

铝合金硬度与强度换算 (GBn 166—82)

附 4-1 HB10D² 硬度与其他硬度、强度换算

硬 度							抗 拉 强 度 σ_b / MPa						
布氏 HB 10D ²	维氏		洛 氏				退火、淬火人工时效				淬火自然时效		变形 铝合金
	HV	IIRR	IIRF	HR 15T	HR 30T	IIR 45T	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)	
55.0	56.1		52.5	62.3	17.6		193	203	204	203			211
56.0	57.1		53.7	62.9	18.8		197	205	205	205			214
57.0	58.2		55.0	63.5	20.2		200	208	207	207			217
58.0	59.8		56.2	64.1	21.5		204	212	211	211			220
59.0	60.4		57.4	64.7	22.8		207	216	215	215			223
60.0	61.5		58.6	65.3	24.1		211	221	219	219			226
61.0	62.6		59.7	65.9	25.2		214	226	224	225			228
62.0	63.6		60.9	66.4	26.5		218	230	228	229			230
63.0	64.7		62.0	67.0	27.7		221	235	234	235			233
64.0	65.8		63.1	67.5	28.9		225	241	240	241			236
65.0	66.9		64.2	68.1	30.0		228	247	246	247			239
66.0	68.0	8.8	65.2	68.6	31.5		231	252	252	253			242
67.0	69.1	10.8	66.3	69.1	32.3		234	258	258	258			245
68.0	70.1	12.7	67.3	69.6	33.4		238	264	264	264			248
69.0	71.2	14.6	68.3	70.1	34.4		241	269	269	270			251
70.0	72.3	16.5	69.3	70.6	35.5		245	274	275	275			254
71.0	73.4	18.2	70.2	71.0	36.5	0.8	248	279	279	279			258
72.0	74.5	20.0	71.1	71.5	37.4	2.3	252	283	285	284			261
73.0	75.6	21.9	72.1	72.0	38.5	3.9	255	288	289	289			264
74.0	76.7	23.4	72.9	72.3	39.3	5.2	259	292	294	293			267

硬 度							抗 拉 强 度 σ_b / MPa						
布氏	维氏	洛 氏		表面洛氏			退火、淬火人工时效				淬火自然时效		变形 铝合金
HB 10D ²	HV	HRB	HRC	HR 15T	HR 30T	HR 45T	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)	
75.0	77.7	25.1	73.8	72.8	40.3	6.7	262	296	299	297			270
76.0	78.8	26.8	74.7	73.2	41.3	8.2	266	300	303	301			273
77.0	79.9	28.3	75.5	73.6	42.1	9.5	269	304	306	304			276
78.0	81.0	29.8	76.3	74.0	43.0	10.8	273	307	310	308			279
79.0	82.1	31.3	77.1	74.4	43.8	12.1	276	310	313	311			282
80.0	83.2	32.9	77.9	74.8	44.7	13.4	279	313	316	313			285
81.0	84.2	34.2	78.6	75.2	45.4	14.6	282	316	319	316			288
82.0	85.3	35.5	79.3	75.5	46.2	15.7	286	319	321	318			292
83.0	86.4	36.9	80.0	75.8	46.9	16.9	289	321	323	320			295
84.0	87.5	38.2	80.7	76.2	47.7	18.0	293	324	325	322			298
85.0	88.6	39.5	81.4	76.5	48.4	19.2	296	326	327	324			301
86.0	89.7	40.8	82.1	76.9	49.2	20.3	300	328	328	326			305
87.0	90.7	42.0	82.7	77.2	49.8	21.3	303	330	330	328			308
88.0	91.8	43.1	83.3	77.5	50.4	22.3	307	330	330	329			311
89.0	92.9	44.3	83.9	77.8	51.1	23.3	310	332	331	330			315
90.0	94.0	45.4	84.5	78.1	51.7	24.2	314	334	332	331	344	406	318
91.0	95.1	46.5	85.1	78.3	52.4	25.2	317	335	333	333	350	409	322
92.0	96.2	47.7	85.7	78.6	53.0	26.2	321	337	334	334	356	413	325
93.0	97.2	48.6	86.2	78.9	53.5	27.0	324	339	335	336	361	417	329
94.0	98.3	49.6	86.7	79.1	54.1	27.9	328	340	336	338	367	421	331
95.0	99.4	50.7	87.3	79.3	54.7	28.8	330	342	338	339	372	425	334
96.0	100.5	51.7	87.8	79.7	55.2	29.7	334	343	339	341	378	428	338
97.0	101.6	52.6	88.3	79.9	55.8	30.5	337	345	340	343	382	431	342
98.0	102.7	53.4	88.7	80.1	56.2	31.1	341	347	342	345	388	435	345
99.0	103.7	54.3	89.2	80.4	56.7	32.0	344	349	344	347	394	439	349

硬 度							抗 拉 强 度 σ_b / MPa						
布氏	维氏	洛 氏		表面洛氏			退火、淬火人工时效				淬火自然时效		变形 铝合金
HB 10D ²	HV	HRR	HRF	HR 15T	HR 30T	HR 45T	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)	
100.0	104.8	55.3	89.7	80.6	57.3	32.8	348	351	346	350	399	442	352
101.0	105.9	56.0	90.1	80.8	57.7	33.4	351	353	348	352	405	446	356
102.0	107.0	57.0	90.6	81.1	58.2	34.3	355	355	350	355	410	450	359
103.0	108.1	57.7	91.0	81.2	58.6	34.9	358	358	353	357	416	454	363
104.0	109.2	58.5	91.4	81.4	59.1	35.6	362	360	356	360	421	457	367
105.0	110.2	59.3	91.8	81.6	59.5	36.2	365	363	359	363	427	461	370
106.0	111.1	60.0	92.2	81.8	59.9	36.9	369	365	363	366	432	465	373
107.0	112.4	60.8	92.6	82.0	60.4	37.5	372	368	366	369	437	470	378
108.0	113.5	61.5	93.0	82.2	60.8	38.2	376	371	370	372	443	473	380
109.0	114.6	62.3	93.4	82.4	61.2	38.8	379	374	375	376	448	476	384
110.0	115.7	63.1	93.8	82.6	61.6	39.5	382	376	379	379	454	480	388
111.0	116.7	63.6	94.1	82.8	62.0	40.0	385	380	383	382	459	483	392
112.0	117.8	64.4	94.5	83.0	62.4	40.7	389	383	388	386	465	487	395
113.0	118.9	65.0	94.8	83.1	62.7	41.1	392	387	394	389	470	490	399
114.0	120.0	65.7	95.2	83.3	63.1	41.8	396	391	399	393	476	494	403
115.0	121.1	66.3	95.5	83.5	63.5	42.3	399	395	405	397	482	498	407
116.0	122.2	67.0	95.9	83.7	63.9	43.0	403	399	411	401	486	502	411
117.0	123.2	67.6	96.2	83.8	64.2	43.4	406	403	417	405	492	506	414
118.0	124.3	68.2	96.5	84.0	64.5	43.9	410	407	424	409	497	509	418
119.0	125.4	68.8	96.8	84.1	64.8	44.4	413	411	429	413	503	513	422
120.0	126.5	69.3	97.1	84.2	65.2	44.9	417	415	435	417	509	517	426
121.0	127.6	69.9	97.4	84.4	65.5	45.4	420	419	442	421	514	521	430
122.0	128.7	70.6	97.8	84.6	65.9	46.1	424	423	448	424	520	524	433
123.0	129.7	71.2	98.1	84.7	66.2	46.6	427	427	455	428	525	528	437
124.0	130.8	71.6	98.3	84.8	66.4	46.9	431	431	461	431	530	532	441

硬 度							抗 拉 强 度 σ_b / MPa						
布氏	维氏	洛 氏		表面洛氏			退火、淬火人工时效				淬火自然时效		变形 铝合金
HB 10D ²	HV	HRB	HRC	HR 15T	HR 30T	HR 45T	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)	
125.0	131.9	72.2	98.6	85.0	66.8	47.4	433	435	466	435	535	535	445
126.0	133.0	72.7	98.9	85.1	67.1	47.9	437	439	473	439	541	539	449
127.0	134.1	73.3	99.2	85.3	67.4	48.4	440	443	479	443	547	542	453
128.0	135.2	73.9	99.5	85.4	67.7	48.9	444	448	483	446	552	546	457
129.0	136.2	74.4	99.8	85.6	68.0	49.3	447	452	488	450	558	550	461
130.0	137.3	74.8	100.0	85.7	68.3	49.7	451	456	493	454	563	554	465
131.0	138.4	75.4	100.3	85.8	68.6	50.2	454	460	497	458	569		469
132.0	139.5	76.0	100.6	86.0	68.9	50.7	458	464	501	462	574		473
133.0	140.6	76.3	100.8	86.1	69.1	51.0	461	468	504	465	580		477
134.0	141.7	76.9	101.1	86.2	69.4	51.5	465	471	507	469	585		482
135.0	142.7	77.3	101.3	86.3	69.6	51.8	468	475	509	474	590		485
136.0	143.8	77.9	101.6	86.5	70.0	52.3	472	479	511	478	596		489
137.0	144.9	78.2	101.8	86.6	70.2	52.6	475	482	512	482	601		493
138.0	146.0	78.8	102.1	86.7	70.5	53.1	479	485	513	486	607		497
139.0	147.1	79.2	102.3	86.8	70.7	53.5	482	488		491			502
140.0	148.2	79.8	102.6	87.0	71.0	53.9	485	492		496			506
141.0	149.2	80.1	102.8	87.1	71.2	54.3	488	495		501			510
142.0	150.3	80.5	103.0	87.2	71.5	54.6	492	499		507			514
143.0	151.4	81.1	103.3	87.3	71.8	55.1	495	502		514			519
144.0	152.5	81.5	103.5	87.4	72.0	55.4	499	505		520			523
145.0	153.6	81.9	103.7	87.5	72.2	55.7	502	509		528			527
146.0	154.7	82.2	103.9	87.6	72.4	56.1	506	512		535			532
147.0	155.7	82.6	104.1	87.7	72.6	56.4	509	516		544			535
148.0	156.8	83.0	104.3	87.8	72.8	56.7	513	519		553			539
149.0	157.9	83.4	104.5	87.9	73.1	57.1	516	523		564			544

硬 度							抗 拉 强 度 σ_b / MPa						变形 铝合金
布氏 10D ²	维氏 HV	洛 氏		表面洛氏			退火、淬火人工时效			淬火自然时效			
		HRB	HRF	HR 15T	HR 30T	HR 45T	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)	
150.0	159.0	83.9	104.8	88.0	73.4	57.6	520	527		575			548
151.0	160.1	84.3	105.0	88.1	73.6	57.9	523	531					
152.0	161.2	84.7	105.2	88.2	73.8	58.2	527	534					
153.0	162.2	85.1	105.4	88.3	74.0	58.5	530	539					
154.0	163.3	85.5	105.6	88.4	74.2	58.9	533	543					
155.0	164.4	85.8	105.8	88.5	74.4	59.2	536	548					
156.0	165.5	86.2	106.0	88.6	74.7	59.5	540	553					
157.0	166.6	86.6	106.2	88.7	74.9	59.9	543	559					
158.0	167.7	86.8	106.3	88.8	75.0	60.0	547	565					
159.0	168.7	87.2	106.5	88.9	75.2	60.3	550	571					
160.0	169.8	87.5	106.7	89.0	75.4	60.7	554	577					
161.0	170.9	87.9	106.9	89.1	75.6	61.0		583					
162.0	172.0	88.3	107.1	89.2	75.8	61.3		590					
163.0	173.1	88.7	107.3	89.3	76.0	61.7		598					
164.0	174.2	89.3	107.6	89.4	76.4	62.1		605					
165.0	175.2	89.6	107.8	89.5	76.6	62.5		613					
166.0	176.3	90.0	108.0	89.6	76.8	62.8		622					
167.0	177.4	90.4	108.2	89.7	77.0	63.1		631					
168.0	178.5	90.8	108.4	89.8	77.2	63.5		638					
169.0	179.6	91.3	108.7	90.0	77.5	64.0		647					
170.0	180.7	91.7	108.9	90.1	77.8	64.3		656					

附4-2 HB30D²硬度与其他硬度、强度换算

硬 度							抗 拉 强 度 σ_b /MPa				
布氏	维氏	洛 氏		表面洛氏			退火、淬火人工时效			淬火自然时效	
HB 30D ²	HV	HRB	HRC	HR 15T	HR 30T	HRC 45T	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A14 (LY12)	2A50 (LD5) 2A14 (LD10)
130.0	132.9	72.7	98.9	85.1	67.1	47.9	439	472	438	540	538
131.0	134.0	73.3	99.2	85.3	67.4	48.4	443	478	442	546	542
132.0	135.1	73.9	99.5	85.4	67.7	48.9	447	483	446	552	546
133.0	136.0	74.3	99.7	85.5	67.9	49.2	451	487	449	557	549
134.0	137.1	74.8	100.0	85.7	68.3	49.7	455	492	453	562	553
135.0	138.2	75.4	100.3	85.8	68.6	50.2	459	496	457	568	
136.0	139.3	75.8	100.5	85.9	68.8	50.5	463	500	461	573	
137.0	140.3	76.3	100.8	86.1	69.1	51.0	466	503	464	578	
138.0	141.3	76.7	101.0	86.2	69.3	51.3	470	506	468	583	
139.0	142.4	77.3	101.3	86.3	69.6	51.8	474	409	472	588	
140.0	143.4	77.7	101.5	86.4	69.9	52.1	477	511	476	593	
141.0	144.5	78.1	101.7	86.5	70.1	52.5	481	512	480	599	
142.0	145.6	78.6	102.0	86.7	70.4	53.0	484	512	484	605	
143.0	146.6	79.0	102.2	86.8	70.6	53.3	487		489		
144.0	147.6	79.4	102.4	86.9	70.8	53.6	490		493		
145.0	148.7	80.0	102.7	87.0	71.1	54.1	494		498		
146.0	149.3	80.3	102.9	87.1	71.3	54.4	497		504		
147.0	150.8	80.7	103.1	87.2	71.6	54.8	500		510		
148.0	151.8	81.1	103.3	87.3	71.8	55.1	503		516		
149.0	152.9	81.7	103.6	87.4	72.1	55.6	507		523		
150.0	154.0	82.0	103.8	87.5	72.3	55.9	510		531		
151.0	155.0	82.4	104.0	87.6	72.5	56.2	513		538		
152.0	156.1	82.8	104.2	87.7	72.7	56.6	517		547		
153.0	157.2	83.2	104.4	87.8	73.0	56.9	521		557		
154.0	158.1	83.6	104.6	87.9	73.2	57.2	524		566		
155.0	159.2	83.9	104.8	88.0	73.4	57.6	528		578		
156.0	160.3	84.3	105.0	88.1	73.6	57.9	532				
157.0	161.4	84.7	105.2	88.2	73.8	58.2	535				
158.0	162.4	85.1	105.4	88.3	74.0	58.5	539				
159.0	163.4	85.5	105.6	88.4	74.2	58.9	544				

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HB 30D ²	HV	HRB	HRF	HR 15T	HR 30T	HR 45T	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A14 (LY12)	2A50 (LD5) 2A14 (LD10)
160.0	164.5	85.8	105.8	88.5	74.4	59.2	549				
161.0	165.5	86.2	106.0	88.6	74.7	59.5	553				
162.0	166.5	86.6	106.2	88.7	74.9	59.9	556				
163.0	167.7	86.8	106.3	88.8	75.0	60.0	565				
164.0	168.5	87.2	106.5	88.9	75.2	60.3	570				
165.0	169.7	87.5	106.7	89.0	75.4	60.7	576				
166.0	170.8	87.9	106.9	89.1	75.6	61.0	583				
167.0	171.9	88.3	107.1	89.2	75.8	61.3	589				
168.0	172.9	88.7	107.3	89.3	76.0	61.7	596				
169.0	173.9	89.1	107.5	89.4	76.3	62.0	604				
170.0	175.0	89.4	107.7	89.5	76.5	62.3	612				
171.0	176.0	89.8	107.9	89.6	76.7	62.6	619				
172.0	177.1	90.2	108.1	89.7	76.9	63.0	628				
173.0	178.2	90.8	108.4	89.8	77.2	63.5	636				
174.0	179.3	91.2	108.6	89.9	77.4	63.8	645				
175.0	180.2	91.5	108.8	90.0	77.6	64.1	653				

附 4-3 HV 硬度与其他硬度、强度换算

硬 度							抗 拉 强 度 σ_t /MPa					
维氏	布氏	洛 氏		表面洛氏			退火、淬火人工时效			淬火自然时效		
HV	HB 10D ²	HRB	HRF	HR 15T	HR 30T	HR 45T	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)
55.0	54.0		51.2	61.7	16.2		190	202	203	203		
56.0	54.9		52.4	62.3	17.5		193	203	204	203		
57.0	55.9		53.6	62.9	18.7		196	205	205	205		
58.0	56.8		54.7	63.4	19.9		199	207	207	207		
59.0	57.7		55.8	63.9	21.1		203	211	210	209		
60.0	58.6		56.9	64.5	22.3		206	214	213	213		
61.0	59.6		58.1	65.1	23.5		209	219	217	217		

硬 度							抗 拉 强 度 σ_b /MPa					
维氏	布氏	洛 氏		表面洛氏			退火、淬火人工时效				淬火自然时效	
HV	HB 10D ²	HRB	HRF	HR 15T	HR 30T	HR 45T	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)
62.0	60.5		59.2	56.6	24.7		212	223	221	222		
63.0	61.4		60.2	66.1	25.8		216	228	226	227		
64.0	62.3		61.2	66.6	26.8		219	232	230	231		
65.0	63.3		62.3	67.1	28.0		222	237	236	237		
66.0	64.2		63.3	67.6	29.1		225	242	241	242		
67.0	65.1	7.0	64.3	68.1	30.2		228	247	246	247		
68.0	66.0	8.8	65.2	68.6	31.1		231	252	252	253		
69.0	66.9	10.6	66.2	69.1	32.2		234	257	257	258		
70.0	67.9	12.4	67.2	69.5	33.3		237	263	263	264		
71.0	68.8	14.3	68.1	70.0	34.2		240	268	268	269		
72.0	69.7	16.0	69.0	70.4	35.2		244	273	273	274		
73.0	70.6	17.5	69.8	70.8	36.0		247	277	278	278		
74.0	71.6	19.4	70.8	71.3	37.1	1.8	250	281	283	282		
75.0	72.5	20.9	71.6	71.7	37.9	3.1	253	285	287	286		
76.0	73.4	22.4	72.4	72.1	38.8	4.4	257	289	291	291		
77.0	74.3	23.9	73.2	72.5	39.7	5.7	260	293	295	294		
78.0	75.2	25.5	74.0	72.9	40.5	7.0	263	297	299	298		
79.0	76.2	27.0	74.8	73.3	41.4	8.3	266	301	303	302		
80.0	77.1	28.5	75.6	73.7	42.2	9.6	270	304	307	305		
81.0	78.0	29.8	76.3	74.0	43.0	10.8	273	307	310	308		
82.0	78.9	31.2	77.0	74.4	43.7	11.9	276	310	313	310		
83.0	79.9	32.7	77.8	74.8	44.6	13.3	279	313	316	313		
84.0	80.8	34.0	78.5	75.1	45.3	14.4	282	316	318	315		
85.0	81.7	35.1	79.1	75.4	46.0	15.4	285	318	320	317		
86.0	82.6	36.5	79.8	75.7	46.7	16.5	288	320	322	319		
87.0	83.6	37.8	80.5	76.1	47.4	17.7	292	323	324	322		
88.0	84.5	38.9	81.1	76.4	48.1	18.7	294	325	326	323		
89.0	85.4	40.1	81.7	76.7	48.7	19.7	298	327	327	325		
90.0	86.3	41.2	82.3	77.0	49.4	20.6	301	328	329	326		

硬 度							抗 拉 强 度 σ_b /MPa					
维氏	布氏	洛 氏		表面洛氏			退火、淬火人工时效				淬火自然时效	
HV	HB 10D ²	HRB	HRF	HR 15T	HR 30T	HR 45T	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)
91.0	87.2	42.2	82.8	77.2	49.9	21.5	304	330	330	328		
92.0	88.2	43.3	83.4	77.5	50.5	22.4	307	331	330	330		
93.0	89.1	44.4	84.0	77.8	51.2	23.4	311	332	331	330		
94.0	90.0	45.4	84.5	78.1	51.7	24.2	314	334	332	331	344	406
95.0	91.0	46.5	85.1	78.3	52.4	25.2	317	335	333	333	350	409
96.0	91.9	47.5	85.6	78.6	52.9	26.1	320	337	334	334	355	413
97.0	92.8	48.4	86.1	78.8	53.4	26.9	324	338	335	336	360	416
98.0	93.7	49.4	86.6	79.1	54.0	27.7	327	340	336	337	365	420
99.0	94.6	50.3	87.1	79.3	54.5	28.5	330	341	337	339	370	423
100.0	95.6	51.3	87.6	79.6	55.0	29.3	332	343	338	341	376	427
101.0	96.5	52.0	88.0	79.8	55.4	30.0	335	344	340	342	380	430
102.0	97.4	53.0	88.5	80.0	56.0	30.8	339	348	341	344	385	433
103.0	98.3	53.8	88.9	80.2	56.4	31.5	342	348	342	346	390	436
104.0	99.2	54.5	89.3	80.4	56.8	32.1	345	349	344	348	395	439
105.0	100.2	55.5	89.8	80.7	57.4	32.9	348	351	346	350	400	443
106.0	101.1	56.2	90.2	80.9	57.8	33.6	352	353	348	352	405	447
107.0	102.0	57.0	90.6	81.1	58.2	34.3	355	355	350	355	410	450
108.0	102.9	57.7	91.0	81.2	58.6	34.9	358	357	353	357	415	453
109.0	103.9	58.5	91.4	81.4	59.1	35.6	361	360	356	360	421	457
110.0	104.8	59.1	91.7	81.6	59.4	36.1	365	362	358	362	426	461
111.0	105.7	59.8	92.1	81.8	59.8	36.7	368	365	361	365	431	464
112.0	106.6	60.6	92.5	82.0	60.3	37.4	371	367	365	368	435	467
113.0	107.6	61.3	92.9	82.8	60.7	38.0	374	370	369	371	440	471
114.0	108.5	61.9	93.2	82.3	61.0	38.5	378	373	373	374	446	474
115.0	109.4	62.5	93.2	82.5	61.3	39.0	380	376	377	377	451	478
116.0	110.3	63.2	93.9	82.7	61.7	39.7	383	379	380	380	456	481
118.0	112.2	64.6	94.6	83.0	62.5	40.8	389	384	389	386	466	487
119.0	113.1	65.1	94.9	83.2	62.8	41.3	393	387	394	390	471	491
120.0	114.0	65.7	95.2	83.3	63.1	41.8	396	391	399	393	476	494

硬 度							抗 拉 强 度 σ_b /MPa					
维氏	布氏	洛 氏		表面洛氏			退火、淬火人工时效				淬火自然时效	
HV	HB 10D ²	HRB	HRF	HR 15T	HR 30T	HR 45T	2A11 (LY11) 2A12 (LY12)	7A04 (TCA)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)
121.0	114.9	66.3	95.5	83.5	63.5	42.3	399	394	405	397	481	498
122.0	115.9	66.9	95.8	83.6	63.8	42.8	402	398	411	400	486	501
123.0	116.8	67.4	96.1	83.8	64.1	43.3	406	402	416	402	491	505
124.0	117.7	68.0	96.4	83.9	64.4	43.8	409	405	422	408	496	508
125.0	118.6	68.6	96.7	84.1	64.7	44.3	412	409	427	411	501	512
126.0	119.6	69.1	97.0	84.2	65.1	44.8	415	413	433	415	506	515
127.0	120.5	69.7	97.3	84.3	65.4	45.2	419	417	439	419	511	519
128.0	121.4	70.3	97.6	84.5	65.7	45.7	422	421	444	422	516	522
129.0	122.3	70.6	97.8	84.6	65.9	46.1	425	425	450	426	521	526
130.0	123.2	71.2	98.1	84.7	66.2	46.6	428	428	456	429	526	529
131.0	124.2	71.8	98.4	84.9	66.5	47.1	431	432	462	432	532	533
132.0	125.1	72.4	98.7	85.0	66.9	47.5	434	435	468	435	536	535
133.0	126.0	72.7	98.9	85.1	67.1	47.9	437	439	473	439	541	539
134.0	126.9	73.3	99.2	85.3	67.4	48.4	440	443	478	442	546	542
135.0	127.9	73.9	99.5	85.4	67.7	48.9	443	447	483	446	552	546
136.0	128.8	74.3	99.7	85.5	67.9	49.2	447	451	487	449	557	549
137.0	129.7	74.8	100.0	85.7	68.3	49.7	450	454	492	453	562	554
138.0	130.6	75.2	100.2	85.8	68.5	50.0	453	458	496	456	567	
139.0	131.5	75.6	100.4	85.9	68.7	50.3	456	462	499	460	572	
140.0	132.5	76.2	100.7	86.0	69.0	50.8	460	466	503	464	577	
141.0	133.4	76.5	100.9	86.1	69.2	51.2	463	469	506	467	582	
142.0	134.3	77.1	101.2	86.3	69.5	51.6	466	472	508	470	586	
143.0	135.2	77.5	101.4	86.4	69.7	52.0	467	476	510	474	591	
144.0	136.2	77.9	101.6	86.5	70.0	52.3	473	479	511	478	597	
145.0	137.1	78.4	101.9	86.6	70.3	52.8	476	482	512	482	602	
146.0	138.0	78.8	102.1	86.7	70.5	53.1	479	485	513	486	607	
147.0	138.9	79.2	102.3	86.8	70.7	53.5	482	488		490		
148.0	139.9	79.6	102.5	86.9	70.9	53.8	484	492		495		
149.0	140.8	80.0	102.7	87.0	71.1	54.1	488	495		500		

硬 度							抗 拉 强 度 σ_b /MPa					
维氏	布氏	洛 氏		表面洛氏			退火、淬火人工时效				淬火自然时效	
HV	HB 10D ²	HRB	HRF	HR 15T	HR 30T	HR 45T	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)
150.0	141.7	80.5	103.0	87.2	71.5	54.6	491	498		505		
151.0	142.6	80.9	103.2	87.2	71.7	54.9	494	501		511		
152.0	143.5	81.3	103.4	87.3	71.9	55.3	497	504		517		
153.0	144.5	81.7	103.6	87.4	72.1	55.6	501	507		524		
154.0	145.4	82.0	103.8	87.5	72.3	55.9	504	510		531		
155.0	146.3	82.4	104.0	87.6	72.5	56.2	507	513		538		
156.0	147.2	82.8	104.2	87.7	72.7	56.6	510	517		546		
157.0	148.2	83.2	104.4	87.8	72.9	56.9	514	520		556		
158.0	149.1	83.6	104.6	87.9	73.1	57.2	517	524		564		
159.0	150.0	83.9	104.8	88.0	73.3	57.6	520	527		574		
160.0	150.9	84.1	104.9	88.1	73.5	57.7	523	531				
161.0	151.9	84.5	105.1	88.2	73.7	58.0	527	534				
162.0	152.8	84.9	105.3	88.3	73.9	58.4	530	538				
163.0	153.7	85.3	105.5	88.4	74.1	58.7	533	542				
164.0	154.6	85.6	105.7	88.5	74.3	59.0	535	546				
165.0	155.5	86.0	105.9	88.6	74.6	59.4	538	551				
166.0	156.5	86.4	106.1	88.7	74.8	59.7	542	553				
167.0	157.4	86.6	106.2	88.7	74.9	59.9	545	561				
168.0	158.3	87.0	106.4	88.8	75.1	60.2	548	566				
169.0	159.2	87.4	106.6	88.9	75.3	60.5	551	572				
170.0	160.2	87.7	106.8	89.0	75.5	60.8	555	578				
171.0	161.1	88.1	107.0	89.1	75.7	61.2		584				
172.0	162.0	88.3	107.1	89.2	75.8	61.3		590				
173.0	162.9	88.7	107.3	89.3	76.0	61.7		597				
174.0	163.9	89.1	107.5	89.4	76.3	62.0		605				
175.0	164.8	89.4	107.7	89.5	76.5	62.3		612				
176.0	165.7	89.8	107.9	89.6	76.7	62.6		619				
177.0	166.6	90.2	108.1	89.7	76.9	63.0		627				
178.0	167.5	90.6	108.3	89.8	77.1	63.3		634				
179.0	168.5	91.0	108.5	89.9	77.3	63.6		643				
180.0	169.4	91.5	108.8	90.0	77.6	64.1		651				

附 4-4 HRB 硬度与其他硬度、强度换算

硬 度						抗 拉 强 度 σ_b /MPa						
洛 氏		表面洛氏			维氏	布氏	退火、淬火人工时效				淬火自然时效	
HRB	HRF	HR 15T	HR 30T	HHR 45T	HV	HB 10D ²	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)
20.0	71.1	71.5	37.4	2.3	74.4	71.9	251	283	284	284		
20.5	71.4	71.6	37.7	2.8	74.8	72.3	253	284	286	286		
21.0	71.7	71.7	38.1	3.2	75.1	72.6	254	286	288	287		
21.5	71.9	71.9	38.3	3.6	75.4	72.8	254	287	289	288		
22.0	72.2	72.0	38.6	4.1	75.8	73.2	256	289	290	290		
22.5	72.4	72.1	38.8	4.4	76.0	73.4	257	289	291	291		
23.0	72.7	72.2	39.1	4.9	76.3	73.7	258	291	293	292		
23.5	73.0	72.4	39.4	5.4	76.8	74.1	259	292	295	293		
24.0	73.2	72.5	39.7	5.7	77.0	74.3	260	293	295	294		
24.5	73.5	72.6	40.0	6.2	77.3	74.6	261	295	297	296		
25.0	73.8	72.8	40.3	6.7	77.7	75.0	262	296	299	297		
25.5	74.0	72.9	40.5	7.0	78.0	75.2	263	297	299	298		
26.0	74.3	73.0	40.8	7.5	78.4	75.6	364	299	301	299		
26.5	74.5	73.1	41.0	7.8	78.6	75.8	265	299	302	300		
27.0	74.8	73.3	41.4	8.3	79.0	76.2	266	301	303	302		
27.5	75.1	73.4	41.7	8.8	79.4	76.5	267	302	305	303		
28.0	75.3	73.5	41.9	9.2	79.7	76.8	268	303	306	304		
28.5	75.6	73.7	42.2	9.6	80.0	77.1	270	304	307	305		
29.0	75.9	73.8	42.5	10.1	80.4	77.5	271	306	308	306		
29.5	76.1	73.9	42.7	10.5	80.8	77.8	272	307	309	307		
30.0	76.4	74.1	43.1	11.0	81.1	78.1	273	308	310	308		
30.5	76.7	74.2	43.4	11.4	81.5	78.5	274	309	311	309		
31.0	76.9	74.6	43.6	11.8	81.9	78.8	276	310	312	310		
31.5	77.2	74.5	43.9	12.3	82.2	79.1	277	311	313	311		
32.0	77.4	74.6	44.1	12.6	82.5	79.4	278	312	314	312		
32.5	77.7	74.7	44.5	13.1	82.9	79.8	279	313	315	312		
33.0	78.0	74.9	44.8	13.6	83.4	80.2	280	314	316	314		
33.5	78.2	75.0	45.0	13.9	83.7	80.5	280	315	317	315		
34.0	78.5	75.1	45.3	14.4	84.1	80.9	282	316	318	316		
34.5	78.8	75.2	45.6	14.9	84.6	81.3	283	317	319	317		

硬 度							抗 拉 强 度 σ_b /MPa					
洛 氏		表面洛氏			维氏	布氏	退火、淬火人工时效			淬火自然时效		
HRB	HRF	HR 15T	HR 30T	HR 45T	HV	HB 10D ²	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)
35.0	79.0	75.3	45.8	15.2	84.8	81.5	284	318	320	317		
35.5	79.3	75.5	46.2	15.7	85.3	82.0	286	319	321	318		
36.0	79.5	75.6	46.5	16.2	85.8	82.4	287	320	322	319		
36.5	79.8	75.7	46.7	16.5	86.1	82.7	288	321	322	320		
37.0	80.1	75.9	47.0	17.0	86.5	83.1	290	322	323	321		
37.5	80.3	76.0	47.2	17.4	86.8	83.4	291	322	324	321		
38.0	80.6	76.1	47.6	17.8	87.3	83.8	292	323	325	322		
38.5	80.9	76.3	47.9	18.3	87.7	84.2	293	324	325	323		
39.0	81.1	76.4	48.1	18.7	88.0	84.5	294	325	326	323		
39.5	81.4	76.5	48.4	19.2	88.6	85.0	296	326	327	324		
40.0	81.7	76.7	48.7	19.7	89.0	85.4	298	327	327	325		
40.5	81.9	76.8	48.9	20.0	89.4	85.8	299	327	328	326		
41.0	82.2	76.9	49.3	20.5	89.9	86.2	300	328	328	326		
41.5	82.4	77.0	49.5	20.8	90.8	86.5	301	329	329	327		
42.0	82.7	77.2	49.8	21.3	90.7	87.0	303	330	330	328		
42.5	83.0	77.3	50.1	21.8	91.3	87.5	305	330	330	328		
43.0	83.2	77.4	50.3	22.1	91.6	87.8	306	330	330	329		
43.5	83.5	77.6	50.6	22.6	92.1	88.3	308	331	330	330		
44.0	83.8	77.7	51.0	23.1	92.7	88.8	310	332	331	330		
44.5	84.0	77.8	51.2	23.4	93.0	89.1	311	332	331	330		
45.0	84.3	78.0	51.5	23.9	93.6	89.6	312	333	332	331	342	
45.5	84.6	78.1	51.8	24.4	94.1	90.1	314	334	332	331	345	406
46.0	84.8	78.2	52.0	24.7	94.5	90.5	315	335	333	332	347	408
46.5	85.1	78.3	52.4	25.2	95.1	91.0	317	335	333	333	350	409
47.0	85.3	78.4	52.6	25.6	95.5	91.4	319	336	334	333	352	411
47.5	85.6	78.6	52.9	26.1	96.0	91.9	320	337	334	334	355	413
48.0	85.9	78.7	53.2	26.5	96.6	92.4	322	338	335	335	358	415
48.5	86.1	78.8	53.4	26.9	97.0	92.8	324	338	335	336	360	416
49.0	86.4	79.0	53.7	27.4	97.7	93.4	326	339	336	336	363	418
49.5	86.7	79.1	54.1	27.9	98.2	93.9	327	340	336	338	366	420

硬 度						抗 拉 强 度 σ_s /MPa						
洛 氏		表面洛氏			维氏	布氏	退火、淬火人工时效				淬火自然时效	
HRB	HRF	HR 15T	HR 30T	HR 45T	HV	HB 10D ²	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)
50.0	86.9	79.2	54.3	28.2	98.6	94.3	329	341	337	338	368	422
50.5	87.2	79.4	54.6	28.7	99.3	94.9	330	342	337	339	372	424
51.0	87.5	79.5	54.9	29.2	99.9	95.5	332	343	338	340	375	426
51.5	87.7	79.6	55.1	29.5	100.4	95.9	333	343	339	341	377	428
52.0	88.0	79.8	55.4	30.0	101.0	96.5	335	344	340	342	380	430
52.5	88.2	79.9	55.7	30.3	101.5	96.9	337	345	340	343	382	431
53.0	88.5	80.0	56.0	30.8	102.1	97.5	339	346	341	344	385	433
53.5	88.8	80.2	56.3	31.3	102.8	98.1	341	347	342	345	389	435
54.0	89.0	80.3	56.5	31.6	103.2	98.5	342	348	343	346	391	437
54.5	89.3	80.4	56.8	32.1	104.0	99.2	345	349	344	348	395	439
55.0	89.6	80.6	57.2	32.6	104.6	99.8	347	351	345	349	398	442
55.5	89.8	80.7	57.4	32.9	105.1	100.3	349	352	346	350	401	444
56.0	90.1	80.8	57.7	33.4	105.8	100.9	351	353	348	352	404	446
56.5	90.4	81.0	58.0	33.9	106.6	101.6	353	354	349	353	408	448
57.0	90.6	81.1	58.2	34.3	107.1	102.1	355	356	350	355	411	450
57.5	90.9	81.2	58.5	34.7	107.9	102.8	358	357	352	357	415	453
58.0	91.1	81.3	58.8	35.1	108.3	103.2	359	358	353	358	417	454
58.5	91.4	81.4	59.1	35.6	109.2	104.0	362	360	356	360	421	457
59.0	91.7	81.6	59.4	36.1	109.9	104.7	364	362	358	362	425	460
59.5	91.9	81.7	59.6	36.4	110.5	105.2	366	363	360	363	428	462
60.0	92.2	81.8	59.9	36.9	111.2	105.9	368	365	362	366	431	465
60.5	92.5	82.0	60.3	37.4	112.1	106.7	371	367	365	368	435	468
61.0	92.7	82.1	60.5	37.7	112.6	107.2	373	369	367	370	438	470
61.5	93.0	82.2	60.8	38.2	113.5	108.0	376	371	370	372	443	473
62.0	93.2	82.3	61.0	38.5	114.0	108.5	378	373	373	374	446	474
62.5	93.5	82.5	61.3	39.0	114.9	109.3	380	375	376	378	450	478
63.0	93.8	82.6	61.6	39.5	115.8	110.1	382	378	380	380	454	481
63.5	94.0	82.7	61.9	39.8	116.3	110.6	384	380	381	380	457	482
64.0	94.3	82.9	62.2	40.3	117.3	111.5	387	382	386	384	462	485
64.5	94.6	83.0	62.5	40.8	118.1	112.3	390	385	390	387	467	488

硬 度							抗 拉 强 度 σ_b /MPa					
洛 氏		表 面 洛 氏			维 氏	布 氏	退 火、淬 火 人 工 时 效				淬 火 自 然 时 效	
HRR	HRE	HR 15T	HR 30T	HR 45T	HV	HB 10D ²	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)
65.0	94.8	83.1	62.7	41.1	118.8	112.9	392	387	393	389	470	490
65.5	95.1	83.3	63.0	41.6	119.8	113.8	395	390	398	392	475	494
66.0	95.4	83.4	63.3	42.1	120.6	114.6	398	393	403	395	479	497
66.5	95.6	83.6	63.6	42.5	121.3	115.2	400	395	406	398	482	499
67.0	95.9	83.7	63.9	43.0	122.3	116.1	403	399	412	401	487	502
67.5	96.1	83.8	64.1	43.3	122.9	116.7	405	401	415	404	490	504
68.0	96.4	83.9	64.4	43.8	124.0	117.7	409	405	422	408	496	508
68.5	96.7	84.1	64.7	44.3	125.0	118.6	412	409	427	411	501	512
69.0	96.9	84.2	64.9	44.6	125.6	119.2	414	411	431	413	504	514
69.5	97.2	84.3	65.3	45.1	126.7	120.2	417	416	438	417	510	518
70.0	97.5	84.4	65.5	45.6	127.8	121.2	421	420	443	421	515	521
70.5	97.7	84.5	65.8	45.9	128.4	121.8	423	422	447	424	519	524
71.0	98.0	84.7	66.1	46.4	129.5	122.8	427	427	453	428	524	528
71.5	98.2	84.8	66.3	46.7	130.3	123.5	429	430	458	430	528	530
72.0	98.5	84.9	66.7	47.2	131.4	124.5	432	433	464	433	533	533
72.5	98.8	85.1	67.0	47.7	132.6	125.6	435	438	471	437	539	537
73.0	99.0	85.2	67.2	48.0	133.3	126.3	438	440	475	440	543	540
73.5	99.3	85.3	67.5	48.5	134.4	127.3	441	445	480	444	548	544
74.0	99.6	85.5	67.8	49.0	135.6	128.4	445	449	485	448	554	548
74.5	99.8	85.6	68.0	49.3	136.4	129.1	448	452	489	451	558	550
75.0	100.1	85.7	68.4	49.8	137.5	130.2	452	457	494	455	564	554
75.5	100.4	85.9	68.7	50.3	138.8	131.4	456	461	499	459	571	
76.0	100.6	86.0	68.9	50.7	139.6	132.1	458	464	501	462	575	
76.5	100.9	86.1	69.2	51.2	140.9	133.3	462	469	505	467	582	
77.0	101.1	86.2	69.4	51.5	141.7	134.0	465	471	507	469	585	
77.5	101.4	86.4	69.7	52.0	143.0	135.2	469	476	510	474	591	
78.0	101.7	86.5	70.1	52.5	144.3	136.4	473	480	512	479	598	
78.5	101.9	86.6	70.3	52.8	145.1	137.2	476	482		482	602	
79.0	102.2	86.8	70.6	53.3	146.5	138.5	481	487		488	610	
79.5	102.5	86.9	70.9	53.8	147.1	139.7	484	491		494		

硬 度							抗 拉 强 度 σ_b /MPa					
洛 氏		表面洛氏			维氏	布氏	退火、淬火人工时效			淬火自然时效		
HRB	HRF	HR 15T	HR 30T	HR 45T	HV	HB 10D ²	2A11 (LY11) 2A12 (LY12)	7A04 (LC4)	2A50 (LD5)	2A14 (LD10)	2A11 (LY11) 2A12 (LY12)	2A50 (LD5) 2A14 (LD10)
80.0	102.7	87.0	71.1	54.1	148.6	140.6	487	494		499		
80.5	103.0	87.2	71.5	54.6	150.2	141.9	492	498		507		
81.0	103.3	87.3	71.8	55.1	151.6	143.2	496	503		515		
81.5	103.5	87.4	72.0	55.4	152.6	144.1	499	506		521		
82.0	103.8	87.5	72.3	55.9	154.1	145.5	504	511		532		
82.5	104.0	87.6	72.5	56.2	155.1	146.4	507	514		538		
83.0	104.3	87.8	72.8	56.7	156.6	147.8	512	519		552		
83.5	104.6	87.9	73.2	57.2	158.2	149.3	517	524		567		
84.0	104.8	88.0	73.4	57.6	159.2	150.2	521	528		578		
84.5	105.1	88.2	73.7	58.0	160.8	151.7	526	534				
85.0	105.4	88.3	74.0	58.5	162.5	153.2	530	540				
85.5	105.6	88.4	74.2	58.9	163.5	154.2	534	544				
86.0	105.9	88.6	74.6	59.4	165.2	155.7	539	552				
86.5	106.1	88.7	74.8	59.7	166.3	156.7	542	557				
87.0	106.4	88.8	75.1	60.2	168.0	158.3	548	566				
87.5	106.7	89.0	75.4	60.7	169.6	159.8	553	576				
88.0	106.9	89.1	75.6	61.0	170.7	160.8		583				
88.5	107.2	89.2	75.9	61.5	172.3	162.3		592				
89.0	107.5	89.4	76.3	62.0	173.9	163.8		604				
89.5	107.7	89.5	76.5	62.3	174.9	164.7		611				
90.0	108.0	89.6	76.8	62.8	176.4	166.1		623				
90.5	108.3	89.8	77.1	63.3	177.8	167.4		634				
91.0	108.5	89.9	77.3	63.6	178.8	168.8		641				
91.5	108.8	90.0	77.6	64.1	180.1	169.5		652				
92.0	109.0	90.1	77.9	64.4	181.0	170.3		659				

注: 1. 本表适用于变形铝合金, 主要是硬铝合金 2A11(LY11)、2A12(LY12)、超硬铝合金 7A04(LC4) 及锻造铝合金 2A50(LD5)、2A14(LD10) 等;

2. 对组织均匀一致的试件, 按本表所获得的换算值是精确的。当测量板材硬度按本表换算成强度时, 若要求严格, 须考虑其加工特性, 对换算值作适当的修正;

3. 对包铝层的试件, 应去除包铝层后, 再进行测试和换算;

4. 对一般精度要求的试件, 使用附 4-1 表中“变形铝合金”栏内强度值进行换算