

Aluminium characteristic comparison and other materials

Material and temper	Tensile strength N/mm ²	Proof stress N/mm ²	Elongation %	Young's index N/mm ²	Shearing force N/mm ²	Gravity	Melting point °C	Electical conductivity % IACS	Heat conduction C.G.S.	Thermal expansion coefficient 10 ⁻⁶ /°C	Brinell hardness	Source
Aluminium												
1100-H (2S)	168	154	5	70,000	91	2.71	643~657	57	0.53	23.6	44	②
2024-T4 (24S)	470	325	19		285	2.77	502~638	30	0.29	22.8	120	②
5052-H (52S)	295	260	7	75,000	168	2.68	593~649	35	0.33	23.8	77	②
6063-T6 (63S)	240	215	12	70,000	150	2.70	616~651	53	0.48	23.4	73	②
Copper												
CuT1-H (Copper pipe)	387	352	8	120,000	204	8.89	1065~1083	101	0.934	16.8		②③
BsT1-H (7:3Brass pipe)	548	500	8	112,000	309	8.53	915~955	28	0.29	19.9		②③
PBB2-1/2H (8%Phosphorus bronze wire rod)	562	457	33	112,000	351	8.80	880~1027	13	0.15	18.2		②③
BC3 (Gunmetal)	280~350	140~180	20~35	105,000		8.7	854~1000	10.5~11.5		10	60~75	②
5% A1 Bronze hard	703	443	8		393	8.17	1050~1060	17.5	0.198			②③
Monel metal hardness	560~770	280~630	20~45	183,000	458	8.84	1300~1350	3.58	0.062	14.0	140~220	②
Zinc												
ZDC1 (Zn Diecast metal)	335		7.0		267	6.7	380~386	27	0.26	27.4	91	②③
Magnesium												
MC1-F (AZ63-F)	204	98	6	45,000	127	1.84	455~610	15.0	0.18	14.5	50	②③
MC1-T6 (AZ63-T6)	281	134	5	45,000	148	1.84	455~610	12.3	0.18	14.5	73	②③
MP1-1/2H (Sheet)	274	190	18	45,000	162	1.77	605~632	18.5	0.23	26.0	73	②③
Lead												
1% Antimonial Lead	21		50	14,000		11.27	312~320	7.88	0.080	28.8	7	②③
Tin												
WJ1 (White metal)			14.0	55,000		7.38	235~370			21.0	24	③
Steel												
SS34 (Steel for structure purpose)	340~410		25									③
SS41 (Same)	410~500	230	20									③
SS50 (Same)	500~600	280	18									③
Low-manganese copper	390	210		200,000		7.98	1310~1360	2.4	0.028	15~18	229~285	③⑤
SUS405 (Stainless 13Cr-low C)	630~1,370	420~1,060	15~30			7.70	1500	3.0	0.060	10.4	410	③
SUS304 (Stainless 18Cr-8Ni)	980~1,760	770~990	5~25	166,900		7.93	1400~1450	2.3	0.039	17.3	150~160	③
SUS316 (Stainless 18Cr-12Ni-Mo)	910~1,440		6~21	166,900		7.98	1370~1400	2.3	0.037	16.0	170	③
FC20 (Gray cast iron)	170~240			75,000~130,000		6.95~7.35	1145~1275	0.8~2.3	0.110~0.137	10	217~255	④⑤
FCD40 (Ductile Cast Iron)	400~700	320~630	0~25	154,000		7.1	1120~1180	3	0.08	10	140~300	④⑤
FCMB32 (Ferrum Casting Malleable Black(FCMB))	280~400	200~280	5~20	176,000		7.15~7.60	約1130	5~7	0.138~0.151	10~13	115~150	④⑤
SC37 (Carbon Steel Castings)	370	180	26									④
SCS13(18-8Stainless cast steel)	450	300									123~183	④
S15C (Mild steel)	380~480	220~300	24~36	211,500		7.86	1470~1490	11~12	0.125	11.7	100~130	③④⑤
S35C (Semi-hard steel)	500~600	300~400	17~30	211,000		7.84	1420~1450	9	0.108	11.2	140~170	③④⑤
S45C (Hard steel)	580~700	340~460	14~26	209,000		7.84	1390~1420	9	0.106	11.2	160~200	③④⑤
Plastics												
Asetan resin (Delrin)	70		15~75	2,870	66.9	1.425	※ 100		0.0006	81		⑤⑥
Polyethylene (High density)	12~32		20~100	560~1,050	18.8	0.92~0.96	※ 42		0.0011~0.0013	100~180		⑤⑥
Polyvinyl chloride PVC (Solid)	35~63		2~40	2,150~4,200		1.35~1.45	※ 60~80		0.0003~0.0007	50~185		⑤⑥
Melamine resin (Cellulose filling)	49~91		0.4~0.6	8,400~9,800		1.47~1.52	※ 205		0.0007~0.001	40		⑤⑥
Phenol resin (Bakelite)	49~56		1.0~1.5	5,300~7,000		1.25~1.30	※ 115~125		0.0003~0.0006	25~60		⑤⑥
Wood												
Japanese red pine	126.7			10,000	5.9	0.49	※※ 263		0.0003		1.0~4.0	⑤⑦
Japanese cedar	87.5			6,500	4.8	0.38	※※ 240		0.0002		0.7~3.1	⑤⑦
Beech	155.5			10,000	7.8	0.67	※※ 271		0.0003		1.8~5.4	⑤⑦
Glass												
Glass	35~85			72,000		2.5	440~1510		0.002~0.003	9		⑦⑧
Concrete												
Concrete	12~19			20,000		2.3				70~130		⑨

※ Softening heat ※※ Ignition point

<Source> ① Showa aluminium ② Metals Handbook ③ Metal manual ④ Basic engineering handbook ⑤ Steel handbook ⑥ Plastics handbook ⑦ Present building materials ⑧ Nitrogen engineering handbook ⑨ Inorganic and organic industry materials manual

Basic unit conversion table

(1) Length

1 in = 25.40mm = 2.540cm
 1 ft (feet) = 12in = 30.48cm = 0.3048m
 1 yd (yard) = 3ft = 36in = 0.9144m
 1 mile = 1.6093km
 1 海里 (nautical mile:kairi) = 1.852km
 1 間(ken) = 6尺(Japanese foot:shaku) = 60寸(sun) 1寸(sun) = 3.030cm

(2) Square

1 in² (square inch) = 6.4516cm² (square cm)
 1 mile² (square mile) = 2.5900km² (square km)
 1 ha (hectar) = 100a (are), 1a = 100m² (square meter)
 1 square arce = 4,046.9m²
 1 町步(cho) = 10反(tan) = 3000坪(tsubo), 1坪(tsubo) = 3.306m²

(3) Volume

1 ℓ (liter) = 1000cm³ (cube centimeter) = 0.001m³ (cube meter)
 1 m³ = 1000 ℓ = 1k ℓ (kilo liter)
 1 gallon = 3.7854 ℓ = 0.8327gal
 1 barrel = 158.94 ℓ = 42(America)gal
 1 斗(to) = 10升(sho) = 100合(go), 1升(sho) = 1.804 ℓ

(4) Weight

1 lb (pound) = 453.592g (gram) = 0.453592kg (kilogram) = 16oz (ounce)
 1 oz = 28.3495g
 1 kg = 2.20462 lb = 35.2739oz
 1 carat = 0.2g, 1 ton (America) = 0.907178t, 1 ton (England) = 1.01604t
 1 貫(kan) = 3.75kg

(5) Force, Stress

1 N (Newton) = 0.10197kgf, 1kgf = 9.80665N
 1 kgf/cm² = 14.223psi (1bf/in²) = 0.098066Mpa (Megapascal)
 1 psi = 0.070307kgf/cm², 1ksi = 1000psi = 0.70307kgf/mm²
 1 Mpa = 10.197kgf/cm² = 145.04psi = 10bar

(6) Calorific value, Heat conduction

10³Btu = 0.293kwh = 252Kcal, 1kwh = 860Kcal = 3412.7Btu
 1HP (Japanese Horse Power) = 0.746kw, 1kw = 1.3405HP
 1Btu/ft²·h·°F = 0.004136cal/cm²·Sec·°C = 1.4881Kcal/m²·h·°C

Vickers/Brinell/Rockwell conversion table

70/30 for brass using purpose

ASTM-E 140-88

Vickers	Brinell		Rockwell B		Vickers	Brinell		Rockwell B	
	500·10" steel ball	100kg·1/16" steel ball	100kg·1/16" steel ball			500·10" steel ball	100kg·1/16" steel ball		
196	169		93.5		116	103		65.0	
194	167		—		114	101		64.0	
192	166		93.0		112	99		63.0	
190	164		92.5		110	97		62.0	
188	162		92.0		108	95		61.0	
186	161		91.5		106	94		59.5	
184	159		91.0		104	92		58.0	
182	157		90.5		102	90		57.0	
180	156		90.0		100	88		56.0	
178	154		89.0		98	86		54.0	
176	152		88.5		96	85		53.0	
174	150		88.0		94	83		51.0	
172	149		87.5		92	82		49.5	
170	147		87.0		90	80		47.5	
168	146		86.0		88	79		46.0	
166	144		85.5		86	77		44.0	
164	142		85.0		84	76		42.0	
162	141		84.0		82	74		40.0	
160	139		83.5		80	72		37.5	
158	138		83.0		78	70		35.0	
156	136		82.0		76	68		32.5	
154	135		81.5		74	66		30.0	
152	133		80.5		72	64		27.5	
150	131		80.0		70	63		24.5	
148	129		79.0		68	62		21.5	
146	128		78.0		66	61		18.5	
144	126		77.5		64	59		15.5	
142	124		77.0		62	57		12.5	
140	122		76.0		60	55		10.0	
138	121		75.0		58	53			
136	120		74.5		56	52			
134	118		73.5		54	50			
132	116		73.0		52	48			
130	114		72.0		50	47			
128	113		71.0		49	46			
126	112		70.0		48	45			
124	110		69.0		47	44			
122	108		68.0		46	43			
120	106		67.0		45	42			
118	105		66.0						