



# CHEMICAL ANALYSIS/PHYSICAL PROPERTIES

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## STAINLESS

SPECIFICATION	APPLICATION	GRADE	UNS DESIGNATION	CHEMICAL REQUIREMENTS (%)								TENSILE REQUIREMENTS	
				C	Si	Mn	P	S	Cr	Ni	Mo	TENSILE STRENGTH MIN.	YIELD STRENGTH MIN.
ASTM A312	HIGH TEMPERATURE & GENERAL CORROSIVE SERVICE	304	S30400	0.08 MAX.	0.75 MAX.	2.00 MAX.	0.04 MAX.	0.03 MAX.	18.0-20.0	8.0-11.0	—	75,000 PSI	30,000 PSI
		304L	S30403	0.035 MAX.	0.75 MAX.	2.00 MAX.	0.04 MAX.	0.03 MAX.	18.0-20.0	8.0-13.0	—	70,000 PSI	25,000 PSI
		316	S31600	0.08 MAX.	0.75 MAX.	2.00 MAX.	0.04 MAX.	0.03 MAX.	16.0-18.0	11.0-14.0*	2.0-3.0	75,000 PSI	30,000 PSI
		316L	S31603	0.035 MAX.	0.75 MAX.	2.00 MAX.	0.04 MAX.	0.03 MAX.	16.0-18.0	10.0-15.0	2.0-3.0	70,000 PSI	25,000 PSI

\*For Welded Type 316 and Type 316H pipe, the nickel range shall be 10.0-14.0%.

<b>SEAMLESS PIPE</b>	ASTM A312/SA312 ASTM A376/SA376	ANSI B36.19, B36.10	<b>BUTT WELD FITTINGS</b>	ASTM A403 MSS SP43	ANSI B16.9, B16.28
<b>WELDED PIPE</b>	ASTM A312/SA312	ANSI B36.19, B36.10	<b>THREADED CAST FITTINGS</b>	ASTM A351	ANSI B16.3, B1.20.1
<b>SEAMLESS TUBING</b>	ASTM A213/SA213 ASTM A269 ASTM A632		<b>FORGED FLANGES</b>	ASTM A182	ANSI B16.5, B120.1
<b>WELDED TUBING</b>	ASTM A269 ASTM A249/SA249 ASTM A632		<b>MSS CAST FLANGES</b>	ASTM A351 MSS SP-51	ANSI B16.5 ANSI B1.20.1
<b>FORGED FITTINGS</b>	ASTM A182 ASTM A479	ANSI B16.11, B1.20.1	<b>CAST VALVES</b>	ASTM A351 API 603	ANSI B16.34, B16.10 ANSI B1.20.1
			<b>FORGED VALVES</b>	ASTM A182 API 602	ANSI B1.20.1 (THRD) ANSI B16.11 (SW)

## CARBON

SPECIFICATION	APPLICATION	GRADE	CHEMICAL REQUIREMENTS (%)										TENSILE REQUIREMENTS	
			C	Si	Mn	P	S	Cr	Ni	Mo	Cu	V	TENSILE STRENGTH MIN.	TENSILE STRENGTH MIN.
ASTM A53	ORDINARY USES	A	0.25 MAX.	—	0.95 MAX.	0.05 MAX.	0.06 MAX.	0.40 MAX.	0.40 MAX.	0.15 MAX.	0.40 MAX.	0.08 MAX.	48,000 PSI (33.7 KG/MM <sup>2</sup> )	30,000 PSI (21.1 KG/MM <sup>2</sup> )
		B	0.30 MAX.	—	1.20 MAX.	0.05 MAX.	0.06 MAX.	0.40 MAX.	0.40 MAX.	0.15 MAX.	0.40 MAX.	0.18 MAX.	60,000 PSI (42.2 KG/MM <sup>2</sup> )	35,000 PSI (24.6 KG/MM <sup>2</sup> )
ASTM A106	HIGH TEMPERATURE SERVICE	A	0.25 MAX.	0.10 MIN.	0.27 MIN. 0.93 MAX.	0.025 MAX.	0.025 MAX.	0.40 MAX.	0.40 MAX.	0.15 MAX.	0.40 MAX.	0.08 MAX.	48,000 PSI (33.7 KG/MM <sup>2</sup> )	30,000 PSI (21.1 KG/MM <sup>2</sup> )
		B	0.30 MAX.	0.10 MIN.	0.29 MIN. 1.06 MAX.	0.025 MAX.	0.025 MAX.	0.40 MAX.	0.40 MAX.	0.15 MAX.	0.40 MAX.	0.08 MAX.	60,000 PSI (42.2 KG/MM <sup>2</sup> )	35,000 PSI (24.6 KG/MM <sup>2</sup> )
		C	0.35 MAX.	0.10 MIN.	0.29 MIN. 1.06 MAX.	0.025 MAX.	0.025 MAX.	0.40 MAX.	0.40 MAX.	0.15 MAX.	0.40 MAX.	0.08 MAX.	70,000 PSI (49.2 KG/MM <sup>2</sup> )	40,000 PSI (28.1 KG/MM <sup>2</sup> )