-230	TUZ6CN 18.09	SUS	2604/2	TS48	SUS	C012
	SUS		A249	TP304	SUS	"	304S25	SUS	2463	X5CrNi189	SUS							
	304TB	SUS	A269	TP304	SUS	3606	LWHT304S22	SUS										
			A623	TP304	SUS	3606	LWCF304S22	SUS										
			A688	TP304	SUS	"	LWBC304S25	SUS										
	SUS		A213	TP304H	SUS	3059	CFS304S59	SUS							2604/2	TS48	SUS	
	304HTB	SUS	A249	TP304H	SUS	3606	304S59	SUS										

	SUS		A213	TP304L	SUS	3605	304S14	SUS	2462	X2CrNi189	SUS	A49-207	TSZ2CN 18.10	SUS	2604/2	TS46	SUS	
	304LTB	SUS	A249	TP304L	SUS	"	304S22	SUS	2463	X2CrNi189	SUS	"	TSZ2CN 18.10	SUS				
			A269	TP304L	SUS	3606	LWHT304S22	SUS				A49-230	TSZ2CN 18.10	SUS				
			A632	TP304L	SUS	"	LWCF304S22	SUS										
			A688	TP304L	SUS	"	LWBC304S22	SUS										
						"	CFS304S22	SUS										
	SUS																	
	309TB	SUS																
	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 1810	SUS				2604/2	TS57	SUS	
	316LTB	SUS	A249	TP316L	SUS	"	316S22	SUS		X2CrNiMo 1812	SUS				"	TS58	SUS	
			A269	TP316L	SUS	3606	LWHT316S24	SUS	2463	X2CrNiMo 1810	SUS							
			A632	TP316L	SUS	"	LWCF316S24	SUS		X2CrNiMo 1812	SUS							
			A688	TP316L	SUS	"	LWBC316S24	SUS	17457	X5CrNi 17122								
						"	CFS346S24	SUS	17458									
						"	LWHT316S29	SUS										
						"	LWCF31^S29	SUS										
						"	LWBC316S29	SUS										
						"	CFS316S29	SUS										
	SUS		A249	TP317	SUS													
	317TB	SUS	A632	TP317	SUS													
	SUS		A249	TP317	SUS													
	317LTB	SUS																
			A213	TP321	SUS	3605	321S18	SUS	2462	X10CrNi	SUS	A49-230	TUZ6CNT	SUS	2604/2	TS53	SUS	

										Ti89			18.10					
	321TB	SUS	A249	TP321	SUS	"	321S22	SUS	2463	X10CrNi Ti189	SUS							
			A269	TP321	SUS	3606	LWHT321S22	SUS	17457									
			A632	TP321	SUS	"	LWCF321S22	SUS	17458	X6CrNiTi 1810								
						"	LWBC321S22	SUS										
						"	CFS321S22											
	SUS		A213	TP321	SUS	3059	CFS321S59	SUS										
	321HTB	SUS	A249	TP321H	SUS	3605	321S59	SUS										
			A213	TP347	SUS	3605	347S18	SUS	2462	X10CrNi Nb189	SUS	A49-207	TSZ6CNNb 18.10	SUS	2604/2	TS50		
	347TB	SUS	A249	TP347	SUS	"	347S17	SUS	17457			"	TUZ6CNNb 18.10	SUS				
			A269	TP347	SUS	3606	LWHT347S17	SUS	17458	X6CrNiNb 1810								
			A632	TP347	SUS	"	LWCF347S17	SUS										
						3606	LWBC347S17	SUS										
						3606	CFS317S17	SUS										
	SUS		A213	TP347H	SUS	3059	CFS347S17	SUS							2604/2	TS56	SUS	
	347HTB	SUS	A249	TP347H	SUS	3605	347S59	SUS										
	SUS																	
	XM15J1TB	SUS																
	SUS																	
	329J2LTB	SUS																
	SUS		A268	TP405	SUS													
	405TB	SUS																
	SUS		A268	TP409														

	409TB	SUS																
	SUS		A268	TP410	SUS				2462	X10Cr13	SUS							
	410TB	SUS																
	SUS																	
	410TiTB	SUS																
	SUS		A268	TP430	SUS				2462	X8Cr7	SUS							
	430TB	SUS																
	SUS		A213	18Cr2Mo	SUS													
	444TB	SUS																
	SUS																	
	XM8TB	SUS																
	SUS		A731	18Cr2Mo	SUS													
	XM27TB	SUS	"	TP439	SUS													