Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures

Mechanical Properties of Austenitic Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures (Continued)

Standard Designation	Grade, Class, Type, Symbol or Name	Steel Number	UNS Number	Product Form/ Heat Treatment	Thickness		Yield Strength, min		Tensile Strength, min		Elongation, min, %	Other
					t, mm	t, in.	N/mm^2 or MPa	ksi	N/mm^2 or MPa	ksi		
ASTM A 213/A 213M-03a	TP309H	---	S30909	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	TP309H	---	S30909	ST	---	---	205	30	515	75	35	90 HRB max
JIS G 3459:1997	SUS309TP	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3463:1994	SUS309TB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
AFNOR NF A 49-244:1993	X15CrNi24-13	---	---	ST or TT	< 3	---	240	---	540-740	---	30	---
					3 ≤ t ≤ 5	---	240	---			35	
					5 < t ≤ 75	---	240	---			35	
ASTM A 213/A 213M-03a	TP310S	---	S31008	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	TP310S	---	S31008	H + RC	---	---	205	30	515	75	35	90 HRB max
ASTM A 312/A 312M-03	TP310S	---	S31008	HF or CF + A	---	---	205	30	515	75	35	---
ASTM A 358/A 358M-01	310S	---	S31008	H, HT, HT-O or HT-SO	---	---	205	30	515	75	40	---
JIS G 3459:1997	SUS310STP	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3463:1994	SUS310STB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3468:1994	SUS310S	---	---	AM	---	---	205	---	520	---	35	---
ASTM A 213/A 213M-03a	TP310H	---	S31009	ST	---	---	205	30	515	75	35	90 HRB
AFNOR NF A 49-244:1993	X1CrNi25-20	---	---	ST or TT	< 3	---	205	---	480-680	---	35	L: 90 J at -196°C T: 70 J at -196°C
					3 ≤ t ≤ 5	---	205	---			40	
					5 < t ≤ 75	---	205	---			40	
JIS G 3463:1994	SUS310TB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3467:1988	SUS 310 TF	---	---	ST	---	---	205	---	520	---	35	---
ISO 2604-II:1975	TS 68	---	---	Q	---	---	205	---	510-710	---	30	---
ASTM A 249/A 249M-03	---	---	S31050	H + RC	---	t ≤ 0.25	270	39	580	84	25	95 HRB max
					---	t > 0.25	255	37	540	78	25	95 HRB max
AFNOR NF A 49-217:1987	TU Z 1 CND 25 22 AZ	---	---	HF + CR + Q (HY)	---	---	260	---	540-740	---	30	---
ASTM A 249/A 249M-03	---	---	S31254	H + WQ or RC	---	t ≤ 0.187	310	45	675	98	35	100 HRB max
						t > 0.187	300	45	655	95		
ASTM A 688/A 688M-03	---	---	S31254	H + WQ or RC	---	t ≤ 0.187	310	45	690	100	35	90 HRB max
						t > 0.187	310	45	655	95	35	
AFNOR NF A 49-217:1987	TU Z 1 CNDU 20 18 06 AZ	---	---	HF + CR + Q (HY)	---	---	300	---	650-850	---	35	---

Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures

Mechanical Properties of Austenitic Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures (Continued)

Standard Designation	Grade, Class, Type, Symbol or Name	Steel Number	UNS Number	Product Form/ Heat Treatment	Thickness		Yield Strength, min		Tensile Strength, min		Elongation, min, %	Other
					t, mm	t, in.	N/mm² or MPa	ksi	N/mm² or MPa	ksi		
ASTM A 213/A 213M-03a	TP316	---	S31600	ST	---	---	205	30	515	75	35	90
ASTM A 249/A 249M-03	TP316	---	S31600	H + RC	---	---	205	30	515	75	35	90 HRB max
ASTM A 312/A 312M-03	TP316	---	S31600	HF or CF + A	---	---	205	30	515	75	35	---
ASTM A 358/A 358M-01	316	---	S31600	H, HT, HT-O or HT-SO	---	---	205	30	515	75	40	---
ASTM A 376/A 376M-02a	TP316	---	---	see standard	---	---	205	30	515	75	35	---
ASTM A 409/A 409M-01	TP316	---	S31600	H, HT, HT-O or HT-SO	---	---	205	30	515	75	---	---
ASTM A 688/A 688M-03	TP316	---	S31600	SA	---	---	205	30	515	75	35	90 HRB max
JIS G 3459:1997	SUS316TP	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3463:1994	SUS316TB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3467:1988	SUS 316 TF	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3468:1994	SUS316	---	---	AM	---	---	205	---	520	---	35	---
BS 3605-1:1990 Issue 2, 1997	316S31	---	---	ST or HF	---	---	240	---	510-710	---	35	---
	316S33	---	---	ST or HF	---	---	240	---	510-710	---	35	---
BS 3605-2:1992 AMD 1:1997	316S31	---	---	AW or ST	---	---	240	---	510-710	---	35	---
	316S33	---	---	AW or ST	---	---	240	---	510-710	---	35	---
DIN 17457:1985	X 5 CrNiMo 17 12 2	1.4401	---	SA & Q	≤ 50	---	205	---	510-710	---	40 L; 35 T	L: 85 J at RT T: 55 J at RT
DIN 17458:1985	X 5 CrNiMo 17 12 2	1.4401	---	SA & Q	≤ 50	---	205	---	510-710	---	40 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 17457:1985	X 5 CrNiMo17 13 3	1.4436	---	SA & Q	≤ 50	---	205	---	510-710	---	40 L; 35 T	L: 85 J at RT T: 55 J at RT
DIN 17458:1985	X 5 CrNiMo17 13 3	1.4436	---	SA & Q	≤ 50	---	205	---	510-710	---	40 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 28180:1985	X 5 CrNiMo 17 12 2	1.4401	---	SA & Q	≤ 50	---	205	---	510-710	---	40 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 28181:1985	X 5 CrNiMo 17 12 2	1.4401	---	SA & Q	≤ 50	---	205	---	510-710	---	40 L; 30 T	L: 85 J at RT T: 55 J at RT
AFNOR NF A 49-217:1987	TU Z 6 CND 17 11	---	---	HF + CR + Q (HY)	---	---	190	---	490-740	---	45	90 HRB max
AFNOR NF A 49-244:1993	X7CrNiMo17-11-2	---	---	ST or TT	< 3	---	225	---	540-740	---	40	L: 90 J at -196°C T: 70 J at -196°C
					3 ≤ t ≤ 5	---	225	---			45	
					5 < t ≤ 75	---	215	---			45	
AFNOR NF A 49-247:1981	TS Z 6 CND 17-11	---	---	Q (HY)	---	---	225	---	540-740	---	40	---
ISO 2604-II:1975	TS 60	---	---	Q	---	---	205	---	510-710	---	30	---
	TS 61	---	---	Q	---	---	205	---	510-710	---	30	---
ISO 2604-V:1978	TW 60	---	---	Q	---	---	205	---	510-710	---	30	---
	TW 61	---	---	Q	---	---	205	---	510-710	---	30	---

Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures

Mechanical Properties of Austenitic Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures (Continued)

Standard Designation	Grade, Class, Type, Symbol or Name	Steel Number	UNS Number	Product Form/ Heat Treatment	Thickness		Yield Strength, min		Tensile Strength, min		Elongation, min, %	Other
					t, mm	t, in.	N/mm² or MPa	ksi	N/mm² or MPa	ksi		
ASTM A 213/A 213M-03a	TP316L	---	S31603	ST	---	---	170	25	485	70	35	90 HRB
ASTM A 249/A 249M-03	TP316L	---	S31603	H + RC	---	---	170	25	485	70	35	90 HRB max
ASTM A 312/A 312M-03	TP316L	---	S31603	HF or CF + A	---	---	170	25	485	70	35	---
ASTM A 358/A 358M-01	316L	---	S31603	H, HT, HT-O or HT-SO	---	---	170	25	485	70	40	---
ASTM A 409/A 409M-01	TP316L	---	S31603	H, HT, HT-O or HT-SO	---	---	170	25	485	70	---	---
ASTM A 688/A 688M-03	TP316L	---	S31603	SA	---	---	175	25	485	70	35	90 HRB max
JIS G 3459:1997	SUS316LTP	---	---	ST	---	---	175	---	480	---	35	---
JIS G 3463:1994	SUS316LTB	---	---	ST	O.D. < 10	---	175	---	480	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3468:1994	SUS316L	---	---	AM	---	---	175	---	480	---	35	---
BS 3605-1:1990 Issue 2, 1997	316S11	---	---	ST or HF	---	---	225	---	490-690	---	35	---
	316S13	---	---	ST or HF	---	---	225	---	490-690	---	35	---
BS 3605-2:1992 AMD 1:1997	316S11	---	---	AW or ST	---	---	225	---	490-690	---	35	---
	316S13	---	---	AW or ST	---	---	225	---	490-690	---	35	---
DIN 17457:1985	X 2 CrNiMo 17 13 2	1.4404	---	SA & Q	≤ 50	---	190	---	490-690	---	40 L; 35 T	L: 85 J at RT T: 55 J at RT
DIN 17458:1985	X 2 CrNiMo 17 13 2	1.4404	---	SA & Q	≤ 50	---	190	---	490-690	---	40 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 17457:1985	X 2 CrNiMo 18 14 3	1.4435	---	SA & Q	≤ 50	---	190	---	490-690	---	40 L; 35 T	L: 85 J at RT T: 55 J at RT
DIN 17458:1985	X 2 CrNiMo 18 14 3	1.4435	---	SA & Q	≤ 50	---	190	---	490-690	---	40 L; 30 T	L: 85 J at RT T: 55 J at RT
AFNOR NF A 49-217:1987	TU Z 2 CND 17 12	---	---	HF + CF + Q (HY)	---	---	175	---	470-720	---	45	90 HRB max
AFNOR NF A 49-244:1993	X3CrNiMo17-11-2	---	---	ST or TT	< 3	---	215	---	510-710	---	40	L: 90 J at -196°C T: 70 J at -196°C
					3 ≤ t ≤ 5	---	215	---			45	
					5 < t ≤ 75	---	205	---			45	
	X3CrNiMo17-12-3	---	---	ST or TT	< 3	---	215	---	510-710	---	40	L: 90 J at -196°C T: 70 J at -196°C
					3 ≤ t ≤ 5	---	215	---			45	
					5 < t ≤ 75	---	205	---			45	
	X3CrNiMo18-12-3	---	---	ST or TT	< 3	---	215	---	510-710	---	40	L: 90 J at -196°C T: 70 J at -196°C
					3 ≤ t ≤ 5	---	215	---			45	
					5 < t ≤ 75	---	205	---			45	
	TU Z 2 CND 18 14	---	---	HF + CF + Q (HY)	---	---	210	---	490-690	---	45	---
AFNOR NF A 49-247:1981	TS Z 2 CND 17-12	---	---	Q (HY)	---	---	215	---	520-720	---	40	---
ISO 2604-II:1975	TS 57	---	---	Q	---	---	185	---	490-690	---	30	---
	TS 58	---	---	Q	---	---	185	---	490-690	---	30	---
ISO 2604-V:1978	TW 57	---	---	Q	---	---	185	---	490-690	---	30	---
	TW 58	---	---	Q	---	---	185	---	490-690	---	30	---

Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures

Mechanical Properties of Austenitic Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures (Continued)

Standard Designation	Grade, Class, Type, Symbol or Name	Steel Number	UNS Number	Product Form/ Heat Treatment	Thickness		Yield Strength, min		Tensile Strength, min		Elongation, min, %	Other
					t, mm	t, in.	N/mm^2 or MPa	ksi	N/mm^2 or MPa	ksi		
ASTM A 213/A 213M-03a	TP316LN	---	S31653	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	TP316LN	---	S31653	H + RC	---	---	205	30	515	75	35	90 HRB max
ASTM A 376/A 376M-02a	TP316LN	---	---	see standard	---	---	205	30	515	75	35	---
ASTM A 688/A 688M-03	TP316LN	---	S31653	SA	---	---	205	30	515	75	35	90 HRB max
DIN 17457:1985	X 2 CrNiMoN 17 13 3	1.4429	---	SA & Q	≤ 50	---	295	---	580-800	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 17458:1985	X 2 CrNiMoN 17 13 3	1.4429	---	SA & Q	≤ 50	---	295	---	580-800	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
AFNOR NF A 49-217:1987	TU Z 2 CND 17 12 AZ	---	---	HF + CF + Q (HY)	---	---	280	---	600-800	---	40	---
AFNOR NF A 49-244:1993	X3CrNiMoN17-11	---	---	ST or TT	< 3	---	290	---	590-790	---	35	L: 100 J at -196°C T: 80 J at -196°C
					3 ≤ t ≤ 5	---	290	---			40	
					5 < t ≤ 75	---	290	---			40	
	X3CrNiMoN17-12	---	---	ST or TT	< 3	---	290	---	590-790	---	35	L: 100 J at -196°C T: 80 J at -196°C
					3 ≤ t ≤ 5	---	290	---			40	
					5 < t ≤ 75	---	290	---			40	
ASTM A 213/A 213M-03a	TP316H	---	S31609	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	TP316H	---	S31609	ST	---	---	205	30	515	75	35	90 HRB max
ASTM A 312/A 312M-03	TP316H	---	S31609	HF or CF + A	---	---	205	30	515	75	35	---
ASTM A 358/A 358M-01	316H	---	S31609	H, HT, HT-O or HT-SO	---	---	205	30	515	75	40	---
ASTM A 376/A 376M-02a	TP316H	---	S31609	see standard	---	---	205	30	515	75	35	---
JIS G 3459:1997	SUS316HTP	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3463:1994	SUS316HTB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3467:1988	SUS 316H TF	---	---	ST	---	---	205	---	520	---	35	---
BS 3605-1:1990 Issue 2, 1997	316S51	---	---	ST or HF	---	---	240	---	510-710	---	35	---
DIN 17459:1992	X 6 CrNiMo 17 13	1.4919	---	SHT	≤ 50	---	205	---	490-690	---	35 L; 30 T	L: 90 J at RT T: 60 J at RT
AFNOR NF A 49-214:1978	Z 6 CND 17-12 B	---	---	L or F/H + RC	---	---	195	---	490-690	---	40	---
ISO 2604-II:1975	TS 63	---	---	Q	---	---	205	---	510-710	---	30	---
BS 3605-1:1990 Issue 2, 1997	316S52	---	---	ST or HF	---	---	240	---	510-710	---	35	---
DIN 17459:1992	X 3 CrNiMoN 17 13	1.4910	---	SHT	≤ 50	---	260	---	550-750	---	35 L; 30 T	L: 120 J at RT T: 80 J at RT

Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures

Mechanical Properties of Austenitic Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures (Continued)

Standard Designation	Grade, Class, Type, Symbol or Name	Steel Number	UNS Number	Product Form/ Heat Treatment	Thickness		Yield Strength, min		Tensile Strength, min		Elongation, min, %	Other
					t, mm	t, in.	N/mm^2 or MPa	ksi	N/mm^2 or MPa	ksi		
JIS G 3459:1997	SUS316TiTP	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3463:1994	SUS316TiTB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
DIN 17457:1985	X 6 CrNiMoTi 17 12 2	1.4571	---	SA & Q	≤ 50	---	210	---	500-730	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 17458:1985	X 6 CrNiMoTi 17 12 2	1.4571	---	SA & Q	≤ 50	---	210	---	500-730	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
					≤ 50	---	190	---	490-690	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 28180:1985	X 6 CrNiMoTi 17 12 2	1.4571	---	SA & Q	≤ 50	---	210	---	500-730	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
				SA & Q	≤ 50	---	190	---	490-690	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 28181:1985	X 6 CrNiMoTi 17 12 2	1.4571	---	SA & Q	≤ 50	---	210	---	500-730	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
AFNOR NF A 49-214:1978	Z 8 CNDT 17-13 B	---	---	L or F/H + RC	---	---	195	---	540-740	---	40	---
AFNOR NF A 49-244:1993	X6CrNiMo17-11-2	---	---	ST or TT	< 3	---	225	---	540-740	---	35	L: 90 J at -196°C T: 70 J at -196°C
					3 ≤ t ≤ 5	---	225	---			40	
					5 < t ≤ 75	---	215	---			40	
ASTM A 213/A 213M-03a	TP317	---	S31700	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	TP317	---	S31700	H + RC	---	---	205	30	515	75	35	90 HRB max
ASTM A 312/A 312M-03	TP317	---	S31700	HF or CF + A	---	---	205	30	515	75	35	---
ASTM A 409/A 409M-01	TP317	---	S31700	H, HT, HT-O or HT-SO	---	---	205	30	515	75	---	---
JIS G 3459:1997	SUS317TP	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3463:1994	SUS317TB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3468:1994	SUS317	---	---	AM	---	---	205	---	520	---	35	---
ASTM A 213/A 213M-03a	TP317L	---	S31703	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	TP317L	---	S31703	H + RC	---	---	205	30	515	75	35	90 HRB max
ASTM A 312/A 312M-03	TP317L	---	S31703	HF or CF + A	---	---	205	30	515	75	35	---
JIS G 3459:1997	SUS317LTP	---	---	ST	---	---	175	---	480	---	35	---
JIS G 3463:1994	SUS317LTB	---	---	ST	O.D. < 10	---	175	---	480	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3468:1994	SUS317L	---	---	AM	---	---	175	---	480	---	35	---

Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures

Mechanical Properties of Austenitic Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures (Continued)

Standard Designation	Grade, Class, Type, Symbol or Name	Steel Number	UNS Number	Product Form/ Heat Treatment	Thickness		Yield Strength, min		Tensile Strength, min		Elongation, min, %	Other
					t, mm	t, in.	N/mm² or MPa	ksi	N/mm² or MPa	ksi		
AFNOR NF A 49-244:1993	X3CrNiMo19-15-4	---	---	ST or TT	< 3	---	215	---	510-710	---	40	L: 90 J at -196°C T: 70 J at -196°C
					3 ≤ t ≤ 5	---	215	---			45	
					5 < t ≤ 75	---	205	---			45	
AFNOR NF A 49-247:1981	TS Z 2 CND 19-15	---	---	Q (HY)	---	---	225	---	520-720	---	35	---
ASTM A 213/A 213M-03a	TP321	---	S32100	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	TP321	---	S32100	H + RC	---	---	205	30	515	75	35	90 HRB max
ASTM A 312/A 312M-03	TP321 Seamless	---	S32100	A	---	≤ ⅜	205	30	515	75	35	---
ASTM A 358/A 358M-01	321	---	S32100	H, HT, HT-O or HT-SO	---	---	205	30	515	75	40	---
ASTM A 376/A 376M-02a	TP321	---	---	see standard	---	≤ ⅜	205	30	515	75	35	---
ASTM A 409/A 409M-01	TP321	---	S32100	H, HT, HT-O or HT-SO	---	---	205	30	515	75	---	---
JIS G 3459:1997	SUS321TP	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3463:1994	SUS321TB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3467:1988	SUS 321 TF	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3468:1994	SUS321	---	---	AM	---	---	205	---	520	---	35	---
BS 3605-1:1990 Issue 2, 1997	321S31	---	---	ST or HF	---	---	235	---	510-710	---	35	---
BS 3605-2:1992 AMD 1:1997	321S31	---	---	AW or ST	---	---	235	---	510-710	---	35	---
DIN 17457:1985	X 6 CrNiTi 18 10	1.4541	---	SA & Q	≤ 50	---	200	---	500-730	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 17458:1985	X 6 CrNiTi 18 10	1.4541	---	SA & Q	≤ 50	---	200	---	500-730	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
					≤ 50	---	180	---	460-680	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 28180:1985	X 6 CrNiTi 18 10	1.4541	---	SA & Q	≤ 50	---	200	---	500-730	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
				SA & Q	≤ 50	---	180	---	460-680	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 28181:1985	X 6 CrNiTi 18 10	1.4541	---	SA & Q	≤ 50	---	200	---	500-730	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
AFNOR NF A 49-217:1987	TU Z 6 CNT 18 10	---	---	HF + CR + Q (HY)	---	---	190	---	490-740	---	45	90 HRB max
AFNOR NF A 49-244:1993	X6CrNiTi18-10	---	---	ST or TT	< 3	---	220	---	530-730	---	35	L: 90 J at -196°C T: 70 J at -196°C
					3 ≤ t ≤ 5	---	220	---			40	
					5 < t ≤ 75	---	210	---			40	
AFNOR NF A 49-247:1981	TS Z 6 CNT 18-10	---	---	Q (HY)	---	---	220	---	530-730	---	35	---
ISO 2604-II:1975	TS 53	---	---	Q	---	---	195	---	510-710	---	30	---
ISO 2604-V:1978	TW 53	---	---	Q	---	---	195	---	510-710	---	30	---

Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures

Mechanical Properties of Austenitic Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures (Continued)

Standard Designation	Grade, Class, Type, Symbol or Name	Steel Number	UNS Number	Product Form/ Heat Treatment	Thickness		Yield Strength, min		Tensile Strength, min		Elongation, min, %	Other
					t, mm	t, in.	N/mm^2 or MPa	ksi	N/mm^2 or MPa	ksi		
ASTM A 213/A 213M-03a	TP321H	---	S32109	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	TP321H	---	S32109	ST	---	---	205	30	515	75	35	90 HRB max
ASTM A 312/A 312M-03	TP321H Welded	---	S32109	HF or CF + A	---	---	205	30	515	75	35	---
ASTM A 376/A 376M-02a	TP321H	---	S32109	see standard	---	≤ ⅜	205	30	515	75	35	---
					---	> ⅜	170	25	480	70	35	---
JIS G 3459:1997	SUS321HTP	---	---	CF or HF + ST	---	---	205	---	520	----	35	---
JIS G 3463:1994	SUS321HTB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3467:1988	SUS 321H TF	---	---	CF or HF,ST	---	---	205	---	520	---	35	---
BS 3605-1:1990 Issue 2, 1997	321S51	---	---	ST or HF	---	---	235	---	510-710	---	35	---
AFNOR NF A 49-214:1978	Z 6 CNT 18-12 B	---	---	L or F/H + RC	---	---	195	---	490-690	---	40	---
ISO 2604-II:1975	TS 54	---	---	Q	---	---	155	---	490-690	---	30	---
JIS G 3463:1994	SUS329J3LTB	---	---	ST	O.D. < 10	---	450	---	620	---	10	---
					10 ≤ O.D. < 20	---					13	---
					O.D. ≥ 20	---					18	---
AFNOR NF A 49-217:1987	TU Z 2 CND 22 05 03	---	---	HF + CR + Q (HY)	---	---	450	---	680-880	---	25	---
JIS G 3463:1994	SUS329J4LTB	---	---	ST	O.D. < 10	---	450	---	620	---	10	---
					10 ≤ O.D. < 20	---					13	---
					O.D. ≥ 20	---					18	---
AFNOR NF A 49-217:1987	TU Z 2 CND 25 07 03	---	---	HF + CR + Q (HY)	---	---	450	---	700-900	---	25	---
ASTM A 213/A 213M-03a	TP347	---	S34700	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	TP347	---	S34700	H + RC	---	---	205	30	515	75	35	90 HRB max
ASTM A 312/A 312M-03	TP347	---	S34700	HF or CF + A	---	---	205	30	515	75	35	---
ASTM A 358/A 358M-01	347	---	S34700	H, HT, HT-O or HT-SO	---	---	205	30	515	75	40	---
ASTM A 376/A 376M-02a	TP347	---	S34700	see standard	---	---	205	30	515	75	35	---
ASTM A 409/A 409M-01	TP347	---	S34700	H, HT, HT-O or HT-SO	---	---	205	30	515	75	---	---
JIS G 3459:1997	SUS347TP	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3463:1994	SUS347TB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3467:1988	SUS 347 TF	---	---	ST	---	---	205	---	520	---	35	---
JIS G 3468:1994	SUS347	---	---	AM	---	---	205	---	520	---	35	---
BS 3605-1:1990 Issue 2, 1997	347S31	---	---	ST or HF	---	---	240	---	510-710	---	35	---
BS 3605-2:1990 Issue 2, 1997	347S31	---	---	ST	---	---	240	---	510-710	---	35	---

Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures

Mechanical Properties of Austenitic Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures (Continued)

Standard Designation	Grade, Class, Type, Symbol or Name	Steel Number	UNS Number	Product Form/ Heat Treatment	Thickness		Yield Strength, min		Tensile Strength, min		Elongation, min, %	Other
					t, mm	t, in.	N/mm² or MPa	ksi	N/mm² or MPa	ksi		
DIN 17457:1985	X 6 CrNiNb 18 10	1.4550	---	SA & Q	≤ 50	---	205	---	510-740	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 17458:1985	X 6 CrNiNb 18 10	1.4550	---	SA & Q	≤ 50	---	205	---	510-740	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
ISO 2604-II:1975	TS 50	---	---	Q	---	---	205	---	510-710	---	30	---
ISO 2604-V:1978	TW 50	---	---	Q	---	---	205	---	510-710	---	30	---
ASTM A 213/A 213M-03a	TP347H	---	S34709	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	TP347H	---	S34709	ST	---	---	205	30	515	75	35	90 HRB max
ASTM A 312/A 312M-03	TP347H	---	S34709	HF or CF + A	---	---	205	30	515	75	35	---
ASTM A 376/A 376M-02a	TP347H	---	S34709	see standard	---	---	205	30	515	75	35	---
JIS G 3459:1997	SUS347HTP	---	---	CF or HF + ST	---	---	205	---	520	---	35	---
JIS G 3463:1994	SUS347HTB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
JIS G 3467:1988	SUS 347H TF	---	---	CF or HF, ST	---	---	205	---	520	---	35	---
BS 3605-1:1990 Issue 2, 1997	347S51	---	---	ST or HF	---	---	240	---	510-710	---	35	---
DIN 17459:1992	X 8 CrNiNb 16 13	1.4961	---	SHT	≤ 50	---	205	---	510-690	---	35 L; 22 T	65 J at RT, L 45 J at RT, T
AFNOR NF A 49-214:1978	Z 6 CN Nb 18-12 B	---	---	L or F/H + RC	---	---	195	---	490-690	---	40	---
ISO 2604-II:1975	TS 56	---	---	Q	---	---	205	---	510-710	---	30	---
ASTM A 213/A 213M-03a	---	---	S31725	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 249/A 249M-03	---	---	S31725	ST	---	---	205	30	515	75	35	90 HRB
ASTM A 312/A 312M-03	---	---	S31725	SA	---	---	205	30	515	75	---	---
ASTM A 358/A 358-01	---	---	S31725	see standard	---	---	205	30	515	75	---	---
ASTM A 376/A 376M-02a	---	---	S31725	HT	---	---	205	30	515	75	35	---
ASTM A 409/A 409M-01	---	---	S31725	H, HT, HT-O or HT-SO	---	---	205	30	515	75	---	---
DIN 17457:1985	X 2 CrNiMoN 17 13 5	1.4439	---	SA & Q	≤ 50	---	285	---	580-800	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
DIN 17458:1985	X 2 CrNiMoN 17 13 5	1.4439	---	SA & Q	≤ 50	---	285	---	580-800	---	35 L; 30 T	L: 85 J at RT T: 55 J at RT
AFNOR NF A 49-244:1993	X3CrNiMoN18-14-5	---	---	ST or TT	< 3	---	290	---	580-780	---	35	L: 100 J at -196°C T: 80 J at -196°C
					3 ≤ t ≤ 5	---	290	---			40	
					5 < t ≤ 75	---	280	---			40	

Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures

Mechanical Properties of Austenitic Stainless Steel Tubes and Pipes for Pressure Purposes and High Temperatures

Standard Designation	Grade, Class, Type, Symbol or Name	Steel Number	UNS Number	Product Form/ Heat Treatment	Thickness		Yield Strength, min		Tensile Strength, min		Elongation, min, %	Other
					t, mm	t, in.	N/mm^2 or MPa	ksi	N/mm^2 or MPa	ksi		
ASTM A 358/A 358M-01	---	---	N08904	H, HT, HT-O or HT-SO	---	---	220	31	490	71	35	---
ASTM A 249/A 249M-03	---	---	N08904	H + WQ or RC	---	---	215	31	490	71	35	90 HRB max
JIS G 3459:1997	SUS890LTP	---	---	ST	---	---	215	---	490	---	35	---
JIS G 3463:1994	SUS890LTB	---	---	ST	O.D. < 10	---	215	---	490	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---
AFNOR NF A 49-244:1993	X2NiCrMoCu25-20	---	---	ST or TT	< 3	---	230	---	530-730	---	30	L: 90 J at -196°C T: 70 J at -196°C
					3 ≤ t ≤ 5	---	230	---			35	
					5 < t ≤ 75	---	230	---			35	
ASTM A 240/A 240M-03c	800	---	N08800	---	---	---	205	30	520	75	30	---
JIS G 3467:1988	NCF 800 TF	---	---	CF, A	---	---	205	---	520	---	30	---
				HF, A	---	---	175	---	450	---	30	---
DIN 17459:1992	X 5 NiCrAlTi 31 20 RK	1.4958 RK	---	A/R	≤ 50	---	210	---	500-750	---	35 L; 30 T	L: 120 J at RT T: 80 J at RT
	X 5 NiCrAlTi 31 20	1.4958	---	SHT	≤ 50	---	170	---	500-750	---	35 L; 30 T	L: 120 J at RT T: 80 J at RT
AFNOR NF A 49-244:1993	X5NiCr32-21	---	---	ST or TT	< 3	---	200	---	490-690	---	25	---
					3 ≤ t ≤ 5	---	200	---			30	
					5 < t ≤ 75	---	200	---			30	
DIN 17459:1992	X 8 NiCrAlTi 32 21	1.4959	---	SHT	≤ 50	---	170	---	500-750	---	35 L; 30 T	L: 120 J at RT T: 80 J at RT
ASTM A 240/A 240M-03c	800H	---	N08810	---	---	---	170	25	450	65	30	---
JIS G 3467:1988	NCF 800H TF	---	---	S	---	---	175	---	450	---	30	---
ASTM A 249/A 249M-03	---	---	N08367	SA	---	t ≤ 0.187	310	45	690	100	30	100 HRB max
					---	t > 0.187	310	45	655	95	30	100 HRB max
	---	---	N08926	SA	---	---	295	43	650	94	35	100 HRB max
ASTM A 312/A 312M-03	---	---	N08926	HT	---	---	295	43	650	94	35	---
ASTM A 688/A 688M-03	---	---	N08367	SA	---	t ≤ 0.187	310	45	655	95	30	---
					---	t > 0.187	310	45	655	95	30	100 HRB max
	---	---	N08926	SA	---	---	295	43	650	94	35	---
JIS G 3463:1994	SUS836LTB	---	---	ST	O.D. < 10	---	205	---	520	---	27	---
					10 ≤ O.D. < 20	---					30	---
					O.D. ≥ 20	---					35	---