



Copper Rod and Wire Tolerances

Rod, Cold Drawn to Size

Diameter or Distance Between Parallel Surfaces (in inches plus or minus)	Alloys C10100, C10200, C11000, C18700, C26000, C36000, C46400, C64200		Alloys C17200, C17500, C51000, C54400, C71500	
	Round	Hexagonal/ Octagonal	Round	Hexagonal/ Octagonal
Up thru .150	0.0013	0.0025	0.002	...
.151 - .500	0.0015	0.003	0.002	0.004
.501 - 1.00	0.002	0.004	0.003	0.005
1.01 - 2.00	0.0025	0.005	0.004	0.006
Over 2.00 (1)	0.15%	0.30%	0.20%	0.40%

(1) Expressed to the nearest .001 in.

Half Oval and Half Round Shapes Finished by Cold Drawing or Rolling

Specified Dimension (in inches)	Tolerance-plus or minus (in inches)
Up thru .500	0.005
.501 - 1.00	0.0075
1.01 - 2.00	0.01
2.01 - 3.00	0.015
3.01 - 4.00	0.025



Hardness Conversion Numbers

Birnell 3000 kg Load 10 mm Ball		Rockwell				Shore Sclero- scope	Tensile Strength psi (approx.)
Diameter Millimeters	Hardness Number	A Scale	B Scale	C Scale	15-N Scale		
2.25	745	84.1	...	65.3	92.3	91	...
2.30	712	...	...	...	...	...	...
2.35	682	82.2	...	61.7	91.0	84	...
2.40	653	81.2	...	60.0	90.2	81	...
2.45	627	80.5	...	58.7	89.6	79	...
2.50	601	79.8	...	57.3	89.0	77	...
2.55	578	79.1	...	56.0	88.4	75	...
2.60	555	78.4	...	54.7	87.8	73	298000
2.65	534	77.8	...	53.5	87.2	71	288000
2.70	514	76.9	...	52.1	86.5	70	274000
2.75	495	76.3	...	51.0	85.9	68	264000
2.80	477	75.6	...	49.6	85.3	66	252000
2.85	461	74.9	...	48.5	84.7	65	242000
2.90	444	74.2	...	47.1	84.0	63	230000
2.95	429	73.4	...	45.7	83.4	61	219000
3.00	415	72.8	...	44.5	82.8	59	212000
3.05	401	72.0	...	43.1	82.0	58	202000
3.10	388	71.4	...	41.8	81.4	56	193000
3.15	375	70.6	...	40.4	80.6	54	184000
3.20	363	70.0	...	39.1	80.0	52	177000
3.25	352	69.3	110.0	37.9	79.3	51	170000
3.30	341	68.7	109.0	36.6	78.6	50	163000
3.35	331	68.1	108.5	35.5	78.0	48	158000
3.40	321	67.5	108.0	34.3	77.3	47	152000
3.45	311	66.9	107.5	33.1	76.7	46	147000
3.50	302	66.3	107.0	32.1	76.1	45	143000
3.55	293	65.7	106.0	30.9	75.5	43	139000
3.60	285	65.3	105.5	29.9	75.0	...	136000
3.65	277	64.6	104.5	28.8	74.4	41	131000
3.70	269	64.1	104.0	27.6	73.7	40	128000
3.75	262	63.6	103.0	26.6	73.1	39	125000
3.80	255	63.0	102.0	25.4	72.5	38	121000
3.85	248	62.5	101.0	24.2	71.7	37	118000
3.90	241	61.8	100.0	22.8	70.9	36	114000
3.95	235	61.4	99.0	21.7	70.3	35	111000
4.00	229	60.8	98.2	20.5	69.7	34	109000
4.05	223	...	97.3	18.8	...	...	104000
4.10	217	...	96.4	17.5	...	33	103000
4.15	212	...	95.5	16.0	...	...	100000
4.20	207	...	94.6	15.2	...	32	99000
4.25	201	...	93.8	13.8	...	31	97000
4.30	197	...	92.8	12.7	...	30	94000
4.35	192	...	91.9	11.5	...	29	92000
4.40	187	...	90.7	10.0	...	...	90000
4.45	183	...	90.0	9.0	...	28	89000
4.50	179	...	89.0	8.0	...	27	88000
4.55	174	...	87.8	6.4	...	...	86000
4.60	170	...	86.8	5.4	...	26	84000
4.65	167	...	86.0	4.4	...	...	83000
4.70	163	...	85.0	3.3	...	25	82000
4.80	156	...	82.9	0.9	...	...	80000
4.90	149	...	80.8	...	...	23	...
5.00	143	...	78.7	...	...	22	...
5.10	137	...	76.4	...	...	21	...
5.20	131	...	74.0	...	...	...	...
5.30	126	...	72.0	...	...	20	...
5.40	121	...	69.8	...	...	19	...
5.50	116	...	67.6	...	...	18	...
5.60	111	...	65.7	...	...	15	...



Hardness Conversion Numbers

Rockwell							Birrell 500 kg Load 10 mm Ball
B Scale	F Scale	15-T Scale	30-T Scale	E Scale	H Scale	A Scale	
74	99.0	...	66.0	...	...	46.0	118
72	98.0	84.0	65.0	...	...	45.0	114
70	97.0	83.5	63.5	99.5	...	44.0	110
68	95.5	...	62.0	98.0	...	43.0	107
66	94.5	82.0	60.5	97.0	...	42.0	104
64	93.5	81.5	59.5	95.5	...	41.5	101
62	92.0	...	58.0	94.5	...	40.5	98
60	91.0	...	56.5	93.0	...	39.5	95
58	90.0	79.5	55.0	92.0	...	38.5	92
56	89.0	79.0	54.0	90.5	...	...	90
54	87.5	...	52.5	89.5	...	37.0	87
52	86.5	77.5	51.0	88.0	...	36.0	85
50	85.5	77.0	49.5	87.0	...	35.0	83
48	84.5	...	48.5	85.5	...	34.5	81
46	83.0	75.5	47.0	84.5	...	33.5	...
44	82.0	75.0	45.5	83.5	...	32.5	78
42	81.0	...	44.0	82.0	...	31.5	76
40	79.5	73.5	43.0	81.0	...	...	...
38	78.5	73.0	41.5	79.5	...	30.0	73
36	77.5	...	40.0	78.5	100.0	29.0	...
34	76.5	71.5	38.5	77.0	99.0	28.0	70
32	75.0	71.0	37.5	76.0	98.5	27.5	...
30	74.0	70.5	36.0	75.0	...	26.5	67
28	73.0	...	34.5	73.5	97.0	25.5	66
26	72.0	69.0	33.0	72.5	...	24.5	65
24	70.5	68.5	32.0	71.0	95.5	24.0	...
22	69.5	...	30.5	70.0	95.0	23.0	...
20	68.5	...	29.0	68.5	...	22.0	...
18	67.0	66.5	27.5	67.5	93.5	...	...
16	66.0	66.0	26.0	66.5	...	20.5	...
14	65.0	...	25.0	65.0	92.0	...	...
12	64.0	64.5	23.5	64.0	91.5	...	...
10	63.0	64.0	22.0	62.5	90.5	...	57
8	61.5	63.5	20.5	61.5	90.0	...	...
6	60.5	...	19.5	60.5	...	...	...
4	59.5	62.0	18.0	59.0	88.5	...	...
2	58.0	61.5	16.5	58.0	...	...	54
0	57.0	...	15.0	57.0	87.0	...	53

Rockwell Hardness Scales

Scale	Major Load, kg	Indenter	Use of Scale
A	60	Diamond Cone	Extremely hard material such as tungsten carbide or hard sheet material too thin for heavy load
B	100	1/16" ball	Materials of B 0 to B 100 hardness.
C	150	Diamond Cone	Materials of C 20 to C 70 hardness
E	100	1/8" ball	Very soft materials such as bearing metals.
F	60	1/16" ball	Very soft materials such as bearing metals.
H	60	1/8" ball	Very soft materials such as bearing metals.

Rockwell Superficial Hardness Scales

15-N	15	Diamond Cone	Materials comparable in hardness of C 20 to C70
15-T	15	1/16" ball	Materials comparable in hardness of B 0 to B 100
30-T	30	1/16" ball	Materials comparable in hardness of B 0 to B 100