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	
ASTM A105 Carbon Steel Where temperatures are moderate and corrosion resistance is not critical.			**ASTM A182, Grade 5 – 4-6% Chromium 1/2% Molybdenum** 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
ASTM A350, LF2 Where cold temperature (-50°F) impact strength is essential.			**ASTM A182, Grade F9 – 9% Chromium** 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
ASTM A182, Grade F11, Class 2 – 1 1/4% Chromium 1/2% Molybdenum			**ASTM A182, Grade F316. Grade F316L – 18% Chromium 8% Nickel 2-3% Molybdenum**		

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%
ASTM A182, Grade F22, Class 3 – 2 1/4% Chromium 1% Molybdenum Where elevated temperature, surface stability, and greater strength than F11 are needed.			**ASTM A182, Grade F316H – 18% Chromium 8% Nickel 2-3% Molybdenum** 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%

Valve Trim Materials

Description & General Use	Chemistry Element % Composition	Description & General Use	Chemistry Element % Composition
13% Chromium Stainless Steel Type 410 ASTM A479 This stainless steel material lends itself readily to hardening by heat treatment and is excellent for contacting parts such as stems, gates, and discs.	C 0.10- 0.15 Mn .60 Max. P .040 Max. S .030 Max. Si 1.00 Max Cr 12 - 13.5	**Cobalt Base and Nickel Base Hard Facing Materials ASME SFA 5.13** Hard facing materials, when used on seating surfaces of Gate, Globe, and Check Valves, give extended service life and troublefree operation.	– Cobalt, Chromium and Tungsten Alloy – Nickel, Chromium and Boron Alloy
13% Chromium Stainless Steel Type 416 ASTM A582 High quality stainless steel yoke nut material having excellent anti-galling characteristic for better operating threads.	C 0.11- 0.14 Mn .60 Max. P .060 Max. S 0.25 - 0.35 Si 1.00 Max Cr 12.00 - 14.00 Ni .60 Max.	**Nickel-Moly-Chromium ASTM B574, Grade N 10276 Hastelloy C-276** A high nickel alloy with exceptional resistance to corrosive attack by chlorine gas.	C .02 Max. Fe 4.00 - 7.00 Ni Balance Si 0.08 Max Co 2.5 Max. Mn 1.00 Max. Cr 14.50 - 16.50 V .35 Max. Mo 15.00 - 17.00 P .04 Max. W 3.00 - 4.50 S .03 Max.
18% Chromium 8% Nickel, 2% Molybdenum Stainless Steel Type 316 Type 316L ASTM A182 Provides excellent resistance to corrosive media at high temperatures and toughness for service at low temperatures.	C .035 Max. Mn 2.00 Max. P .040 Max. S 0.020 - .030 Si 1.00 Max Cr 16.00 - 18.00 Ni 10.00 - 14.00 Mo 2.00 - 3.00	**Precipitation Hardened Stainless Steel A564, Gr. 630 17-4 PH** Provides corrosion resistance and high strength for stems in NACE applications.	C 0.07 Max Cr 15.00 - 17.50 Mn 1.00 Max. Ni 3.00 - 5.00 P .04 Max. Cu 3.00 - 5.00 S .03 Max. Cb 0.15 - 0.45 Si 1.00 Max +Ta
Nickel-Copper Monel Alloy K500 FED-SPEC QQ-N-286F Class A This wrought material is precipitation hardened and possesses excellent corrosion resistance, high strength properties and hardness for internal valve components.	C .25 Max. Mn 1.50 Max. S 0.010 Max. Ni 63.00 - 70.00 Si .50 Max Fe 2.00 Max Al 2.3 - 3.15 Ti .35 - .85 Cu 27.0 - 33.0 P 0.020 Zn 0.020	**S-Monel ASTM A-494, Grade M-25S** Material used for Monel castings.	C .25 Max. Ni .03 Mn 1.50 Fe Balance Si 3.5 - 4.5 Cu 3.5 P .03 27.00 - 33.00

	Pb Sn	0.006 0.006					
Monel **Alloy 400** **ASTM B164 (N0400)** Non hardened alloy, except by work hardened, that has high strength and toughness over a wide temperature range. Has excellent corrosion resistance in chlorine and alkylation service.	C Mn S Si Ni Fe Cu	.030 Max. 2.00 Max. .024 Max. 0.50 Max 63.00 - 70.00 2.50 Max 27.0 - 33.0	**ASTM A-743, Grade CA-15** Material used for 13 CR castings, the cast equivalent to type 410 Stainless Steel.	C Mn Si P	.15 Max. 1.00 1.50 Max. .040	S Cr Ni Mo	.040 Max. 11.50 - 14.00 1.0 Max. .50 Max.
			Cast Cobalt **ASME-SFA–5.13** **RCoCr-A** Material used for Cobalt castings, the cast equivalent to Stellite #6.	C Mn Si Ni Cr	0.9-1.4 1.0 1.5 3.0 27.0 - 31.0	Mo W Fe Others Co	1.0 3.5 - 5.5 3.0 .50 Balance
			ASTM A351 **Grade CF8M** Material used for 18-8 castings, the cast equivalent to type 316 stainless steel.	C Mn P S Si	08 Max 1.50 Max .040 Max .040 Max 1.50 Max	Cr Ni Mo	18.0-21.0 9.0-12.0 2.0-3.0