



Physical Properties of Various Metals

Metals and Alloys	Stress in Thousands of Pounds per Square Inch				Modulus of Elasticity 1,000,000 Lbs.	Elongation %
	Tension Ultimate	Tension Yield Point	Compression Ultimate	Shear Ultimate		
ALUMINUM, TYPE 3003-0, ANNEALED	16	6	.....	11	10	40
ALUMINUM, TYPE 3003-H18, HARD	29	27	.....	16	10	10
ALUMINUM, TYPE 5052-0, ANNEALED	28	13	.....	18	10.2	30
ALUMINUM, TYPE 5052-H38, HARD	42	37	.....	24	10.2	8
ALUMINUM, TYPE 5056-0, ANNEALED	42	22	.....	26	10.3	35
ALUMINUM, TYPE 2014-0, ANNEALED	27	14	.....	18	10.6	18
ALUMINUM, TYPE 2014-T4, HEAT TREATED	62	42	.....	38	10.6	20
ALUMINUM, TYPE C4A, CASTING, SOLUTION HEAT TREAT	32	16	16▲	24	.....	8.5
ALUMINUM, TYPE S5C, AS DIE CAST	30	16	16▲	19	.....	9
BRASS, ALUMINUM, ANNEALED	60	27	.....	.....	16	55
BRASS, RED, 15% ZN, ANNEALED	39	10	.....	31	17	48
BRASS, RED, 15% ZN, HARD	70	57	.....	42	17	5
BRASS, RED, LEADED, CAST, GRADE 4A	33-46	17-24	10-12▲	.....	9.1-14.8	20-35
BRASS, RED, LEADED, CAST, GRADE 4B	30-38	12-17	11-12▲	.....	.....	15-27
BRASS, YELLOW, 35% ZN, ANNEALED	46	14	.....	32	15	65
BRASS, YELLOW, 35% ZN, HARD	74	60	.....	43	15	8
BRONZE, ALUMINUM, AS CAST	67-95	27-45	.....	.....	15-18	5-35
BRONZE, COMMERCIAL, 10% ZN, ANNEALED	37†	10†	.....	28†	17	45†
BRONZE, MANGANESE, ANNEALED	65†	30†	.....	42†	15	33†
BRONZE, PHOSPHOR, ANNEALED	40-66	14-24	.....	.....	16-17	48-70
BRONZE, TIN, HIGH LEADED, CAST	23-38	11-22	12-16▲	.....	8.5-13	7-20
BRONZE, TIN, LEADED, CAST	33-48	16-26	9-15▲	.....	10.6-16	15-40
COPPER, BERYLLIUM, ANNEALED	60-80†	25-35†	.....	50-60†	19	35-50†
INCONEL, CAST	65-90	.....	.....	.....	23	10-20
INCONEL, S, CAST	90-120	80-100	.....	.....	25	1-3
IRON, CAST, CLASS 30	30-34	.....	115	44	15	.....
IRON, CAST, CLASS 35	35-40	.....	125	43	16	.....
IRON, MALLEABLE, CLASS 32510	50	33	90	46	25	10-18
IRON, MALLEABLE, CLASS 35018	55	37	90	51	25	18-25
IRON, NODULAR (DUCTILE) CLASS 60-45-10	60	45	120	.....	22-25	10-25
IRON, NODULAR (DUCTILE) CLASS 80-60-3	80	60	160	.....	22-25	3-10
IRON, PEARLITIC, MALLEABLE	60-90	40-70	.....	.....	28	3-12
IRON, WROUGHT, HOT ROLLED	34-47	23-24	.....	.....	29	7-35
LEAD, HARD, ROLLED	4.0-4.6	.....	.....	.....	.....	31-48
MONEL, CAST	65-90	32-45	.....	.....	23	20-50
MONEL, S, CAST	120-145	80-130	.....	.....	24.2	1-4
MONEL, SHAPES, PLATE, ETC., ANNEALED	70-85†	25-45†	.....	.....	26	35-50†
NICKEL, CAST	50-65	15-30	.....	.....	21.5	15-30
NICKEL, SILVER, ANNEALED	49-63†	18-30†	.....	.....	17-18	35-60†
STEEL, CAST CARBON, CLASS 70,000 NORMALIZED	70	38	.....	.....	30	28
STEEL, CAST LOW ALLOY, CLASS 100,000, NORMALIZE & TEMPERED	100	68	.....	.....	29-30	20
STEEL, CAST LOW ALLOY, CLASS 120,000, QUENCHED AND TEMPERED	120	95	.....	.....	29-30	16
STEEL, CAST LOW ALLOY, CLASS 200,000, QUENCHED AND TEMPERED	200	170	.....	.....	29-30	5
STEEL, SHEETS	48	25	.....	.....	29-30	18-27
STEEL, STAINLESS, AUSTENITIC, TYPES 304, 316	85	35	.....	.....	28	55-60
STEEL, STAINLESS, MARTENSITIC, TYPE 416	75	40	.....	.....	29	30
STEEL, STRUCTURAL, BRIDGE AND BUILDING, ASTM A7	60-72	33	33▲	45-54	29-30	21
STEEL, STRUCTURAL, HIGH STRENGTH, LOW ALLOY, ASTM A242	63-72	42-50	42-50▲	47-53	29-30	18-24
ZINC, DIE CAST ALLOY, XXIII	41	.....	60▲	31	.....	10

† When hardened, strength values are higher, elongation less.

▲ Compression yield point.