

Properties of Valve Materials

ALLOY	ASTM NO.	OTHER ALLOY DESIGNATION	NOMINAL OR MAXIMUM CHEMICAL COMPOSITION								
			AL	CARBON C	CHROME Cr	COBALT Co	COPPER Cu	IRON Fe	LEAD Pb	MANGANESE Mn	MOLYBDENESE Mo
Commercial Aluminum 380	SC 84 A (Modified)	UNS A38000	87.0				1.0	1.3		0.35	
Free Cutting Brass	B 16	UNS C36000					61.5		3.0		
Navy "M" (Steam Bronze)	B 61	UNS C92200	0.005				88.0	0.25	1.5		
Composition Bronze (Ounce Metal)	B 62	UNS C83600	0.005				85.0	0.30	5.0		
Copper-Silicon Alloy B	B 98/B 99	UNS C65100					96.0	0.8	0.05	0.7	
Forging Brass	B 124	UNS C37700					60.0	0.3	2.0		
Brass Wire (Red Brass)	B 134	UNS C23000					85.0	0.05	0.05		
Leaded Red Brass	B 140	UNS C31400					89.0	0.10	1.9		
Aluminum Bronze (Cast)	B 148	UNS C95400	11.0				85.0	4.0			
Aluminum Bronze (Rod)	B 150	UNS C64200	7.0				91.0	0.30	0.05	0.10	
Silicon Red Brass	B 371	UNS C69400					81.5	0.20	0.30		
Leaded Semi-Red Brass	B 584	UNS C84400	0.005				81.0	0.40	7.0		
Leaded Red Brass		UNS C84500	0.005				78.0	0.40	7.0		
Leaded Nickel Bronze	B 584	UNS C97600					64.0		4.0		

Bronze & Brass

Copper	Copper (Wrought)	B 75	UNS C12200						99.9				
	Gray Iron	A 126	Class B										
Iron	3% Ni Grey Iron	A 126 Modified	Class B										
	Austenitic Grey Iron (Ni Resist)	A 436	Type 2		3.00	2.0			0.5			1.0	
	Ductile Iron (Ferritic)	A 395			3.20								
	Austenitic Ductile Iron (Ductile) (ni-Resist)	A 536 A 439 D2C			2.9	0.5						2.4	1.0

Properties of Valve Materials (2)

ALLOY	NOMINAL OR MAXIMUM CHEMICAL COMPOSITION									NOMINAL PHYSICAL PROPERTIES			
	NICKEL Ni	PHOS P	SILICON Si	SULFUR S	TIN Sn	TITANIUM Ti	TUNG-STEM W	ZINC Zn	TENSILE STRENGTH Psi	YIELD STRENGTH Psi	% ELONGATION	HARDNESS	
Commercial Aluminum 380	0.50		12.0		0.15			0.50	42,000	19,000	3.5		
Free Cutting Brass								35.5	50,000	20,000	15	75 HRB	
Navy "M" (Steam Bronze)	1.0	0.05	0.005	0.05	6.0			4.5	34,000	16,000	22	65 HB *500 kg	
Composition Bronze (Ounce Metal)	1.0	0.05	0.005	0.08	5.0			5.0	30,000	14,000	20	60 HB 500 kg	
Copper-Silicon Alloy B			1.6					1.5	86,000**	20,000	11	65 HRB	
Forging Brass								38.0	52,000	20,000	45	80 HRB	
Brass Wire (Red)								15.0	56,000			60 HRB	

	Brass)												
	Leaded Red Brass	0.7						9.1	50,000	30,000	7	60 HRB	
	Aluminum Bronze (Cast)								75,000	30,000	12	170 HB *3000 kg	
	Aluminum Bronze (Rod)	0.25		2.0		0.20		0.5	90,000	45,000	9	80 HRB	
	Silicon Red Brass			4.0				14.5	80,000	40,000	15	85 HRB	
	Leaded Semi-Red Brass		0.02	0.005	0.08	3.0		9.0	29,000	13,000	18	55 HB *500 kg	
	Leaded Red Brass	1.0	0.02	0.005	0.08	3.0		12.0	29,000	13,000	16	55 HB *500 kg	
	Leaded Nickel Bronze	20.0				4.0		8.0	40,000	17,000	10	80 HB	
Copper	Copper (Wrought)		0.02						36,000	30,000	25	45 T	
Iron	Gray Iron		0.75		1.5				31,000			195 HB	
	3% Ni Grey Iron	3.00	0.75		0.15				31,000			195 HB	
	Austenitic Grey Iron (Ni Resist)	20.0		2.0	0.12				25,000			118 HB	
	Ductile Iron (Ferritic)		0.08	2.50					80,000	55,000	6	160 HB	
	Austenitic Ductile Iron (Ductile) (ni-Resist)	24.0	0.08	3.0					58,000	28,000	20	146 HB	

*Load Applied During Testing

**Allowable Range is 75,000 to 95,000

Properties of Valve Materials (3)

ALLOY	ASTM NO.	OTHER ALLOY DESIGNATION	NOMINAL OR MAXIMUM CHEMICAL COMPOSITION										
			AL	CARBON C	CHROME Cr	COBALT Co	COPPER Cu	IRON Fe	LEAD Pb	MANGANESE Mn	MOLYB-NESE Mo		
Stainless Steel	Wrot 304	A 167 304	UNS S30400		0.08	19						2	
	Cast 316	A 351 CF8M	UNS S31600		0.08	20						1.5	2.5
	Cast 316	A 743 CF16F			0.16	20						1.5	1.5
	Cast 316	A 743 CF8M			0.08	20						1.5	2.5
	Wrot 316	A 276 316	UNS S31600		0.08	17						2	
	Cast 410	A 217 CA 15			0.15	13						1	2.5
	Forged 410	A 182 F6A2			0.15	13						1	
Wrot 410	A 276 410	UNS S41000		0.15	13						1		
Wrot 416	A 582	UNS S41600		0.15	13						1.25		
Wrot 420	A 276 420	UNS S42000		0.15	13						1		
Cast Alloy 20	A 743 CN7M			0.07	20			3.5			1.5	2.5	
Wrot Alloy 20	B 473 20C63	UNS N08020		0.07	20			3.5			2	2.5	
Wrot 17-4PH	A 564 630	UNS S17400		0.07	16			3.5			1		
Trim Steels	Forged Carbon Steel	A 105			0.35							1	
	Cast Carbon Steel	A 216 WCB			0.3							1.1	
	Cast Cr. Moly Steel	A 217 WC6			0.2	1.2						0.7	0.55
	Cast Cr. Moly Steel	A 217 C5			0.2	5						0.55	0.55
	Cast Low Carbon Steel	A 352 LCB			0.3							1.0	
	Nickel-Low Carbon Steel	A 352 LC2			0.25							0.65	
	B-7 Alloy Steel Studs	A 193 B7			0.4	1						0.85	0.2
	304 SS Nuts	A 194 GR8			0.08	19						2	
	2-H Alloy Steel Nuts	A 194 2H			0.4								
	Reg. Steel Bolting	A 307 Gr. B			0.2							0.45	
Steel Bolting	A 449	UNS S30400		0.4							0.6		
304SS Bolting	A 493 304			0.08	19						2		
Eyebolts	A 489			0.48							1.0		
Gland Nuts	A 563 Gr. A			0.37	0.55			0.35			1.0		
H/W Nuts	A 108 1020	UNS G10200		0.20							0.45		
Swing Bolt Pin	A 108 1212	UNS G12120		0.13							0.85		
Yoke Bushing Caps	A108 12L14			0.15							.25	1.0	
Seat Ring Base	A 519 1026			0.25							0.75		
F.	(Trademark Materials		AWS 5.13		1.25	29	55			2.5			

like, Stellite 6*, Stoddy 6, and Wallex 6)												
Cast Monel		QQ-N-288-E	0.5	0.3				30	3.5		1.5	
Wrot Monel (K-500)		QQ-N-286-C1B	3.0	0.1				24	2.0		1.5	

Properties of Valve Materials (4)

ALLOY		NOMINAL OR MAXIMUM CHEMICAL COMPOSITION							NOMINAL PHYSICAL PROPERTIES				
		NICKEL Ni	PHOS P	SILICON Si	SULFUR S	TIN Sn	TITAN- IUM Ti	TUNG- STEM W	ZINC Zn	TENSILE STRENGTH Psi	YIELD STRENGTH Psi	% ELONGATION	HARDNESS
Stainless Steel	Wrot 304	9	0.045	1.0	0.03					75,000	30,000	40	202 HB
	Cast 316	11	0.04	2.0	0.04					70,000	30,000	25	
	Cast 316	11	0.04	2.0	0.04					70,000	30,000	30	
	Cast 316	12	0.045	1.0	0.03					75,000	30,000	30	
	Wrot 316	12	0.045	1.0	0.03					75,000	30,000	30	
	Cast 410	1	0.04	1.5	0.04					90,000	65,000	18	
	Forged 410		0.04	1.0	0.03					85,000	55,000	18	200/225 HB
	Wrot 410	0.5	0.04	1.0	0.03					100,000	80,000	15	
Wrot 416		0.06	1.0	0.15					114,000	95,000	17	235 HB	
Wrot 420		0.04	1.0	0.03								250/450 HB	
Cast Alloy 20	28	0.04	1.5	0.04					62,000	25,000	35		
Wrot Alloy 20	35	0.045	1.0	0.035					85,000	35,000	30		
Wrot 17-4PH	4	0.04	1.0	0.03					115,000	75,000	18	255 HB	
Trim Steels	Forged Carbon Steel		0.04	0.035	0.05					70,000	36,000	22	187 HB
	Cast Carbon Steel		0.04	0.6	0.045					70,000	36,000	22	
	Cast Cr. Moly Steel		0.04	0.06	0.045								
	Cast Cr. Moly Steel		0.04	0.75	0.045								
	Cast Low Carbon Steel		0.04	0.6	0.045					65,000	35,000	24	
	Nickel-Low Carbon Steel	2.5	0.04	0.6	0.045					70,000	40,000	24	
	B-7 Alloy Steel Studs		0.035	0.25	0.04					125,000	105,000	16	
	304 SS Nuts	9	0.045	1.0	0.03								126/300 HB
2-H Alloy Steel Nuts		0.04		0.05								250/300 HB	
Reg. Steel Bolting		0.04		0.05					100,000		18	121/212 HB	

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	Steel Bolting		0.04		0.05				120,000	92,000	14	
	304SS Bolting	9	0.045	1.0	0.03				90,000			
	Eyebolts		0.04	0.25	0.05				75,000	30,000	30	
	Gland Nuts	0.35	0.04	0.2	0.05							
	H/W Nuts		0.04		0.05							120/300 HB
	Swing Bolt Pin		0.10		0.20							
	Yoke Bushing Caps		0.07		0.3							
	Seat Ring Base		0.04		0.05				55,000	35,000	25	
Monel H.F.	(Trademark Materials like, Stellite 6*, Stody 6, and Wallex 6)	3						5	105,000		10	350 HB
	Cast Monel	60	1.5						65,000	32,500	25	125/150 HB
	Wrot Monel (K-500)	67	0.5	0.01	0.5				135,000	95,000	20	255 HB