

## Cross-Reference of ASTM Material Specifications Covering Cast and Forged Valves, Fittings, Flanges and Unions

Material	Forgings	Castings	Wrought Fittings
Carbon Steel Cold Temperature Service	A105 A350-LF2	A216-WCB	A234-WPB A420-WPL6
Carbon-1/2 Moly Alloy Steel High Temperature Service	A182-F1	A217-WC1 A352-LC1	A234-WP1
3-1/2 Nickel Alloy Steel Low Temperature Service	A350-LF3	A352-LC3	A420-WPL3
1/2 Cr-1/2 Mo Alloy Steel 1/2 Cr-1/2 Mo-1 Ni Alloy Steel 3/4 Cr-1 Mo-3/4 Ni Alloy Steel 1 Cr-1/2 Mo Alloy Steel	A182-F2 A182-F12 CL2	A217-WC4 A217-WC5	A234-WP12 CL2
1-1/4 Cr-1/2 Mo Alloy Steel 2-1/4 Cr-1 Mo Alloy Steel 5 Cr-1/2 Mo Alloy Steel 5 Cr-1/2 Mo Alloy Steel 9 Cr-1 Mo Alloy Steel 13 Cr Alloy Steel	A182-F11 CL2 A182-F22 CL3 A182-F5 A182-F5a A182-F9 A182-F6	A217-WC6 A217-WC9 A217-C5 A217-C12 A743-CA15	A234-WP11 CL2 A234-WP22 CL3 A234-WP5 A234-WP9
Type 304 Stainless Steel (18 Cr-8 Ni) Standard Low Carbon High Temperature Service	A182-F304  A182-F304L A182-F304H	A351-CF3 A351-CF8	A403-WP304 A403-WP304L A403-WP304H
Type 310 Stainless Steel (25 Cr-20 Ni) Type 316 Stainless Steel (16 Cr-12 Ni-2 Mo) Standard Low Carbon High Temperature	A182-F310H A182-F316 A182-F316L A182-F316H	A351-CK20 A351-CF3M A351-CF8M	A403-WP310 A403-WP316 A403-WP316L A403-WP316H
Type 317 Stainless Steel (18 Cr-13 Ni-3 Mo) Type 321 Stainless Steel (18 Cr-10 Ni-Ti) Standard High Temperature Service	A182-F321 A182-F321H		A403-WP317 A403-WP321 A403-WP321H
Type 347 Stainless Steel (18 Cr-10 Ni-Cb) Standard High Temperature Service	A182-F347 A182-F321H	A351-CF8C	A403-WP347 A403-WP347H
Type 348 Stainless Steel (18 Cr-10 Ni-Cb) Standard High Temperature Service	A182-F348 A182-F348H		A403-WP348 A403-WP348H

# Forging Materials

Chemistry Element – % Composition		Mechanical Properties		Chemistry Element – % Composition		Mechanical Properties	
<b>ASTM A105 Carbon Steel</b> Where temperatures are moderate and corrosion resistance is not critical.				<b>ASTM A182, Grade 5 – 4-6% Chromium 1/2% Molybdenum</b> With moderately corrosive fluids and in oil refineries where high temperature stability and oxidation resistance of the lower alloy steels are inadequate.			
C 0.20 - 0.24 Mn 1.00 - 1.35 Si 0.15 - 0.30 P .030 Max. S 0.015 - 0.040 Cr 0.20 Ni 0.20 Mo 0.06 V 0.02 Cb 0.02 Cu 0.20 Pb 0.02 Total Residuals = 0.50	TS Min. psi(MPa) YS Min. psi(MPa) EL (2" Min.) RA Min. Hardness, Bhn	70,000(485) 36,000(250) 22% 30% Max. 187	C 0.15 Max. Mn 0.30 - 0.60 P .030 Max. S 0.015 - 0.035 Si 0.50 Max Ni 0.50 Max Cr 4.00 - 6.00 Mo 0.44 - 0.65	TS Min. psi(MPa) YS Min. psi(MPa) EL (2" Min.) RA Min. Hardness, Bhn	70,000(485) 40,000(275) 20% 35% 143-217		
<b>ASTM A350, LF2</b> Where cold temperature (-50°F) impact strength is essential.				<b>ASTM A182, Grade F9 – 9% Chromium</b> For services where the higher chrome alloys are preferred and where high temperature stability and oxidation resistance of the lower alloy steels are inadequate.			
C 0.20 - 0.24 Mn 1.00 - 1.35 Si 0.15 - 0.30 P .030 Max. S 0.015 - 0.040 Cr 0.20 Ni 0.20 Mo 0.06 V 0.02 Cb 0.02 Cu 0.20 Pb 0.02 Total Residuals = 0.50	TS Min. psi(MPa) YS Min. psi(MPa) EL (2" Min.) RA Min. Hardness, Bhn -50°F Charpy Energy (Ft./Lb.) Average of Each Set of 3 Specimen For One Specimen	70,000(485) 36,000(250) 22% 30% Max. 197 Min. Impact (J) 15(20) 12(16)	C 0.15 Max. Mn 0.30 - 0.60 P .030 Max. S 0.030 Max Si 0.50 - 1.00 Cr 8.00 - 10.00 Mo 0.90 - 1.10	TS Min. psi(MPa) YS Min. psi(MPa) EL (2" Min.) RA Min. Hardness, Bhn	85,000(585) 55,000(380) 20% 40% 179-217		
<b>ASTM A182, Grade F11, Class 2 – 1 1/4% Chromium 1/2% Molybdenum</b>				<b>ASTM A182, Grade F316. Grade F316L – 18% Chromium 8% Nickel 2-3% Molybdenum</b>			

To minimize graphitization encountered with carbon and carbon moly steels at high temperatures.			For corrosion resistance applications where high temperature strength is required. Has restricted carbon level to minimize sensitization. Do not use for service temperatures above 1000°F.		
C 0.10 - 0.15 Mn 0.30 - 0.80 P .040 Max. S 0.015 - 0.035 Si 0.50 - 1.00 Cr 1.00 - 1.50 Mo 0.44 - 0.65	TS Min. psi(MPa) YS Min. psi(MPa) EL (2" Min.) RA Min. Hardness, Bhn	70,000(485) 40,000(275) 20% 30% 143-207	C 0.035 Max. Mn 2.00 Max. P .040 Max. S 0.020 - 0.030 Si 1.00 Max Ni 10.00 - 14.00 Cr 16.00 - 18.00 Mo 2.00 - 3.00	TS Min. psi(MPa) YS Min. psi(MPa) EL (2" Min.) RA Min.	75,000(515) 30,000(205) 30% 30%
<b>ASTM A182, Grade F22, Class 3 – 2 1/4% Chromium 1% Molybdenum</b> Where elevated temperature, surface stability, and greater strength than F11 are needed.			<b>ASTM A182, Grade F316H – 18% Chromium 8% Nickel 2-3% Molybdenum</b> For corrosion resistance applications where extreme high temperature service is expected. Has a restricted carbon range for high temperature strength above 1000°F.		
C 0.15 Max. Mn 0.30 - 0.60 P .040 Max. S 0.015 - 0.035 Si 0.50 Max Cr 2.00 - 2.50 Mo 0.87 - 1.13	TS Min. psi(MPa) YS Min. psi(MPa) EL (2" Min.) RA Min. Hardness, Bhn	75,000(515) 40,000(310) 20% 30% 156-207	C 0.04 - 0.10 Mn 2.00 Max. P .040 Max. S 0.020 - 0.030 Si 1.00 Max Ni 10.00 - 14.00 Cr 16.00 - 18.00 Mo 2.00 - 3.00	TS Min. psi(MPa) YS Min. psi(MPa) EL (2" Min.) RA Min.	75,000(515) 30,000(205) 30% 30%