

Table A-3-2 Typical Material Properties: Al Alloys

Typical values based on "as-cast" characteristics for separately die cast specimens, not specimens cut from production die castings.

Aluminum Die Casting Alloys											
Commercial: ANSI/AA	360 360.0	A360 A360.0	380 380.0	A380 (E)(F) A380.0	383 (E) 383.0	384 384.0	390* B390.0	13 413.0	A13 A413.0	43 C443.0	218 518.0
Mechanical Properties											
Ultimate Tensile Strength											
ksi	44	46	46	47	45	48	46	43	42	33	45
(MPa)	(303)	(317)	(317)	(324)	(310)	(330)	(317)	(300)	(290)	(228)	(310)
Yield Strength (A)											
ksi	25	24	23	23	22	24	36	21	19	14	28
(MPa)	(170)	(170)	(160)	(160)	(150)	(165)	(250)	(140)	(130)	(97)	(193)
Elongation											
% in 2in. (51mm)	2.5	3.5	3.5	3.5	3.5	2.5	<1	2.5	3.5	9.0	5.0
Hardness (B)											
BHN	75	75	80	80	75	85	120	80	80	65	80
Shear Strength											
ksi	28	26	28	27	—	29	—	25	25	19	29
(MPa)	(190)	(180)	(190)	(190)	—	(200)	—	(170)	(170)	(130)	(200)
Impact Strength											
ft-lb (J)	—	—	3 (4)	—	3 (D) (4)	—	—	—	—	—	7 (9)
Fatigue Strength (C)											
ksi	20	18	20	20	21	20	20	19	19	17	20
(MPa)	(140)	(120)	(140)	(140)	(145)	(140)	(140)	(130)	(130)	(120)	(140)
Young's Modulus											
psi x 10 ⁶ (GPa)	10.3 (71)	10.3 (71)	10.3 (71)	10.3 (71)	10.3 (71)	—	11.8 (81.3)	10.3 (71)	—	10.3 (71)	—
Physical Properties											
Density											
lb/in ³ (g/cm ³)	0.095 (2.63)	0.095 (2.63)	0.099 (2.74)	0.098 (2.71)	0.099 (2.74)	0.102 (2.82)	0.098 (2.71)	0.096 (2.66)	0.096 (2.66)	0.097 (2.69)	0.093 (2.57)
Melting Range											
°F (°C)	1035-1105 (557-596)	1035-1105 (557-596)	1000-1100 (540-595)	1000-1100 (540-595)	960-1080 (516-582)	960-1080 (516-582)	950-1200 (510-650)	1065-1080 (574-582)	1065-1080 (574-582)	1065-1170 (574-632)	995-1150 (535-621)
Specific Heat											
BTU/lb °F (J/kg °C)	0.230 (963)	0.230 (963)	0.230 (963)	0.230 (963)	0.230 (963)	—	—	0.230 (963)	0.230 (963)	0.230 (963)	—
Coefficient of Thermal Expansion											
μ in/in°F (μ m/m°K)	11.6 (21.0)	11.6 (21.0)	12.2 (22.0)	12.1 (21.8)	11.7 (21.1)	11.6 (21.0)	10.0 (18.0)	11.3 (20.4)	11.9 (21.6)	12.2 (22.0)	13.4 (24.1)
Thermal Conductivity											
BTU/ft hr°F (W/m °K)	65.3 (113)	65.3 (113)	55.6 (96.2)	55.6 (96.2)	55.6 (96.2)	55.6 (96.2)	77.4 (134)	70.1 (121)	70.1 (121)	82.2 (142)	55.6 (96.2)
Electrical Conductivity											
% IACS	30	29	27	23	23	22	27	31	31	37	24
Poisson's Ratio											
	0.33	0.33	0.33	0.33	0.33	—	—	—	—	0.33	—

(A) 0.2% offset. (B) 500 kg load, 10mm ball. (C) Rotary Bend 5 x 10⁸ cycles. (D) Notched Charpy. Sources: ASTM B85-92a; ASM; SAE; Wabash Alloys. (E) A 0.3% Mg version of A380 and 383 have been registered with the Aluminum Association as E380 and B383. (F) Higher levels of Mg and the addition of Sr to alloy A380 have shown positive results. The limited data on page 3-7 shows the effect.

*Two other aluminum alloys, 361 & 369, are being utilized in limited applications where vibration and wear are of concern. There are also other heat treatable specialty alloys available for structural applications, such as the Silafonts and AA365, and high ductility, high strength alloys such as Mercalloy and K-Alloy. Contact your alloy producer for more information. More information can also be obtained from *Microstructures and Properties of Aluminum Die Casting Alloys Book*, NADCA Publication #215 and the *High Integrity Aluminum Die Casting Book*, NADCA Publication #307.