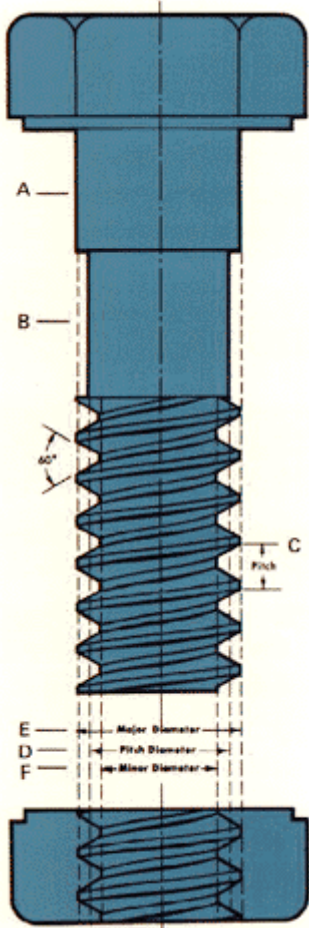


Thread Terminology

	<p>A. FULL DIAMETER SHANK: Equal to major diameter of thread. Produced by cut thread or by roll thread on extruded blank. Characteristic of machine bolts and cap screws.</p>	<p>ROLLED THREAD: Threads are cold formed by squeezing the blank between reciprocating serrated dies. This acts to increase the major diameter of the thread over and above the diameter of unthreaded shank (if any), unless an extruded blank is used.</p>
	<p>B. UNDERSIZED SHANK: Equal approximately to pitch diameter of thread. Produced by roll threading a non-extruded blank. Characteristic of machine screws.</p>	<p>Classes of thread are distinguished from each other by the amounts of tolerance and allowance specified. External threads or bolts are designated with the suffix "A"; internal or nut threads with "B".</p>
	<p>C. PITCH: The distance from a point on the screw thread to a corresponding point on the next thread measured parallel to the axis.</p>	<p>CLASSES 1A and 1B: For work of rough commercial quality where loose fit for spin-on-assembly is desirable.</p>
	<p>D. PITCH DIAMETER: The simple, effective diameter of screw thread. Approximately half way between the major and minor diameters.</p>	<p>CLASSES 2A and 2B: The recognized standard for normal production of the great bulk of commercial bolts, nuts and screws.</p>
	<p>E. MAJOR DIAMETER: The largest diameter of a screw thread.</p>	<p>CLASSES 3A and 3B: Used where a closed fit between mating parts for high quality work is required.</p>
	<p>F. MINOR DIAMETER: The smallest diameter of a screw thread.</p>	<p>CLASS 4: A theoretical rather than practical class, now obsolete.</p>
	<p>LEAD: The distance a screw thread advances axially in one turn.</p>	<p>CLASS 5: For a wrench fit.</p>



CUT THREAD: Threads are cut or chased; the unthreaded portion of shank will be equal to major diameter of thread.

Used principally for studs and their mating tapped holes. A force fit requiring the application of high torque for semi-permanent assembly.

Table I. Unified National Fine Screw Thread Data

Size	Major Dia	Threads Per Inch	Pitch Dia	Minor Dia External^a	Minor Dia Internal^b	Minor Dia Area	Tensile Stress Area
#	inch	tpi	inch	inch	inch	sq. inch	sq. inch
#0	0.06	80	0.0519	0.0451	0.0465	0.00151	0.0018
#1*	0.073	72	0.064	0.0565	0.058	0.00237	0.00278
#2	0.086	64	0.0759	0.0674	0.0691	0.00339	0.00394
#3*	0.099	56	0.0874	0.0778	0.0797	0.00451	0.00523
#4	0.112	48	0.0985	0.0871	0.0894	0.00566	0.00661
#5	0.125	44	0.1102	0.0979	0.1004	0.00716	0.0083
#6	0.138	40	0.1218	0.1082	0.1109	0.00874	0.01015
#8	0.164	36	0.146	0.1309	0.1339	0.01285	0.01474
#10	0.19	32	0.1697	0.1528	0.1562	0.0175	0.02
#12*	0.216	28	0.1928	0.1734	0.1773	0.0226	0.0258
1/4	0.25	28	0.2268	0.2074	0.2113	0.0326	0.0364
5/16	0.3125	24	0.2854	0.2629	0.2674	0.0524	0.058
3/8	0.375	24	0.3479	0.3254	0.3299	0.0809	0.0878
7/16	0.4375	20	0.405	0.378	0.3834	0.109	0.1187
1/2	0.5	20	0.4675	0.4405	0.4459	0.1486	0.1599
9/16	0.5625	18	0.5264	0.4964	0.5024	0.189	0.203
5/8	0.625	18	0.5889	0.5589	0.5649	0.24	0.256
3/4	0.75	16	0.7094	0.6763	0.6823	0.351	0.373

Table II. Unified National Coarse Screw Thread Data

Size	Major Dia	Threads Per Inch	Pitch Dia	Minor Dia External^a	Minor Dia Internal^b	Minor Dia Area	Tensile Stress Area
#	inch	tpi	inch	inch	inch	sq. inch	sq. inch
#1*	0.073	64	0.0629	0.0544	0.0561	0.00218	0.00263
#2	0.086	56	0.0744	0.0648	0.0667	0.0031	0.0037
#3*	0.099	48	0.0855	0.0741	0.0764	0.00406	0.00487
#4	0.112	40	0.0958	0.0822	0.0849	0.00496	0.00604
#5	0.125	40	0.1088	0.0952	0.0979	0.00672	0.00796
#6	0.138	32	0.1177	0.1008	0.1042	0.00745	0.00909
#8	0.164	32	0.1437	0.1268	0.1302	0.01196	0.014
#10	0.19	24	0.1629	0.1404	0.1449	0.0145	0.0175
#12*	0.216	24	0.1889	0.1664	0.1709	0.0206	0.0242
¼	0.25	20	0.2175	0.1905	0.1959	0.0269	0.0318
5/16	0.3125	18	0.2764	0.2464	0.2524	0.0454	0.0524
3/8	0.375	16	0.3344	0.3005	0.3073	0.0678	0.0775
7/16	0.4375	14	0.3911	0.3525	0.3602	0.0933	0.1063
½	0.5	13	0.45	0.4084	0.4167	0.1257	0.1419
9/16	0.5625	12	0.5084	0.4633	0.4723	0.162	0.182
5/8	0.625	11	0.566	0.5168	0.5266	0.202	0.226
¾	0.75	10	0.685	0.6309	0.6417	0.302	0.334

Table III. Tap and Clearance Drill Data

Size of Screw			Clearance Hole Drills					
			Tap Drill		Close Fit		Free Fit	
No. or Dia.	Decimal (inch)	Threads Per Inch	Drill Size	Decimal (inch)	Drill Size	Decimal (inch)	Drill Size	Decimal (inch)
#0	0.06	80	3/64	0.0469	52	0.0635	50	0.07
#1	0.073	64	53	0.0595	48	0.076	46	0.081
#1	0.073	72	53	0.0595	48	0.076	46	0.081
#2	0.086	56	50	0.07	43	0.089	41	0.096
#2	0.086	64	50	0.07	43	0.089	41	0.096
#3	0.099	48	47	0.0785	37	0.104	35	0.11
#3	0.099	56	45	0.082	37	0.104	35	0.11
#4	0.112	36	44	0.086	32	0.116	30	0.1285
#4	0.112	40	43	0.089	32	0.116	30	0.1285
#4	0.112	48	42	0.0935	32	0.116	30	0.1285
#5	0.125	40	38	0.1015	30	0.1285	29	0.136
#5	0.125	44	37	0.104	30	0.1285	29	0.136
#6	0.138	32	36	0.1065	27	0.144	25	0.1495
#6	0.138	40	33	0.113	27	0.144	25	0.1495
#8	0.164	32	29	0.136	18	0.1695	16	0.177
#8	0.164	36	29	0.136	18	0.1695	16	0.177
#10	0.19	24	25	0.1495	9	0.196	7	0.201
#10	0.19	32	21	0.159	9	0.196	7	0.201
#12	0.216	24	16	0.177	2	0.221	I	0.228
#12	0.216	28	14	0.182	2	0.221	I	0.228
#14	0.242	20	10	0.1935	D	0.246	F	0.257
#14	0.242	24	7	0.201	D	0.246	F	0.257
1/4	0.25	20	7	0.201	F	0.257	H	0.266
1/4	0.25	28	3	0.213	F	0.257	H	0.266
5/16	0.3125	18	F	0.257	P	0.323	Q	0.332
5/16	0.3125	24	I	0.272	P	0.323	Q	0.332
3/8	0.375	16	5/16	0.3125	W	0.386	X	0.397

sMaterial Properties - Metals

Material Name	Young's Modulus, E (Msi)	Shear Modulus, G (Msi)	Poisson Ratio, ν	Density, ρ (lb/in ³)	Tensile Strength Ultimate (Ksi)	Tensile Yield (Ksi)	Shear Strength Ultimate (Ksi)	Shear Yield (Ksi)	CTE (10 ⁻⁶ in/in °F)	Source
Brass: Yellow (Hard)	15.0	5.6	0.35	0.306	74	60	43	35	10.5	Mark's Standard Hc
Copper DHP (Hard Temper)	17.0	6.4	0.33	0.323	50	45	29	26	18.0	Mark's Standard Hc
Boralyn H25-T7	16.8	6.3	0.33	0.096	65	56	37.5	32.3	0.0	Alyn Corporation, A
Boralyn H15-T6	14.2	5.3	0.33	0.096	64	56	37.5	32.3	0.0	Alyn Corporation, A
Boralyn H05-T6	11.5	4.3	0.33	0.096	64	55	37.5	31.8	0.0	Alyn Corporation, A
Boralyn E15-T6	15.1	5.7	0.33	0.096	101	94	58.3	54.3	0.0	Alyn Corporation, A
Boralyn E05-T6	11.5	4.3	0.33	0.096	97	92	56	53.1	0.0	Alyn Corporation, A
Tungsten (WHA1598 0009Co) 90W-9NI-2Co	52.0	20.7	0.26	0.632	142	91	82	52	2.5	Mark's Standard Hc
Boralyn H35-T8	19.6	7.4	0.33	0.096	65	56	37.5	32.3	0.0	Alyn Corporation, A
Steel AMS 6524 Quenched/Tempered	28.5	11.1	0.30	0.280	220	190	137	109.7	6.5	Military Handbook :
Magnesium, AZ31B, - EXTRUSION, FORGING	6.5	2.4	0.35	0.064	35	21	21	12.1	14.0	Military Handbook :
Steel AMS 6520 (250 Grade Maraging 900F)	26.5	10.1	0.31	0.286	247	245	221	128	5.0	Military Handbook :
Steel AMS 6512 (250 Grade Maraging 900F)	26.5	10.1	0.31	0.286	255	250	260	144	5.0	Military Handbook :
Steel AMS 6521 (280 Grade Maraging 900F)	26.5	10.1	0.31	0.286	271	270	244	141	5.4	Military Handbook :
Steel AMS 6514 (280 Grade Maraging 900F)	26.5	10.1	0.31	0.286	275	270	281	156	5.4	Military Handbook :
Steel AISI 4130	29.0	11.0	0.32	0.283	95	75	57	43.3	6.5	Military Handbook :
Steel AISI 4130 Quenched/Tempered	29.0	11.0	0.32	0.283	125	100	75	57.7	6.5	Military Handbook : (levels)
Steel AISI 4135	29.0	11.0	0.32	0.283	95	75	75	43.3	6.5	Military Handbook :
Steel AISI 4135 Quenched/Tempered	29.0	11.0	0.32	0.283	125	100	100	57.7	6.5	Military Handbook : (levels)
Steel AISI 4340 Quenched/Tempered	29.0	11.0	0.32	0.283	260	215	240	124	6.5	Military Handbook : (levels)
Steel AMS 6485 Quenched/Tempered	30.0	11.0	0.36	0.281	260	215	234	124	6.2	Military Handbook :
Steel AMS 6437 Quenched/Tempered	30.0	11.0	0.36	0.281	260	220	156	127	6.2	Military Handbook :
Steel AMS 6523 Quenched/Tempered	28.8	11.1	0.30	0.283	190	180	193	104	6.5	Military Handbook :
Steel AF 1410	29.4	11.2	0.31	0.283	235	214	141	124	5.4	Military Handbook :

Steel, Stainless, AM-350 (AMS 5548) Hardened (SCT 850)	29.0	11.0	0.32	0.282	183	150	163	85	6.3	Military Handbook :
Steel, Stainless, AM-355 (AMS 5547) Hardened (SCT 850)	29.0	11.0	0.32	0.282	188	165	180	93.5	6.5	Military Handbook :
Steel, Stainless, Custom 450, Heat Treat (H900)	29.0	11.0	0.29	0.280	180	170	175	98.2	6.1	Military Handbook :
Steel, Stainless, Custom 455, Heat Treat (H950)	28.5	11.3	0.27	0.280	225	210	219	121	5.9	Military Handbook :
Steel, Stainless, PH 13-8Mo, Heat Treat (H950) - FLAT STOCK	28.3	11.0	0.28	0.279	221	205	211	118	5.9	Military Handbook : (confidence)
Steel, Stainless, PH 13-8Mo, Heat Treat (H950) - FORGING, EXTRUSION	28.3	11.0	0.28	0.279	220	205	211	118	5.9	Military Handbook : (confidence)
Steel, Stainless, 15-5PH, Heat Treat (H900) - FORGING, EXTRUSION	28.5	11.2	0.27	0.283	190	170	112	95.3	5.9	Military Handbook :
Steel, Stainless, 15-5PH, Heat Treat (H1025) - FLAT PLATE	28.5	11.2	0.27	0.283	154	145	97	82.6	5.9	Military Handbook :
Steel, Stainless, 15-5PH, Heat Treat (H935) - CASTING	30.2	11.8	0.28	0.283	170	150	107	86.6	5.9	Military Handbook :
Steel, Stainless, PH15-7Mo, (TH1050)	29.0	11.4	0.28	0.277	185	170	182	95	6.1	Military Handbook :
Steel, Stainless, 17-4PH, Heat Treat (H900) - FORGING, PLATES	28.5	11.2	0.27	0.282	195	175	175	101	5.9	Military Handbook : (confidence)
Steel, Stainless, 17-4PH, Heat Treat (H1000) - CASTING	28.5	12.7	0.27	0.282	150	130	98	75	6.3	Military Handbook :
Steel, Stainless, 17-7PH, Heat Treat (TH1050) - PLATE, SHEET	29.0	11.5	0.28	0.276	183	167	179	96	6.4	Military Handbook : (confidence)
Steel, Stainless, 18-8 (AISI 301), Annealed	29.0	11.2	0.27	0.286	75	30	27	15.6	8.6	Military Handbook :
Steel, Stainless, 18-8 (AISI 301), 1/2 Hard	26.0	10.5	0.27	0.286	151	105	72	41	8.6	Military Handbook : (confidence)
Steel, Stainless, 18-8 (AISI 301), Full Hard	26.0	10.5	0.27	0.286	185	142	98	56.6	8.6	Military Handbook : (confidence)
Magnesium, AZ31B-0, - SHEET, PLATE	6.5	2.4	0.35	0.064	36	19	23	8.1	14.0	Military Handbook : (confidence)
Magnesium, AZ31B-H26, - SHEET, PLATE	6.5	2.4	0.35	0.064	40	30	18	12.7	14.0	Military Handbook : (confidence)
Lead (rolled)	2.0	0.7	0.43	0.410	2.5	2	2	1.2	16.4	Mark's Standard H
Steel AMS 6526 Quenched/Tempered	28.5	11.1	0.30	0.280	220	190	137	109.7	6.5	Military Handbook :
Magnesium, HK31A-0, - SHEET, PLATE	6.5	2.4	0.35	0.065	32	19	13	8.1	12.1	Military Handbook : (confidence)
Magnesium, HK31A-H24, - SHEET, PLATE	6.5	2.4	0.35	0.065	36	28	21	12.1	12.1	Military Handbook : (confidence)
Magnesium, HM21A-T8, - SHEET, PLATE	6.5	2.4	0.35	0.064	33	21	20	11.6	13.2	Military Handbook :
Magnesium, ZK60A-T5, - EXTRUSIONS, FORGINGS	6.5	2.4	0.35	0.066	45	36	28	16.2	13.5	Military Handbook :

Magnesium, AZ91C-T4, - CASTING	6.5	2.4	0.35	0.065	34	11	11	6.4	14.0	Military Handbook :
Magnesium, AZ91C-T6, - CASTING	6.5	2.4	0.35	0.065	34	16	16	9.2	14.0	Military Handbook :
Magnesium, AZ92A, - CASTING	6.5	2.4	0.35	0.066	23	11	11	6.4	14.2	Military Handbook :
Magnesium, AZ92A-T4, - CASTING	6.5	2.4	0.35	0.066	34	18	18	10.4	14.2	Military Handbook :
Magnesium, QE22A-T6, - CASTING	6.5	2.4	0.35	0.065	40	28	28	16.2	14.0	Military Handbook :
Aluminum 1100-00 (Annealed)	10.0	3.8	0.33	0.098	11	3.5	6.4	2.02	13.1	Mark's Standard H:
Aluminum 2014-T6 - PLATE	10.7	4.0	0.33	0.101	69	59	41	34	12.4	Military Handbook : (confidence)
Aluminum 2014-T6 - FORGED	10.5	4.0	0.33	0.101	67	58	41	34	12.4	Military Handbook : (confidence)
Aluminum 2017-T4	10.4	4.0	0.33	0.101	55	32	33	18.5	12.2	Military Handbook :
Aluminum 2024-T3	10.5	4.0	0.33	0.101	66	43	41	23.1	12.5	Military Handbook : (confidence)
Aluminum 2024-T4	10.4	4.0	0.33	0.101	64	42	38	24	12.2	Military Handbook : (confidence)
Aluminum 2024-T861	10.4	4.0	0.33	0.101	72	66	40	38.1	12.2	Military Handbook :
Aluminum 2124-T851	10.4	4.0	0.33	0.100	68	61	39	35	12.6	Military Handbook : (confidence)
Aluminum 2219-T87	10.5	4.0	0.33	0.103	64	53	38	30.6	12.3	Military Handbook : (confidence)
Aluminum 2618-T61 - FORGED	10.7	4.1	0.33	0.100	56	40	33	23	11.0	Military Handbook :
Aluminum 5052-0	10.1	3.9	0.33	0.097	25	9.5	16	5.5	12.6	Military Handbook :
Aluminum 5052-H38	10.1	3.9	0.33	0.097	39	32	23	18.5	12.6	Military Handbook :
Aluminum 5456-0	10.2	3.9	0.33	0.096	42	19	26	11	13.5	Military Handbook :
Aluminum 5456-H343	10.2	3.9	0.33	0.096	53	39	31	22.5	13.5	Military Handbook :
Aluminum 6061-T4	9.9	3.8	0.33	0.098	32	18	21	4.6	12.6	Military Handbook : (confidence)
Aluminum 6061-T6	9.9	3.8	0.33	0.098	43	38	28	21.9	12.6	Military Handbook : (confidence)
Aluminum 6151-T6	10.1	3.9	0.33	0.098	44	37	28	20.2	12.5	Military Handbook :
Aluminum 7010-T7651	10.2	3.9	0.33	0.102	76	66	42	37.5	12.9	Military Handbook :
Aluminum 7049-T73511	10.5	4.0	0.33	0.102	74	60	40	35	13.0	Military Handbook :
Aluminum 7050-T76511	10.3	3.9	0.33	0.102	79	67	43	38.7	12.8	Military Handbook :


Aluminum 7075-T6 - SHEET, PLATE	10.3	3.9	0.33	0.101	80	71	48	41	12.3	Military Handbook : confidence)
Aluminum 7075-T6 - EXTRUSION	10.4	4.0	0.33	0.101	85	72	45	42	12.3	Military Handbook :
Aluminum 7175-T74 - FORGING	10.2	3.9	0.33	0.101	76	62	43	36	12.9	Military Handbook :
Steel AISI 1025	29.0	11.0	0.32	0.284	55	36	35	21	6.0	Military Handbook :
Steel A-7 (STRUCTURAL)	30.0	12.0	0.27	0.283	66	35	38	20	6.5	Mark's Standard Hc
Magnesium, AZ61A-F, - EXTRUSION, FORGING	6.3	2.4	0.31	0.065	40	24	19	8	14.0	Military Handbook :
Aluminum 7475-T651	10.2	3.9	0.33	0.101	77	68	43	39	12.9	Military Handbook :
Aluminum A201.0-T7 - CAST	10.3	4.0	0.33	0.101	60	50	36	29	10.0	Military Handbook :
Aluminum 354.0-T6 - CAST	10.6	4.0	0.33	0.098	50	42	35	24	11.6	Military Handbook :
Aluminum 355.0-T6 - CAST	10.3	3.8	0.33	0.098	37	23	26	13	12.0	Military Handbook :
Aluminum C355.0-T6 - CAST	10.1	3.9	0.33	0.098	50	40	35	23	12.4	Military Handbook :
Aluminum A356.0-T6 - CAST	10.4	3.9	0.33	0.097	45	34	31	20	12.4	Military Handbook :
Aluminum A357.0-T6 - CAST	10.4	3.9	0.33	0.097	50	40	35	23	12.0	Military Handbook :
Aluminum 520.0-T4 - CAST	10.3	3.9	0.33	0.093	42	22	30	13	13.1	Military Handbook :
Aluminum 712.0-T5 - CAST	10.3	3.8	0.33	0.101	34	25	27	14	13.7	Military Handbook :
Titanium Pure, Annealed	15.5	6.5	0.32	0.163	80	70	42	40	4.9	Military Handbook :
Titanium Ti-5Al-2.5Sn, Annealed - PLATE, SHEET	15.5	6.5	0.32	0.162	135	125	128	72	5.2	Military Handbook :
Titanium Ti-5Al-2.5Sn, Annealed - FORGED	15.5	6.5	0.32	0.162	115	110	110	61	5.2	Military Handbook :
Titanium Ti-8Al-1Mo-1V, Single Anneal	17.5	6.7	0.32	0.158	145	135	91	78	4.8	Military Handbook :
Titanium Ti-8Al-1Mo-1V, Double Anneal	17.5	6.7	0.32	0.158	135	120	81	69	4.8	Military Handbook :
Titanium Ti-6Al-2Sn-4Zr-2Mo, Duplex Anneal	16.5	6.2	0.32	0.164	143	134	142	77	4.3	Military Handbook : confidence)
Titanium Ti-11Sn-5Zr-2Al - 1Mo, Annealed	16.5	6.2	0.32	0.174	140	130	91	77	5.0	Military Handbook : confidence)
Titanium Ti-6Al-4V, Annealed - PLATE, SHEET	16.0	6.2	0.31	0.160	139	131	138	75	4.9	Military Handbook : confidence)
Titanium Ti-6Al-4V, Solution Treat & Age - PLATE, SHEET	16.0	6.2	0.31	0.160	160	145	154	84	4.9	Military Handbook :
Titanium Ti-6Al-4V, Annealed - BAR, EXTRUSION	16.0	6.2	0.31	0.160	142	134	140	77	4.9	Military Handbook : confidence)
Titanium Ti-6Al-4V, Solution Treat & Age - BAR, EXTRUSION	16.0	6.2	0.31	0.160	163	147	157	87	4.9	Military Handbook : confidence)
Titanium Ti-6Al-6V-2Sn, Annealed - PLATE, SHEET	16.0	6.2	0.31	0.164	160	154	139	80	5.3	Military Handbook :

Titanium Ti-6Al-6V-2Sn, Solution Treat & Age - PLATE, SHEET	16.0	6.2	0.31	0.164	170	160	101	92	5.3	Military Handbook :
Titanium Ti-13V-11Cr-3Al, Annealed	14.5	6.2	0.31	0.174	132	126	92	69	5.2	Military Handbook :
Titanium Ti-13V-11Cr-3Al, Solution Treat & Age	15.5	6.2	0.31	0.174	170	160	162	92	5.2	Military Handbook :
Titanium Ti-15V-3Cr-3Sn-3Al, Solution Treat	11.4	6.2	0.31	0.172	98	100	98	55	4.6	Military Handbook :
Titanium Ti-15V-3Cr-3Sn-3Al, Solution Treat & Age	15.2	6.5	0.31	0.172	141	140	139	81	4.6	Military Handbook :
Beralcast 363	29.9	11.5	0.30	0.079	47	38	27	22	6.3	Starmet, Provided I
AerMet 100	28.2	10.8	0.30	0.285	285	250	165	144	0.0	Callaway Golf Com
Steel, Stainless, Custom 465, Heat Treat (H950)	28.8	11.3	0.27	0.282	250	230	230	133	5.9	Callaway Golf Com
Liquid Metal (Vitrology 01)	13.3	5.1	0.30	0.220	280	260	260	150	0.0	(1998) Amorphous (714)643-1700
Cast Iron (pearlitic malleable)	26.4	10.0	0.32	0.266	100	80	58	46	0.0	Mark's Standard Ht
Beryllium, QMV	42.0	16.2	0.30	0.067	45	33	26	19	8.2	Mark's Standard Ht
Gold, pure	10.8	3.8	0.42	0.701	18	16	16	0	0.0	Mark's Standard Ht
Lead, pure	2.0	0.7	0.42	0.412	2.6	1.3	1.3	0.75	29.3	Mark's Standard Ht
Molybdenum (Mo-0.5 Ti)	46.0	17.4	0.32	0.367	130	120	120	69	3.4	ASM Materials Har
Platinum	21.3	7.7	0.39	0.779	22	18	18	10.4	5.0	Mark's Standard Ht
Plutonium, alpha phase	14.0	5.9	0.18	0.702	60	40	40	23	30.0	Mark's Standard Ht
Silver, pure	10.5	3.8	0.37	0.381	18	8	10.4	4.6	11.0	Mark's Standard Ht
Tantalum	27.0	10.0	0.35	0.603	130	45	45	26	3.6	Mark's Standard Ht
Thorium, induction melt	8.5	3.4	0.27	0.421	32	21	21	12.1	7.0	Mark's Standard Ht
Uranium D-38	24.0	9.9	0.21	0.689	56	28	32.3	16.2	6.0	ASM Materials Har
Beryllium-Copper (C17200-Hard)	19.0	7.3	0.30	0.302	220	206	127	119	9.4	ASM Materials Har
Beryllium-Copper (C17500-Hard)	20.0	7.7	0.30	0.319	150	140	87	81	10.0	ASM Materials Har
Niobium (Nb-1ZR)	10.0	3.9	0.30	0.310	35	20	20	11.5	4.2	ASM Materials Har
Niobium (C-103)	12.6	4.9	0.30	0.320	105	97	97	56	4.5	ASM Materials Har
Niobium (C-129Y)	16.2	6.2	0.30	0.343	90	75	75	43	3.8	ASM Materials Har
Niobium (Cb-752)	16.0	6.2	0.30	0.326	78	58	58	33.5	4.1	ASM Materials Har
Molybdenum (TZM, or Mo-0.5Ti-0.1Zr)	46.0	17.4	0.32	0.367	140	125	125	72	2.7	ASM Materials Har
Zirconium (Zr-2.5Nb, grade 705)	14.2	5.0	0.33	0.233	80	55	46	32	11.3	ASM Materials Har

Invar	21.4	7.9	0.35	0.293	85	60	60	35	0.4	ASM Materials Har
Shape Memory Alloy - Nickel/Titanium (Austenite)	12.0	4.6	0.32	0.233	130	100	100	57.7	0.0	ASM Materials Har
Shape Memory Alloy - Nickel/Titanium (Martensite)	5.0	1.9	0.32	0.233	130	20	20	11.5	0.0	ASM Materials Har
Shape Memory Alloy - Copper/Zinc/Aluminum (Beta-Phase)	10.4	3.9	0.33	0.276	87	51	50	29	0.0	ASM Materials Har
Shape Memory Alloy - Copper/Aluminum (Martensite)	10.2	3.8	0.33	0.276	87	11.5	50	6.6	0.0	ASM Materials Har
Shape Memory Alloy - Copper/Aluminum/Nickel (Beta-Phase)	12.3	4.6	0.33	0.257	116	58	58	33.5	0.0	ASM Materials Har
Shape Memory Alloy - Copper/Aluminum/Nickel (Martensite)	11.6	4.4	0.33	0.257	116	19	67	11	0.0	ASM Materials Har

[\[Back to Material Properties Index\]](#)

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