

中华人民共和国国家标准

GBn 166—82

铝合金硬度与强度换算值

Values of hardness and strength for
aluminium alloys conversion tables

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本标准适用于变形铝合金,主要是硬铝合金 LY11、LY12,超硬铝合金 LC4 以及锻造铝合金 LD5、LD10 等。

1 换算值表的使用说明

1.1 对组织均匀一致的试件,按本标准表 1 至表 4 所获得的换算值是精确的。当测量板材硬度按本标准换算成强度时,若要求严格,须考虑其加工特性,对换算值作适当的修正。

1.2 对包铝层的试件,应去除包铝层后,再进行测试和换算。

1.3 对一般精度要求的试件,使用表 1 中“变形铝合金”栏内所列强度值进行换算。

2 换算值表

2.1 换算值表的分类

| 换算 值表 序号 | 首 硬 度 标 准 | 铝 合 金 牌 号 及 工 艺 状 态 | | 页 次 |
|----------------|-----------------------------|-------------------------------|-----------------------|--------|
| | | 退火、淬火人工时效 (M:CS) | 淬火自然时效 (CZ) | |
| 1 | 布氏硬度 HB 10D ² | LY11, LY12, LC4, LD5, LD10 | LY11, LY12, LD5, LD10 | 2 |
| 2 | 布氏硬度 HB 30D ² | LC4, LD5, LD10 | LY11, LY12, LD5, LD10 | 6 |
| 3 | 维氏硬度 HV | LY11, LY12, LC4, LD5, LD10 | LY11, LY12, LD5, LD10 | 8 |
| 4 | 洛氏硬度 HRB | LY11, LY12, LC4, LD5, LD10 | LY11, LY12, LD5, LD10 | 12 |

2.2 换算值表

| | | | | | | | | | | | | | | |
|-------|-------|-------|------|-------|------|------|------|------|------|------|------|------|------|------|
| 89.0 | 3.714 | 92.9 | 44.3 | 83.9 | 77.8 | 51.1 | 23.3 | 31.6 | 33.9 | 33.8 | 33.7 | — | — | 32.1 |
| 90.0 | 3.694 | 94.0 | 45.4 | 84.5 | 78.1 | 51.7 | 24.2 | 32.0 | 34.1 | 33.9 | 33.8 | 35.1 | 41.4 | 32.4 |
| 91.0 | 3.675 | 95.1 | 46.5 | 85.1 | 78.3 | 52.4 | 25.2 | 32.3 | 34.2 | 34.0 | 34.0 | 35.7 | 41.7 | 32.8 |
| 92.0 | 3.655 | 96.2 | 47.7 | 85.7 | 78.6 | 53.0 | 26.2 | 32.7 | 34.4 | 34.1 | 34.1 | 36.3 | 42.1 | 33.1 |
| 93.0 | 3.636 | 97.2 | 48.6 | 86.2 | 78.9 | 53.5 | 27.0 | 33.0 | 34.6 | 34.2 | 34.3 | 36.8 | 42.5 | 33.5 |
| 94.0 | 3.618 | 98.3 | 49.6 | 86.7 | 79.1 | 54.1 | 27.9 | 33.4 | 34.7 | 34.3 | 34.5 | 37.4 | 42.9 | 33.8 |
| 95.0 | 3.599 | 99.4 | 50.7 | 87.3 | 79.4 | 54.7 | 28.8 | 33.7 | 34.9 | 34.5 | 34.6 | 37.9 | 43.3 | 34.1 |
| 96.0 | 3.581 | 100.5 | 51.7 | 87.8 | 79.7 | 55.2 | 29.7 | 34.1 | 35.0 | 34.6 | 34.8 | 38.5 | 43.6 | 34.5 |
| 97.0 | 3.563 | 101.6 | 52.6 | 88.3 | 79.9 | 55.8 | 30.5 | 34.4 | 35.2 | 34.7 | 35.0 | 39.0 | 44.0 | 34.9 |
| 98.0 | 3.545 | 102.7 | 53.4 | 88.7 | 80.1 | 56.2 | 31.1 | 34.8 | 35.4 | 34.9 | 35.2 | 39.6 | 44.4 | 35.2 |
| 99.0 | 3.528 | 103.7 | 54.3 | 89.2 | 80.4 | 56.7 | 32.0 | 35.1 | 35.6 | 35.1 | 35.4 | 40.2 | 44.8 | 35.6 |
| 100.0 | 3.511 | 104.8 | 55.3 | 89.7 | 80.6 | 57.3 | 32.8 | 35.5 | 35.8 | 35.3 | 35.7 | 40.7 | 45.1 | 35.9 |
| 101.0 | 3.494 | 105.9 | 56.0 | 90.1 | 80.8 | 57.9 | 33.4 | 35.8 | 36.0 | 35.5 | 35.9 | 41.3 | 45.5 | 36.3 |
| 102.0 | 3.478 | 107.0 | 57.0 | 90.6 | 81.1 | 58.2 | 34.3 | 36.2 | 36.2 | 35.7 | 36.2 | 41.8 | 45.9 | 36.6 |
| 103.0 | 3.461 | 108.1 | 57.7 | 91.0 | 81.2 | 58.6 | 34.9 | 36.5 | 36.5 | 36.0 | 36.4 | 42.4 | 46.3 | 37.0 |
| 104.0 | 3.445 | 109.2 | 58.5 | 91.4 | 81.4 | 59.1 | 35.6 | 36.9 | 36.7 | 36.3 | 36.7 | 42.9 | 46.6 | 37.4 |
| 105.0 | 3.429 | 110.2 | 59.3 | 91.8 | 81.8 | 59.5 | 36.2 | 37.2 | 37.0 | 36.6 | 37.0 | 43.5 | 47.0 | 37.7 |
| 106.0 | 3.413 | 111.1 | 60.0 | 92.2 | 82.1 | 59.9 | 36.9 | 37.6 | 37.2 | 37.0 | 37.3 | 44.1 | 47.4 | 38.1 |
| 107.0 | 3.398 | 112.4 | 60.8 | 92.6 | 82.3 | 60.4 | 37.5 | 37.9 | 37.3 | 37.3 | 37.6 | 44.6 | 47.9 | 38.5 |
| 108.0 | 3.383 | 113.5 | 61.5 | 93.0 | 82.4 | 60.8 | 38.2 | 38.3 | 37.5 | 37.7 | 37.9 | 45.2 | 48.2 | 38.8 |
| 109.0 | 3.367 | 114.6 | 62.3 | 93.4 | 82.4 | 61.2 | 38.8 | 38.6 | 37.8 | 38.2 | 38.3 | 45.7 | 48.5 | 39.2 |
| 110.0 | 3.353 | 115.7 | 63.1 | 93.8 | 82.6 | 61.6 | 39.5 | 39.0 | 38.5 | 38.6 | 38.6 | 46.3 | 48.9 | 39.6 |
| 111.0 | 3.338 | 116.7 | 63.6 | 94.1 | 82.8 | 62.0 | 40.0 | 39.3 | 38.8 | 39.1 | 39.0 | 46.8 | 49.3 | 40.0 |
| 112.0 | 3.323 | 117.8 | 64.4 | 94.5 | 83.0 | 62.4 | 40.7 | 39.7 | 39.1 | 39.6 | 39.4 | 47.4 | 49.7 | 40.3 |
| 113.0 | 3.309 | 118.9 | 65.0 | 94.8 | 83.1 | 62.7 | 41.1 | 40.0 | 39.5 | 40.2 | 39.7 | 48.0 | 50.0 | 40.7 |
| 114.0 | 3.295 | 120.0 | 65.7 | 95.2 | 83.3 | 63.1 | 41.8 | 40.4 | 39.9 | 40.7 | 40.1 | 48.5 | 50.4 | 41.1 |
| 115.0 | 3.281 | 121.1 | 66.3 | 95.5 | 83.5 | 63.5 | 42.3 | 40.7 | 40.3 | 41.3 | 40.5 | 49.1 | 50.8 | 41.5 |
| 116.0 | 3.267 | 122.2 | 67.0 | 95.9 | 83.7 | 63.9 | 43.0 | 41.1 | 40.7 | 41.9 | 40.9 | 49.6 | 51.2 | 41.9 |
| 117.0 | 3.254 | 123.2 | 67.6 | 96.2 | 83.8 | 64.2 | 43.4 | 41.4 | 41.1 | 42.5 | 41.3 | 50.2 | 51.6 | 42.2 |
| 118.0 | 3.240 | 124.3 | 68.2 | 96.5 | 84.0 | 64.5 | 43.9 | 41.8 | 41.5 | 43.2 | 41.7 | 50.7 | 51.9 | 42.6 |
| 119.0 | 3.227 | 125.4 | 68.8 | 96.8 | 84.1 | 64.8 | 44.4 | 42.1 | 41.9 | 43.8 | 42.1 | 51.3 | 52.3 | 43.0 |
| 120.0 | 3.214 | 126.5 | 69.3 | 97.1 | 84.2 | 65.2 | 44.9 | 42.5 | 42.3 | 44.4 | 42.5 | 51.9 | 52.7 | 43.4 |
| 121.0 | 3.201 | 127.6 | 69.9 | 97.4 | 84.4 | 65.5 | 45.4 | 42.8 | 42.7 | 45.1 | 42.9 | 52.4 | 53.1 | 43.8 |
| 122.0 | 3.188 | 128.7 | 70.6 | 97.8 | 84.6 | 65.9 | 46.1 | 43.2 | 43.1 | 45.7 | 43.2 | 53.0 | 53.4 | 44.2 |
| 123.0 | 3.175 | 129.7 | 71.2 | 98.1 | 84.7 | 66.2 | 46.6 | 43.5 | 43.5 | 46.4 | 43.6 | 53.5 | 53.8 | 44.6 |
| 124.0 | 3.163 | 130.8 | 71.6 | 98.3 | 84.8 | 66.4 | 46.9 | 43.9 | 44.0 | 47.0 | 44.0 | 54.0 | 54.2 | 45.0 |
| 125.0 | 3.151 | 131.9 | 72.2 | 98.6 | 85.0 | 66.8 | 47.4 | 44.2 | 44.4 | 47.6 | 44.4 | 54.6 | 54.6 | 45.4 |
| 126.0 | 3.138 | 133.0 | 72.7 | 98.9 | 85.1 | 67.1 | 47.9 | 44.6 | 44.8 | 48.2 | 44.8 | 55.2 | 55.0 | 45.8 |
| 127.0 | 3.126 | 134.1 | 73.3 | 99.2 | 85.3 | 67.4 | 48.4 | 44.9 | 45.2 | 48.8 | 45.2 | 55.8 | 55.3 | 46.2 |
| 128.0 | 3.114 | 135.2 | 73.9 | 99.5 | 85.4 | 67.7 | 48.9 | 45.3 | 45.7 | 49.3 | 45.5 | 56.3 | 55.7 | 46.6 |
| 129.0 | 3.103 | 136.2 | 74.4 | 99.8 | 85.6 | 68.0 | 49.3 | 45.6 | 46.1 | 49.8 | 45.9 | 56.9 | 56.1 | 47.0 |
| 130.0 | 3.091 | 137.3 | 74.8 | 100.0 | 85.7 | 68.3 | 49.7 | 46.0 | 46.5 | 50.3 | 46.3 | 57.4 | 56.5 | 47.4 |

| | | | | | | | | | | | | | | | | | |
|-------|-------|-------|------|-------|------|------|------|---|------|---|---|---|---|---|---|---|---|
| 165.0 | 2.751 | 175.2 | 89.6 | 107.8 | 89.5 | 76.6 | 62.5 | — | 62.5 | — | — | — | — | — | — | — | — |
| 166.0 | 2.743 | 176.3 | 90.0 | 108.0 | 89.6 | 76.8 | 62.8 | — | 63.4 | — | — | — | — | — | — | — | — |
| 167.0 | 2.735 | 177.4 | 90.4 | 108.2 | 89.7 | 77.0 | 63.1 | — | 64.3 | — | — | — | — | — | — | — | — |
| 168.0 | 2.727 | 178.5 | 90.8 | 108.4 | 89.8 | 77.2 | 63.5 | — | 65.1 | — | — | — | — | — | — | — | — |
| 169.0 | 2.719 | 179.6 | 91.3 | 108.7 | 90.0 | 77.5 | 64.0 | — | 66.0 | — | — | — | — | — | — | — | — |
| 170.0 | 2.711 | 180.7 | 91.7 | 108.9 | 90.1 | 77.8 | 64.3 | — | 66.9 | — | — | — | — | — | — | — | — |

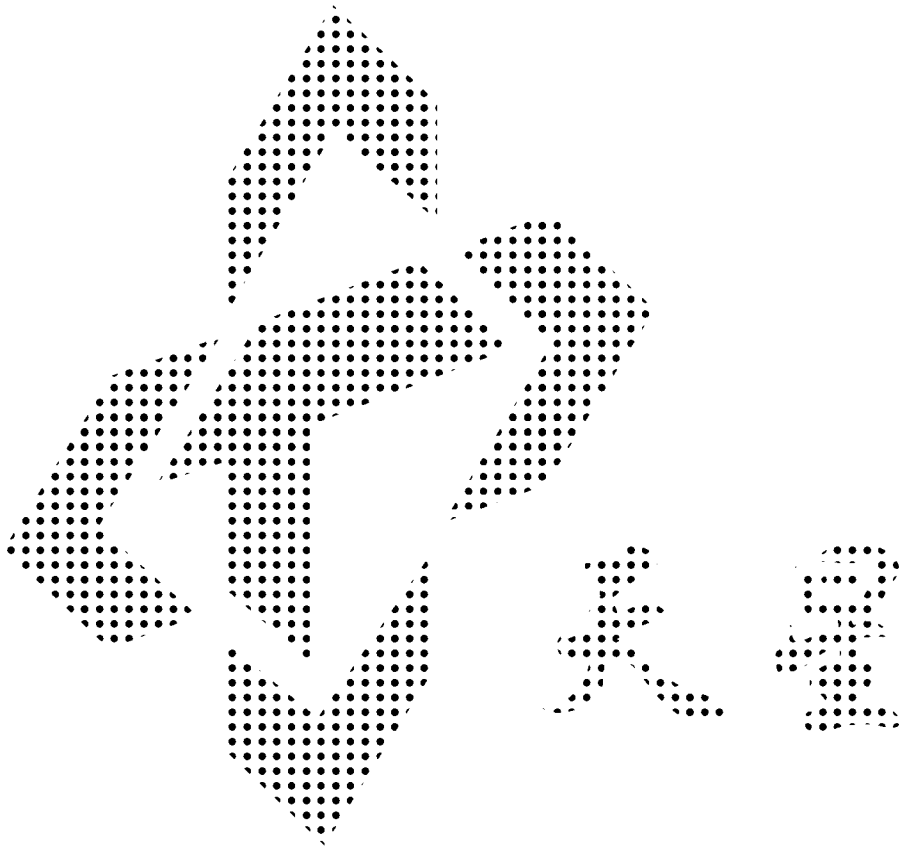


表 2

| 布氏 | | 硬度 | | | | 抗拉强度 σ , 公斤力/毫米 ² | | | | | | | | |
|-------|--|-------|------|-------|-------|-------------------------------------|-------|--------|------|------|------|------|-----|------|
| | | 维氏 | 洛氏 | 氏 | 氏 | 退火、淬火人工时效 | | 淬火自然时效 | | | | | | |
| HB | $P=30D^2$ $d_{10}, 2d,$ $4d_{10}$, 毫米 | HV | HRB | HRF | HR15T | HR30T | HR45T | LC4 | LD5 | LD10 | LY11 | LY12 | LD5 | LD10 |
| | | | | | | | | | | | | | | |
| 130.0 | 5.218 | 132.9 | 72.7 | 98.9 | 85.1 | 67.1 | 47.9 | 44.8 | 48.1 | 44.7 | 55.1 | 54.9 | — | — |
| 131.0 | 5.119 | 134.0 | 73.3 | 99.2 | 85.3 | 67.4 | 48.4 | 45.2 | 48.7 | 45.1 | 55.7 | 55.3 | — | — |
| 132.0 | 5.181 | 135.1 | 73.9 | 99.5 | 85.4 | 67.7 | 48.9 | 45.6 | 49.3 | 45.5 | 56.3 | 55.7 | — | — |
| 133.0 | 5.163 | 136.0 | 74.3 | 99.7 | 85.5 | 67.9 | 49.2 | 46.0 | 49.7 | 45.8 | 56.8 | 56.0 | — | — |
| 134.0 | 5.145 | 137.1 | 74.8 | 100.0 | 85.7 | 68.3 | 49.7 | 46.4 | 50.2 | 46.2 | 57.3 | 56.4 | — | — |
| 135.0 | 5.128 | 138.2 | 75.4 | 100.3 | 85.8 | 68.6 | 50.2 | 46.8 | 50.6 | 46.6 | 57.9 | — | — | — |
| 136.0 | 5.110 | 139.3 | 75.8 | 100.5 | 85.9 | 68.8 | 50.5 | 47.2 | 51.0 | 47.0 | 58.4 | — | — | — |
| 137.0 | 5.093 | 140.3 | 76.3 | 100.8 | 86.1 | 69.1 | 51.0 | 47.5 | 51.3 | 47.3 | 58.9 | — | — | — |
| 138.0 | 5.076 | 141.3 | 76.7 | 101.0 | 86.2 | 69.3 | 51.3 | 47.8 | 51.6 | 47.7 | 59.5 | — | — | — |
| 139.0 | 5.059 | 142.4 | 77.3 | 101.3 | 86.3 | 69.6 | 51.8 | 48.2 | 51.9 | 48.1 | 60.0 | — | — | — |
| 140.0 | 5.042 | 143.4 | 77.7 | 101.5 | 86.4 | 69.9 | 52.1 | 48.6 | 52.1 | 48.5 | 60.5 | — | — | — |
| 141.0 | 5.025 | 144.5 | 78.1 | 101.7 | 86.5 | 70.1 | 52.5 | 49.0 | 52.2 | 48.9 | 61.1 | — | — | — |
| 142.0 | 5.009 | 145.6 | 78.6 | 102.0 | 86.7 | 70.4 | 53.0 | 49.4 | 52.2 | 49.4 | 61.7 | — | — | — |
| 143.0 | 4.993 | 146.6 | 79.0 | 102.2 | 86.8 | 70.6 | 53.3 | 49.7 | — | 49.9 | — | — | — | — |
| 144.0 | 4.977 | 147.6 | 79.4 | 102.4 | 86.9 | 70.8 | 53.6 | 50.0 | — | 50.3 | — | — | — | — |
| 145.0 | 4.961 | 148.7 | 80.0 | 102.7 | 87.0 | 71.1 | 54.1 | 50.4 | — | 50.8 | — | — | — | — |
| 146.0 | 4.945 | 149.8 | 80.3 | 102.9 | 87.1 | 71.3 | 54.4 | 50.7 | — | 51.4 | — | — | — | — |
| 147.0 | 4.929 | 150.8 | 80.7 | 103.1 | 87.2 | 71.6 | 54.8 | 51.0 | — | 52.0 | — | — | — | — |
| 148.0 | 4.914 | 151.8 | 81.1 | 103.3 | 87.3 | 71.8 | 55.1 | 51.3 | — | 52.6 | — | — | — | — |
| 149.0 | 4.898 | 152.9 | 81.7 | 103.6 | 87.4 | 72.1 | 55.6 | 51.7 | — | 53.3 | — | — | — | — |
| 150.0 | 4.883 | 154.0 | 82.0 | 103.8 | 87.5 | 72.3 | 55.9 | 52.0 | — | 54.1 | — | — | — | — |
| 151.0 | 4.868 | 155.0 | 82.4 | 104.0 | 87.6 | 72.5 | 56.2 | 52.3 | — | 54.9 | — | — | — | — |
| 152.0 | 4.853 | 156.1 | 82.8 | 104.2 | 87.7 | 72.7 | 56.6 | 52.7 | — | 55.8 | — | — | — | — |
| 153.0 | 4.838 | 157.2 | 83.2 | 104.4 | 87.8 | 73.0 | 56.9 | 53.1 | — | 56.8 | — | — | — | — |
| 154.0 | 4.823 | 158.1 | 83.6 | 104.6 | 87.9 | 73.2 | 57.2 | 53.4 | — | 57.7 | — | — | — | — |
| 155.0 | 4.809 | 159.2 | 83.9 | 104.8 | 88.0 | 73.4 | 57.6 | 53.8 | — | 58.9 | — | — | — | — |
| 156.0 | 4.794 | 160.3 | 84.3 | 105.0 | 88.1 | 73.6 | 57.9 | 54.2 | — | — | — | — | — | — |
| 157.0 | 4.780 | 161.4 | 84.7 | 105.2 | 88.2 | 73.8 | 58.2 | 54.6 | — | — | — | — | — | — |
| 158.0 | 4.776 | 162.4 | 85.1 | 105.4 | 88.3 | 74.0 | 58.5 | 55.0 | — | — | — | — | — | — |
| 159.0 | 4.752 | 163.4 | 85.5 | 105.6 | 88.4 | 74.2 | 58.9 | 55.5 | — | — | — | — | — | — |
| 160.0 | 4.738 | 164.5 | 85.8 | 105.8 | 88.5 | 74.4 | 59.2 | 56.0 | — | — | — | — | — | — |
| 161.0 | 4.724 | 165.5 | 86.2 | 106.0 | 88.6 | 74.7 | 59.5 | 56.4 | — | — | — | — | — | — |
| 162.0 | 4.710 | 166.6 | 86.6 | 106.2 | 88.7 | 74.9 | 59.9 | 56.7 | — | — | — | — | — | — |
| 163.0 | 4.697 | 167.7 | 86.8 | 106.3 | 88.8 | 75.0 | 60.0 | 57.6 | — | — | — | — | — | — |

| | | | | | | | | | | | | |
|-------|-------|-------|------|-------|------|------|------|------|---|---|---|---|
| 164.0 | 4.683 | 168.6 | 87.2 | 106.5 | 88.9 | 75.2 | 60.3 | 58.1 | — | — | — | — |
| 165.0 | 4.670 | 169.7 | 87.5 | 106.7 | 89.0 | 75.4 | 60.7 | 58.7 | — | — | — | — |
| 166.0 | 4.657 | 170.8 | 87.9 | 106.9 | 89.1 | 75.6 | 61.0 | 59.4 | — | — | — | — |
| 167.0 | 4.644 | 171.9 | 88.3 | 107.1 | 89.2 | 75.8 | 61.3 | 60.1 | — | — | — | — |
| 168.0 | 4.631 | 172.9 | 88.7 | 107.3 | 89.3 | 76.0 | 61.7 | 60.8 | — | — | — | — |
| 169.0 | 4.618 | 173.9 | 89.1 | 107.5 | 89.4 | 76.3 | 62.0 | 61.6 | — | — | — | — |
| 170.0 | 4.605 | 175.0 | 89.4 | 107.7 | 89.5 | 76.5 | 62.3 | 62.4 | — | — | — | — |
| 171.0 | 4.592 | 176.0 | 89.8 | 107.9 | 89.6 | 76.7 | 62.6 | 63.1 | — | — | — | — |
| 172.0 | 4.580 | 177.1 | 90.2 | 108.1 | 89.7 | 76.9 | 63.0 | 64.0 | — | — | — | — |
| 173.0 | 4.567 | 178.2 | 90.8 | 108.4 | 89.8 | 77.2 | 63.5 | 64.9 | — | — | — | — |
| 174.0 | 4.555 | 179.3 | 91.2 | 108.6 | 89.9 | 77.4 | 63.8 | 65.8 | — | — | — | — |
| 175.0 | 4.543 | 180.2 | 91.5 | 108.8 | 90.0 | 77.6 | 64.1 | 66.6 | — | — | — | — |

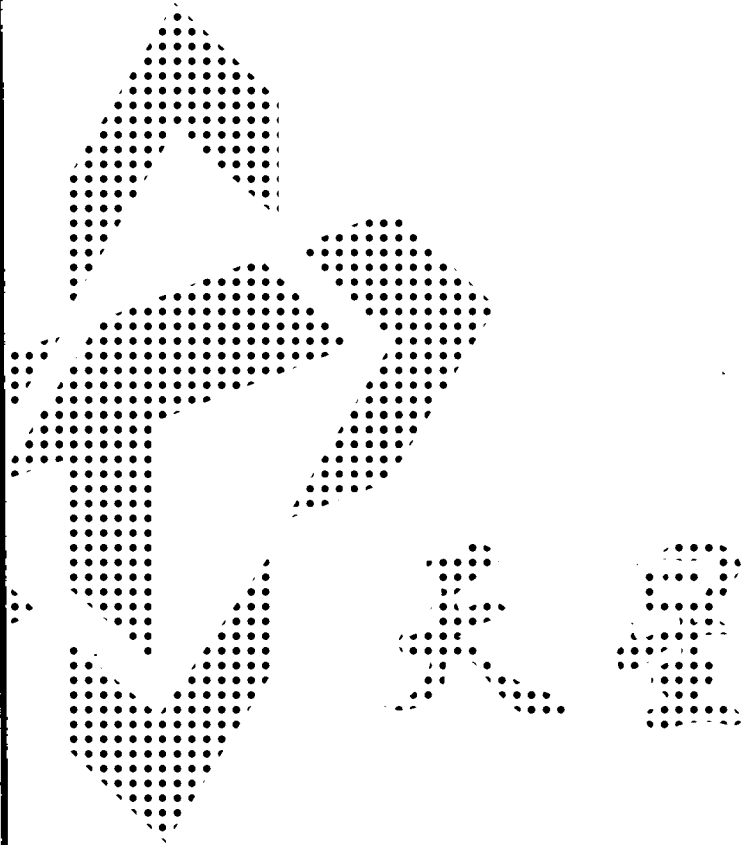


表 3

| 维氏 | 硬度 | | | | | | | | | | 抗拉强度 σ_b , 公斤力/毫米 ² | | | | | | | | | |
|------|-----------|---------------------------------|------|------|------|------|-------|---|-------|---|---------------------------------------|------|--------------|------|-------------|---|--------------|---|-------------|---|
| | 布氏 | | 洛氏 | | 氏 | | 表面洛氏 | | 氏 | | 退火、淬火人工时效 | | 淬火自然时效 | | | | | | | |
| | $P=10D^2$ | | HRB | | HRF | | HR15T | | HR30T | | HR45T | | LY11 LY12 | | LD5 LD10 | | LY11 LY12 | | LD5 LD10 | |
| | HB | $d_{10}, 2d_5$ $4d_{2.5}$ 毫米 | | | | | | | | | | | | | | | | | | |
| 55.0 | 54.0 | 4.710 | — | 51.2 | 61.7 | 16.2 | — | — | — | — | — | 19.4 | 20.6 | 20.7 | — | — | — | — | — | — |
| 56.0 | 54.9 | 4.674 | — | 52.4 | 62.3 | 17.5 | — | — | — | — | — | 19.7 | 20.7 | 20.8 | — | — | — | — | — | — |
| 57.0 | 55.9 | 4.635 | — | 53.6 | 62.9 | 18.7 | — | — | — | — | — | 20.0 | 20.9 | 20.9 | — | — | — | — | — | — |
| 58.0 | 56.8 | 4.600 | — | 54.7 | 63.4 | 19.9 | — | — | — | — | — | 20.3 | 21.1 | 21.1 | — | — | — | — | — | — |
| 59.0 | 57.7 | 4.566 | — | 55.8 | 63.9 | 21.1 | — | — | — | — | — | 20.7 | 21.5 | 21.4 | — | — | — | — | — | — |
| 60.0 | 58.6 | 4.533 | — | 56.9 | 64.5 | 22.3 | — | — | — | — | — | 21.0 | 21.8 | 21.7 | — | — | — | — | — | — |
| 61.0 | 59.6 | 4.497 | — | 58.1 | 65.1 | 23.5 | — | — | — | — | — | 21.3 | 22.3 | 22.1 | — | — | — | — | — | — |
| 62.0 | 60.5 | 4.465 | — | 59.2 | 65.6 | 24.7 | — | — | — | — | — | 21.6 | 22.7 | 22.5 | — | — | — | — | — | — |
| 63.0 | 61.4 | 4.434 | — | 60.2 | 66.1 | 25.8 | — | — | — | — | — | 22.0 | 23.2 | 23.0 | — | — | — | — | — | — |
| 64.0 | 62.3 | 4.404 | — | 61.2 | 66.6 | 26.8 | — | — | — | — | — | 22.3 | 23.7 | 23.5 | — | — | — | — | — | — |
| 65.0 | 63.3 | 4.371 | — | 62.3 | 67.1 | 28.0 | — | — | — | — | — | 22.6 | 24.2 | 24.1 | — | — | — | — | — | — |
| 66.0 | 64.2 | 4.342 | — | 63.3 | 67.6 | 29.1 | — | — | — | — | — | 22.9 | 24.7 | 24.6 | — | — | — | — | — | — |
| 67.0 | 65.1 | 4.313 | 7.0 | 64.3 | 68.1 | 30.2 | — | — | — | — | — | 23.3 | 25.2 | 25.1 | — | — | — | — | — | — |
| 68.0 | 66.0 | 4.285 | 8.8 | 65.2 | 68.6 | 31.1 | — | — | — | — | — | 23.6 | 25.7 | 25.7 | — | — | — | — | — | — |
| 69.0 | 66.9 | 4.258 | 10.6 | 66.2 | 69.1 | 32.2 | — | — | — | — | — | 23.9 | 26.2 | 26.2 | — | — | — | — | — | — |
| 70.0 | 67.9 | 4.228 | 12.4 | 67.2 | 69.5 | 33.3 | — | — | — | — | — | 24.2 | 26.8 | 26.8 | — | — | — | — | — | — |
| 71.0 | 68.8 | 4.201 | 14.3 | 68.1 | 70.0 | 34.2 | — | — | — | — | — | 24.5 | 27.3 | 27.3 | — | — | — | — | — | — |
| 72.0 | 69.7 | 4.175 | 16.0 | 69.0 | 70.4 | 35.2 | — | — | — | — | — | 24.9 | 27.8 | 27.8 | — | — | — | — | — | — |
| 73.0 | 70.6 | 4.150 | 17.5 | 69.8 | 70.8 | 36.0 | — | — | — | — | — | 25.2 | 28.2 | 28.3 | — | — | — | — | — | — |
| 74.0 | 71.6 | 4.122 | 19.4 | 70.8 | 71.3 | 37.1 | 1.8 | — | — | — | — | 25.5 | 28.7 | 28.9 | — | — | — | — | — | — |
| 75.0 | 72.5 | 4.098 | 20.9 | 71.6 | 71.7 | 37.9 | 3.1 | — | — | — | — | 25.8 | 29.1 | 29.3 | — | — | — | — | — | — |
| 76.0 | 73.4 | 4.074 | 22.4 | 72.4 | 72.1 | 38.8 | 4.4 | — | — | — | — | 26.2 | 29.5 | 29.7 | — | — | — | — | — | — |
| 77.0 | 74.3 | 4.050 | 23.9 | 73.2 | 72.5 | 39.7 | 5.7 | — | — | — | — | 26.5 | 29.9 | 30.1 | — | — | — | — | — | — |
| 78.0 | 75.2 | 4.027 | 25.5 | 74.0 | 72.9 | 40.5 | 7.0 | — | — | — | — | 26.8 | 30.3 | 30.5 | — | — | — | — | — | — |
| 79.0 | 76.2 | 4.001 | 27.0 | 74.8 | 73.3 | 41.4 | 8.3 | — | — | — | — | 27.1 | 30.7 | 30.9 | — | — | — | — | — | — |
| 80.0 | 77.1 | 3.979 | 28.5 | 75.6 | 73.7 | 42.2 | 9.6 | — | — | — | — | 27.5 | 31.0 | 31.3 | — | — | — | — | — | — |
| 81.0 | 78.0 | 3.957 | 29.8 | 76.3 | 74.0 | 43.0 | 10.8 | — | — | — | — | 27.8 | 31.3 | 31.6 | — | — | — | — | — | — |
| 82.0 | 78.9 | 3.935 | 31.2 | 77.0 | 74.4 | 43.7 | 11.9 | — | — | — | — | 28.1 | 31.6 | 31.9 | — | — | — | — | — | — |
| 83.0 | 79.9 | 3.912 | 32.7 | 77.8 | 74.8 | 44.6 | 13.3 | — | — | — | — | 28.4 | 31.9 | 32.2 | — | — | — | — | — | — |
| 84.0 | 80.8 | 3.891 | 34.0 | 78.5 | 75.1 | 45.3 | 14.4 | — | — | — | — | 28.8 | 32.2 | 32.4 | — | — | — | — | — | — |
| 85.0 | 81.7 | 3.870 | 35.1 | 79.1 | 75.4 | 46.0 | 15.4 | — | — | — | — | 29.1 | 32.4 | 32.6 | — | — | — | — | — | — |
| 86.0 | 82.6 | 3.850 | 36.5 | 79.8 | 75.7 | 46.7 | 16.5 | — | — | — | — | 29.4 | 32.6 | 32.8 | — | — | — | — | — | — |
| 87.0 | 83.6 | 3.828 | 37.8 | 80.5 | 76.1 | 47.4 | 17.7 | — | — | — | — | 29.7 | 32.9 | 33.0 | — | — | — | — | — | — |
| 88.0 | 84.5 | 3.808 | 38.9 | 81.1 | 76.4 | 48.1 | 18.7 | — | — | — | — | 30.0 | 33.1 | 33.2 | — | — | — | — | — | — |

| | | | | | | | | | | | | | |
|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|
| 89.0 | 85.4 | 3.789 | 40.1 | 81.7 | 76.7 | 48.7 | 19.7 | 30.4 | 33.3 | 33.3 | 33.1 | — | — |
| 90.0 | 86.3 | 3.770 | 41.2 | 82.3 | 77.0 | 49.4 | 20.6 | 30.7 | 33.4 | 33.5 | 33.2 | — | — |
| 91.0 | 87.2 | 3.751 | 42.2 | 82.8 | 77.2 | 49.9 | 21.5 | 31.0 | 33.6 | 33.6 | 33.4 | — | — |
| 92.0 | 88.2 | 3.730 | 43.3 | 83.4 | 77.5 | 50.5 | 22.4 | 31.3 | 33.8 | 33.7 | 33.6 | — | — |
| 93.0 | 89.1 | 3.712 | 44.4 | 84.0 | 77.8 | 51.2 | 23.4 | 31.7 | 33.9 | 33.8 | 33.7 | — | — |
| 94.0 | 90.0 | 3.694 | 45.4 | 84.5 | 78.1 | 51.7 | 24.2 | 32.0 | 34.1 | 33.9 | 33.8 | 41.4 | 41.4 |
| 95.0 | 91.0 | 3.675 | 46.5 | 85.1 | 78.3 | 52.4 | 25.2 | 32.3 | 34.2 | 34.0 | 34.0 | 35.7 | 41.7 |
| 96.0 | 91.9 | 3.657 | 47.5 | 85.6 | 78.6 | 52.9 | 26.1 | 32.6 | 34.4 | 34.1 | 34.1 | 36.2 | 42.1 |
| 97.0 | 92.8 | 3.640 | 48.4 | 86.1 | 78.8 | 53.4 | 26.9 | 33.0 | 34.5 | 34.2 | 34.3 | 36.7 | 42.4 |
| 98.0 | 93.7 | 3.623 | 49.4 | 86.6 | 79.1 | 54.0 | 27.7 | 33.3 | 34.7 | 34.3 | 34.4 | 37.2 | 42.8 |
| 99.0 | 94.6 | 3.606 | 50.3 | 87.1 | 79.3 | 54.5 | 28.5 | 33.6 | 34.8 | 34.4 | 34.6 | 37.7 | 43.1 |
| 100.0 | 95.6 | 3.588 | 51.3 | 87.6 | 79.6 | 55.0 | 29.3 | 33.9 | 35.0 | 34.5 | 34.8 | 38.3 | 43.5 |
| 101.0 | 96.5 | 3.572 | 52.0 | 88.0 | 79.8 | 55.4 | 30.0 | 34.2 | 35.1 | 34.7 | 34.9 | 38.8 | 43.8 |
| 102.0 | 97.4 | 3.556 | 53.0 | 88.5 | 80.0 | 56.0 | 30.8 | 34.6 | 35.5 | 34.8 | 35.1 | 39.3 | 44.2 |
| 103.0 | 98.3 | 3.540 | 53.8 | 88.9 | 80.2 | 56.4 | 31.5 | 34.9 | 35.5 | 34.9 | 35.3 | 39.8 | 44.5 |
| 104.0 | 99.2 | 3.525 | 54.5 | 89.3 | 80.4 | 56.8 | 32.1 | 35.2 | 35.6 | 35.1 | 35.5 | 40.3 | 44.8 |
| 105.0 | 100.2 | 3.508 | 55.5 | 89.8 | 80.7 | 57.4 | 32.9 | 35.5 | 35.8 | 35.3 | 35.7 | 40.8 | 45.2 |
| 106.0 | 101.1 | 3.492 | 56.2 | 90.2 | 80.9 | 57.8 | 33.6 | 35.9 | 36.0 | 35.5 | 35.9 | 41.3 | 45.6 |
| 107.0 | 102.0 | 3.478 | 57.0 | 90.6 | 81.1 | 58.2 | 34.4 | 36.2 | 36.2 | 35.7 | 36.2 | 41.8 | 45.9 |
| 108.0 | 102.9 | 3.463 | 57.7 | 91.0 | 81.3 | 58.6 | 35.1 | 36.5 | 36.4 | 36.0 | 36.4 | 42.3 | 46.2 |
| 109.0 | 103.9 | 3.447 | 58.5 | 91.4 | 81.5 | 59.1 | 35.8 | 36.8 | 36.7 | 36.3 | 36.7 | 42.9 | 46.6 |
| 110.0 | 104.8 | 3.432 | 59.1 | 91.7 | 81.6 | 59.4 | 36.1 | 37.2 | 36.9 | 36.5 | 36.9 | 43.4 | 47.0 |
| 111.0 | 105.7 | 3.418 | 59.8 | 92.1 | 81.8 | 59.8 | 36.7 | 37.5 | 37.2 | 36.8 | 37.2 | 43.9 | 47.3 |
| 112.0 | 106.6 | 3.404 | 60.6 | 92.5 | 82.0 | 60.3 | 37.4 | 37.8 | 37.4 | 37.2 | 37.5 | 44.4 | 47.6 |
| 113.0 | 107.6 | 3.389 | 61.3 | 92.9 | 82.2 | 60.7 | 38.1 | 38.1 | 37.7 | 37.6 | 37.8 | 44.9 | 48.0 |
| 114.0 | 108.5 | 3.375 | 61.9 | 93.2 | 82.3 | 61.0 | 38.5 | 38.5 | 38.0 | 38.0 | 38.1 | 45.5 | 48.3 |
| 115.0 | 109.4 | 3.362 | 62.5 | 93.2 | 82.5 | 61.3 | 39.0 | 38.8 | 38.3 | 38.4 | 38.4 | 46.0 | 48.7 |
| 116.0 | 110.3 | 3.348 | 63.2 | 93.9 | 82.7 | 61.7 | 39.7 | 39.1 | 38.6 | 38.8 | 38.7 | 46.5 | 49.0 |
| 117.0 | 111.2 | 3.335 | 63.8 | 94.2 | 82.8 | 62.1 | 40.2 | 39.4 | 38.9 | 39.2 | 39.1 | 47.0 | 49.4 |
| 118.0 | 112.2 | 3.321 | 64.6 | 94.6 | 83.0 | 62.5 | 40.8 | 39.7 | 39.2 | 39.7 | 39.4 | 47.5 | 49.7 |
| 119.0 | 113.1 | 3.308 | 65.1 | 94.9 | 83.2 | 62.8 | 41.3 | 40.1 | 39.5 | 40.2 | 39.8 | 48.0 | 50.1 |
| 120.0 | 114.0 | 3.295 | 65.7 | 95.2 | 83.3 | 63.1 | 41.8 | 40.4 | 39.9 | 40.7 | 40.1 | 48.5 | 50.4 |
| 121.0 | 114.9 | 3.282 | 66.3 | 95.5 | 83.5 | 63.5 | 42.3 | 40.7 | 40.2 | 41.3 | 40.5 | 49.0 | 50.8 |
| 122.0 | 115.9 | 3.269 | 66.9 | 95.8 | 83.6 | 63.8 | 42.8 | 41.0 | 40.6 | 41.9 | 40.8 | 49.6 | 51.1 |
| 123.0 | 116.8 | 3.256 | 67.4 | 96.1 | 83.8 | 64.1 | 43.3 | 41.4 | 41.0 | 42.4 | 41.2 | 50.1 | 51.5 |
| 124.0 | 117.7 | 3.244 | 68.0 | 96.4 | 83.9 | 64.4 | 43.8 | 41.7 | 41.3 | 43.0 | 41.6 | 50.6 | 51.8 |
| 125.0 | 118.6 | 3.232 | 68.6 | 96.7 | 84.1 | 64.7 | 44.3 | 42.0 | 41.7 | 43.5 | 41.9 | 51.1 | 52.2 |
| 126.0 | 119.6 | 3.219 | 69.1 | 97.0 | 84.2 | 65.1 | 44.8 | 42.3 | 42.1 | 44.2 | 42.3 | 51.6 | 52.5 |
| 127.0 | 120.5 | 3.207 | 69.7 | 97.3 | 84.3 | 65.4 | 45.2 | 42.7 | 42.5 | 44.8 | 42.7 | 52.1 | 52.9 |
| 128.0 | 121.4 | 3.196 | 70.3 | 97.6 | 84.5 | 65.7 | 45.7 | 43.0 | 42.9 | 45.3 | 43.0 | 52.6 | 53.2 |
| 129.0 | 122.3 | 3.184 | 70.6 | 97.8 | 84.6 | 65.9 | 46.1 | 43.3 | 43.3 | 45.9 | 43.4 | 53.1 | 53.6 |
| 130.0 | 123.2 | 3.173 | 71.2 | 98.1 | 84.7 | 66.2 | 46.6 | 43.6 | 43.6 | 46.5 | 43.7 | 53.6 | 53.9 |

续表 3

| 维氏 | | 硬度 | | | | | | | | | | 抗拉强度 σ_b 公斤力/毫米 ² | | | | | | | | |
|-------|-------|-----------|------|-------|------|------|------|-------|------|-------|------|-------------------------------------|------|------|------|--------|------|------|------|------|
| | | 布氏 | | 洛氏 | | 氏 | | 表面 | | 洛氏 | | 退火、淬火 | | 人工时效 | | 淬火自然时效 | | | | |
| | | $P=10D^2$ | | HRB | | HRF | | HR15T | | HR30T | | HR45T | | LY11 | LY12 | LD5 | LD10 | LY11 | LY12 | LD5 |
| 131.0 | 124.2 | 3.161 | 71.8 | 98.4 | 84.9 | 66.5 | 47.1 | 44.0 | 44.1 | 47.1 | 44.1 | 44.0 | 44.1 | 47.1 | 44.1 | 44.1 | 54.2 | 54.3 | 54.2 | 54.3 |
| 132.0 | 125.1 | 3.149 | 72.4 | 98.7 | 85.0 | 66.8 | 47.5 | 44.3 | 44.4 | 47.5 | 44.3 | 44.3 | 44.4 | 47.7 | 44.4 | 44.4 | 54.7 | 54.6 | 54.7 | 54.6 |
| 133.0 | 126.0 | 3.138 | 72.7 | 98.9 | 85.1 | 67.1 | 47.9 | 44.6 | 44.8 | 47.9 | 44.6 | 44.6 | 44.8 | 48.2 | 44.8 | 44.8 | 55.2 | 55.0 | 55.2 | 55.0 |
| 134.0 | 126.9 | 3.128 | 73.3 | 99.2 | 85.3 | 67.4 | 48.4 | 44.9 | 45.2 | 48.4 | 44.9 | 44.9 | 45.2 | 48.7 | 45.1 | 45.1 | 55.7 | 55.3 | 55.7 | 55.3 |
| 135.0 | 127.9 | 3.116 | 73.9 | 99.5 | 85.4 | 67.7 | 48.9 | 45.2 | 45.6 | 48.9 | 45.2 | 45.2 | 45.6 | 49.3 | 45.5 | 45.5 | 56.3 | 55.7 | 56.3 | 55.7 |
| 136.0 | 128.8 | 3.105 | 74.3 | 99.7 | 85.5 | 67.9 | 49.2 | 45.6 | 46.0 | 49.2 | 45.6 | 45.6 | 46.0 | 49.7 | 45.8 | 45.8 | 56.8 | 56.0 | 56.8 | 56.0 |
| 137.0 | 129.7 | 3.094 | 74.8 | 100.0 | 85.7 | 68.2 | 49.7 | 45.9 | 46.3 | 49.7 | 45.9 | 45.9 | 46.3 | 50.2 | 46.2 | 46.2 | 57.3 | 56.4 | 57.3 | 56.4 |
| 138.0 | 130.6 | 3.084 | 75.2 | 100.2 | 85.8 | 68.5 | 50.0 | 46.4 | 46.7 | 50.0 | 46.4 | 46.4 | 46.7 | 50.6 | 46.5 | 46.5 | 57.8 | — | 57.8 | — |
| 139.0 | 131.5 | 3.074 | 75.6 | 100.4 | 85.9 | 68.7 | 50.3 | 46.5 | 47.1 | 50.3 | 46.5 | 46.5 | 47.1 | 50.9 | 46.9 | 46.9 | 58.3 | — | 58.3 | — |
| 140.0 | 132.5 | 3.062 | 76.2 | 100.7 | 86.0 | 69.0 | 50.8 | 46.9 | 47.5 | 50.8 | 46.9 | 46.9 | 47.5 | 51.3 | 47.3 | 47.3 | 58.8 | — | 58.8 | — |
| 141.0 | 133.4 | 3.052 | 76.5 | 100.9 | 86.1 | 69.2 | 51.2 | 47.2 | 47.8 | 51.2 | 47.2 | 47.2 | 47.8 | 51.6 | 47.6 | 47.6 | 59.3 | — | 59.3 | — |
| 142.0 | 134.3 | 3.042 | 77.1 | 101.2 | 86.3 | 69.5 | 51.6 | 47.5 | 48.1 | 51.6 | 47.5 | 47.5 | 48.1 | 51.8 | 48.0 | 48.0 | 59.8 | — | 59.8 | — |
| 143.0 | 135.2 | 3.032 | 77.5 | 101.4 | 86.4 | 69.7 | 52.0 | 47.8 | 48.5 | 52.0 | 47.8 | 47.8 | 48.5 | 52.0 | 48.3 | 48.3 | 60.3 | — | 60.3 | — |
| 144.0 | 136.2 | 3.022 | 77.9 | 101.6 | 86.5 | 70.0 | 52.3 | 48.2 | 48.8 | 52.3 | 48.2 | 48.2 | 48.8 | 52.1 | 48.8 | 48.8 | 60.9 | — | 60.9 | — |
| 145.0 | 137.1 | 3.012 | 78.4 | 101.9 | 86.6 | 70.3 | 52.8 | 48.5 | 49.2 | 52.8 | 48.5 | 48.5 | 49.2 | 52.2 | 49.2 | 49.2 | 61.4 | — | 61.4 | — |
| 146.0 | 138.0 | 3.002 | 78.8 | 102.1 | 86.7 | 70.5 | 53.1 | 48.8 | 49.5 | 53.1 | 48.8 | 48.8 | 49.5 | 52.3 | 49.6 | 49.6 | 61.9 | — | 61.9 | — |
| 147.0 | 138.9 | 2.993 | 79.2 | 102.3 | 86.8 | 70.7 | 53.5 | 49.1 | 49.8 | 53.5 | 49.1 | 49.1 | 49.8 | — | 50.0 | 50.0 | — | — | — | — |
| 148.0 | 139.9 | 2.982 | 79.6 | 102.5 | 86.9 | 70.9 | 53.8 | 49.4 | 50.2 | 53.8 | 49.4 | 49.4 | 50.2 | — | 50.5 | 50.5 | — | — | — | — |
| 149.0 | 140.8 | 2.973 | 80.0 | 102.7 | 87.0 | 71.1 | 54.1 | 49.8 | 50.5 | 54.1 | 49.8 | 49.8 | 50.5 | — | 51.0 | 51.0 | — | — | — | — |
| 150.0 | 141.7 | 2.964 | 80.5 | 103.0 | 87.2 | 71.5 | 54.6 | 50.1 | 50.8 | 54.6 | 50.1 | 50.1 | 50.8 | — | 51.5 | 51.5 | — | — | — | — |
| 151.0 | 142.6 | 2.955 | 80.9 | 103.2 | 87.3 | 71.7 | 54.9 | 50.4 | 51.1 | 54.9 | 50.4 | 50.4 | 51.1 | — | 52.1 | 52.1 | — | — | — | — |
| 152.0 | 143.5 | 2.945 | 81.3 | 103.4 | 87.4 | 71.9 | 55.3 | 50.7 | 51.4 | 55.3 | 50.7 | 50.7 | 51.4 | — | 52.7 | 52.7 | — | — | — | — |
| 153.0 | 144.5 | 2.936 | 81.7 | 103.6 | 87.5 | 72.1 | 55.6 | 51.1 | 51.7 | 55.6 | 51.1 | 51.1 | 51.7 | — | 53.4 | 53.4 | — | — | — | — |
| 154.0 | 145.4 | 2.927 | 82.0 | 103.8 | 87.5 | 72.3 | 55.9 | 51.4 | 52.0 | 55.9 | 51.4 | 51.4 | 52.0 | — | 54.1 | 54.1 | — | — | — | — |
| 155.0 | 146.3 | 2.918 | 82.4 | 104.0 | 87.6 | 72.5 | 56.2 | 51.7 | 52.3 | 56.2 | 51.7 | 51.7 | 52.3 | — | 54.9 | 54.9 | — | — | — | — |
| 156.0 | 147.2 | 2.909 | 82.8 | 104.2 | 87.7 | 72.7 | 56.6 | 52.0 | 52.7 | 56.6 | 52.0 | 52.0 | 52.7 | — | 55.7 | 55.7 | — | — | — | — |
| 157.0 | 148.2 | 2.899 | 83.2 | 104.4 | 87.8 | 73.0 | 56.9 | 52.4 | 53.0 | 56.9 | 52.4 | 52.4 | 53.0 | — | 56.7 | 56.7 | — | — | — | — |
| 158.0 | 149.1 | 2.891 | 83.6 | 104.6 | 87.9 | 73.2 | 57.2 | 52.7 | 53.4 | 57.2 | 52.7 | 52.7 | 53.4 | — | 57.6 | 57.6 | — | — | — | — |
| 159.0 | 150.0 | 2.882 | 83.9 | 104.8 | 88.0 | 73.4 | 57.6 | 53.0 | 53.7 | 57.6 | 53.0 | 53.0 | 53.7 | — | 58.6 | 58.6 | — | — | — | — |
| 160.0 | 150.9 | 2.874 | 84.1 | 104.9 | 88.1 | 73.5 | 57.7 | 53.3 | 54.1 | 57.7 | 53.3 | 53.3 | 54.1 | — | — | — | — | — | — | — |
| 161.0 | 151.9 | 2.865 | 84.5 | 105.1 | 88.2 | 73.7 | 58.0 | 53.7 | 54.5 | 58.0 | 53.7 | 53.7 | 54.5 | — | — | — | — | — | — | — |
| 162.0 | 152.8 | 2.856 | 84.9 | 105.3 | 88.3 | 73.9 | 58.4 | 54.0 | 54.9 | 58.4 | 54.0 | 54.0 | 54.9 | — | — | — | — | — | — | — |
| 163.0 | 153.7 | 2.848 | 85.3 | 105.5 | 88.4 | 74.1 | 58.7 | 54.3 | 55.3 | 58.7 | 54.3 | 54.3 | 55.3 | — | — | — | — | — | — | — |
| 164.0 | 154.6 | 2.840 | 85.6 | 105.7 | 88.5 | 74.3 | 59.0 | 54.6 | 55.7 | 59.0 | 54.6 | 54.6 | 55.7 | — | — | — | — | — | — | — |

表 4

| 洛 氏 | | 硬 度 | | | | | | | | | | 抗 拉 强 度 σ_s , 公 斤 力 / 毫 米 ² | | | | |
|------|------|------|-------|-------|-------|------|-------|-----------|------|------|------|---|------|-------------|------|-----|
| | | 氏 | | 洛 氏 | | 氏 | | 布 氏 | | 氏 | | 退 火、淬 火 人 工 时 效 | | 淬 火 自 然 时 效 | | |
| | | HRF | HR15T | HR30T | HR45T | HV | HB | $P=10D^2$ | LY11 | LY12 | LC4 | LD5 | LD10 | LY11 | LY12 | LD5 |
| 20.0 | 71.1 | 71.5 | 37.4 | 2.3 | 74.4 | 71.9 | 4.114 | 25.6 | 28.9 | 29.0 | 29.0 | 29.0 | — | — | — | — |
| 20.5 | 71.4 | 71.6 | 37.7 | 2.8 | 74.8 | 72.3 | 4.103 | 25.8 | 29.0 | 29.2 | 29.2 | 29.2 | — | — | — | — |
| 21.0 | 71.7 | 71.8 | 38.1 | 3.2 | 75.1 | 72.6 | 4.095 | 25.9 | 29.2 | 29.3 | 29.3 | 29.3 | — | — | — | — |
| 21.5 | 71.9 | 71.9 | 38.3 | 3.6 | 75.4 | 72.8 | 4.090 | 25.9 | 29.3 | 29.4 | 29.4 | 29.4 | — | — | — | — |
| 22.0 | 72.2 | 72.0 | 38.6 | 4.1 | 75.8 | 73.2 | 4.079 | 26.1 | 29.5 | 29.5 | 29.5 | 29.5 | — | — | — | — |
| 22.5 | 72.4 | 72.1 | 38.8 | 4.4 | 76.0 | 73.4 | 4.074 | 26.2 | 29.5 | 29.6 | 29.6 | 29.6 | — | — | — | — |
| 23.0 | 72.7 | 72.2 | 39.1 | 4.9 | 76.3 | 73.7 | 4.066 | 26.3 | 29.7 | 29.7 | 29.7 | 29.7 | — | — | — | — |
| 23.5 | 73.0 | 72.4 | 39.4 | 5.4 | 76.8 | 74.1 | 4.055 | 26.4 | 29.8 | 29.8 | 29.8 | 29.8 | — | — | — | — |
| 24.0 | 73.2 | 72.5 | 39.7 | 5.7 | 77.0 | 74.3 | 4.050 | 26.5 | 29.9 | 30.1 | 30.1 | 30.1 | — | — | — | — |
| 24.5 | 73.5 | 72.6 | 40.0 | 6.2 | 77.3 | 74.6 | 4.042 | 26.6 | 30.1 | 30.3 | 30.3 | 30.3 | — | — | — | — |
| 25.0 | 73.8 | 72.8 | 40.3 | 6.7 | 77.7 | 75.0 | 4.032 | 26.7 | 30.2 | 30.5 | 30.5 | 30.5 | — | — | — | — |
| 25.5 | 74.0 | 72.9 | 40.5 | 7.0 | 78.0 | 75.2 | 4.027 | 26.8 | 30.3 | 30.5 | 30.5 | 30.5 | — | — | — | — |
| 26.0 | 74.3 | 73.0 | 40.8 | 7.5 | 78.4 | 75.6 | 4.017 | 26.9 | 30.5 | 30.7 | 30.7 | 30.7 | — | — | — | — |
| 26.5 | 74.5 | 73.1 | 41.0 | 7.8 | 78.6 | 75.8 | 4.011 | 27.0 | 30.5 | 30.8 | 30.8 | 30.8 | — | — | — | — |
| 27.0 | 74.8 | 73.3 | 41.4 | 8.3 | 79.0 | 76.2 | 4.001 | 27.1 | 30.7 | 30.9 | 30.9 | 30.9 | — | — | — | — |
| 27.5 | 75.1 | 73.4 | 41.7 | 8.8 | 79.4 | 76.5 | 3.994 | 27.2 | 30.8 | 31.1 | 31.1 | 31.1 | — | — | — | — |
| 28.0 | 75.3 | 73.5 | 41.9 | 9.2 | 79.7 | 76.8 | 3.986 | 27.3 | 30.9 | 31.2 | 31.2 | 31.2 | — | — | — | — |
| 28.5 | 75.6 | 73.7 | 42.2 | 9.6 | 80.0 | 77.1 | 3.979 | 27.5 | 31.0 | 31.3 | 31.3 | 31.3 | — | — | — | — |
| 29.0 | 75.9 | 73.8 | 42.5 | 10.1 | 80.4 | 77.5 | 3.969 | 27.6 | 31.2 | 31.4 | 31.4 | 31.4 | — | — | — | — |
| 29.5 | 76.1 | 73.9 | 42.7 | 10.5 | 80.8 | 77.8 | 3.962 | 27.7 | 31.3 | 31.5 | 31.5 | 31.5 | — | — | — | — |
| 30.0 | 76.4 | 74.1 | 43.1 | 11.0 | 81.1 | 78.1 | 3.955 | 27.8 | 31.4 | 31.6 | 31.6 | 31.6 | — | — | — | — |
| 30.5 | 76.7 | 74.2 | 43.4 | 11.4 | 81.5 | 78.5 | 3.945 | 27.9 | 31.5 | 31.7 | 31.7 | 31.7 | — | — | — | — |
| 31.0 | 76.9 | 74.3 | 43.6 | 11.8 | 81.9 | 78.8 | 3.938 | 28.1 | 31.6 | 31.8 | 31.8 | 31.8 | — | — | — | — |
| 31.5 | 77.2 | 74.5 | 43.9 | 12.3 | 82.2 | 79.1 | 3.931 | 28.2 | 31.7 | 31.9 | 31.9 | 31.9 | — | — | — | — |
| 32.0 | 77.4 | 74.6 | 44.1 | 12.6 | 82.5 | 79.4 | 3.923 | 28.3 | 31.8 | 32.0 | 32.0 | 32.0 | — | — | — | — |
| 32.5 | 77.7 | 74.7 | 44.5 | 13.1 | 82.9 | 79.8 | 3.914 | 28.4 | 31.9 | 32.1 | 32.1 | 32.1 | — | — | — | — |
| 33.0 | 78.0 | 74.9 | 44.8 | 13.6 | 83.4 | 80.2 | 3.905 | 28.5 | 32.0 | 32.2 | 32.2 | 32.2 | — | — | — | — |
| 33.5 | 78.2 | 75.0 | 45.0 | 13.9 | 83.7 | 80.5 | 3.898 | 28.6 | 32.1 | 32.3 | 32.3 | 32.3 | — | — | — | — |
| 34.0 | 78.5 | 75.1 | 45.3 | 14.4 | 84.1 | 80.9 | 3.888 | 28.8 | 32.2 | 32.4 | 32.4 | 32.4 | — | — | — | — |
| 34.5 | 78.8 | 75.2 | 45.6 | 14.9 | 84.6 | 81.3 | 3.879 | 28.9 | 32.3 | 32.5 | 32.5 | 32.5 | — | — | — | — |
| 35.0 | 79.0 | 75.3 | 45.8 | 15.2 | 84.8 | 81.5 | 3.875 | 29.0 | 32.4 | 32.6 | 32.6 | 32.6 | — | — | — | — |
| 35.5 | 79.3 | 75.5 | 46.2 | 15.7 | 85.3 | 82.0 | 3.863 | 29.2 | 32.5 | 32.7 | 32.7 | 32.7 | — | — | — | — |
| 36.0 | 79.6 | 75.6 | 46.5 | 16.2 | 85.8 | 82.4 | 3.854 | 29.3 | 32.6 | 32.8 | 32.8 | 32.8 | — | — | — | — |
| 36.5 | 79.8 | 75.7 | 46.7 | 16.5 | 86.1 | 82.7 | 3.848 | 29.4 | 32.7 | 32.8 | 32.8 | 32.8 | — | — | — | — |
| 37.0 | 80.1 | 75.9 | 47.0 | 17.0 | 86.5 | 83.1 | 3.839 | 29.6 | 32.8 | 32.9 | 32.9 | 32.9 | — | — | — | — |
| 37.5 | 80.3 | 76.0 | 47.2 | 17.4 | 86.8 | 83.4 | 3.832 | 29.7 | 32.8 | 33.0 | 33.0 | 33.0 | — | — | — | — |
| 38.0 | 80.6 | 76.1 | 47.6 | 17.8 | 87.3 | 83.8 | 3.823 | 29.8 | 32.9 | 33.1 | 33.1 | 33.1 | — | — | — | — |

| | | | | | | | | | | | | |
|------|------|------|------|-------|-------|-------|------|------|------|------|------|------|
| 38.5 | 76.3 | 47.9 | 18.3 | 87.7 | 84.2 | 3.814 | 29.9 | 33.0 | 33.1 | 32.9 | — | — |
| 39.0 | 76.4 | 48.1 | 18.7 | 88.0 | 84.5 | 3.808 | 30.0 | 33.1 | 33.2 | 32.9 | — | — |
| 39.5 | 76.5 | 48.4 | 19.2 | 88.6 | 85.0 | 3.797 | 30.2 | 33.2 | 33.3 | 33.0 | — | — |
| 40.0 | 76.7 | 48.7 | 19.7 | 89.0 | 85.4 | 3.789 | 30.4 | 33.3 | 33.3 | 33.1 | — | — |
| 40.5 | 76.8 | 48.9 | 20.0 | 89.4 | 85.8 | 3.780 | 30.5 | 33.3 | 33.4 | 33.2 | — | — |
| 41.0 | 76.9 | 49.3 | 20.5 | 89.9 | 86.2 | 3.772 | 30.6 | 33.4 | 33.4 | 33.2 | — | — |
| 41.5 | 77.0 | 49.5 | 20.8 | 90.2 | 86.5 | 3.765 | 30.7 | 33.5 | 33.5 | 33.3 | — | — |
| 42.0 | 77.2 | 49.8 | 21.3 | 90.7 | 87.0 | 3.755 | 30.9 | 33.6 | 33.6 | 33.4 | — | — |
| 42.5 | 77.3 | 50.1 | 21.8 | 91.3 | 87.5 | 3.745 | 31.1 | 33.6 | 33.6 | 33.4 | — | — |
| 43.0 | 77.4 | 50.3 | 22.1 | 91.6 | 87.8 | 3.738 | 31.2 | 33.7 | 33.7 | 33.5 | — | — |
| 43.5 | 77.6 | 50.6 | 22.6 | 92.1 | 88.3 | 3.728 | 31.4 | 33.8 | 33.7 | 33.6 | — | — |
| 44.0 | 77.7 | 51.0 | 23.1 | 92.7 | 88.8 | 3.718 | 31.6 | 33.9 | 33.8 | 33.6 | — | — |
| 44.5 | 77.8 | 51.2 | 23.4 | 93.0 | 89.1 | 3.712 | 31.7 | 33.9 | 33.8 | 33.7 | — | — |
| 45.0 | 78.0 | 51.5 | 23.9 | 93.6 | 89.5 | 3.702 | 31.8 | 34.0 | 33.9 | 33.8 | — | — |
| 45.5 | 78.1 | 51.8 | 24.4 | 94.1 | 89.9 | 3.692 | 32.0 | 34.1 | 33.9 | 33.8 | 34.9 | 41.4 |
| 46.0 | 78.2 | 52.0 | 24.7 | 94.5 | 90.5 | 3.684 | 32.1 | 34.2 | 34.0 | 33.9 | 35.2 | 41.6 |
| 46.5 | 78.3 | 52.4 | 25.2 | 95.1 | 91.0 | 3.675 | 32.3 | 34.2 | 34.0 | 34.0 | 35.4 | 41.7 |
| 47.0 | 78.4 | 52.6 | 25.6 | 95.5 | 91.4 | 3.667 | 32.5 | 34.3 | 34.1 | 34.0 | 35.7 | 41.9 |
| 47.5 | 78.6 | 52.9 | 26.1 | 96.0 | 91.9 | 3.657 | 32.6 | 34.4 | 34.1 | 34.1 | 35.9 | 42.1 |
| 48.0 | 78.7 | 53.2 | 26.5 | 96.6 | 92.4 | 3.648 | 32.8 | 34.5 | 34.2 | 34.2 | 36.2 | 42.3 |
| 48.5 | 78.8 | 53.4 | 26.9 | 97.0 | 92.8 | 3.640 | 33.0 | 34.5 | 34.2 | 34.2 | 36.5 | 42.4 |
| 49.0 | 79.0 | 53.7 | 27.4 | 97.7 | 93.4 | 3.633 | 33.2 | 34.6 | 34.3 | 34.3 | 36.7 | 42.6 |
| 49.5 | 79.1 | 54.1 | 27.9 | 98.2 | 93.9 | 3.626 | 33.3 | 34.7 | 34.3 | 34.3 | 37.0 | 42.8 |
| 50.0 | 79.2 | 54.3 | 28.2 | 98.6 | 94.3 | 3.612 | 33.5 | 34.8 | 34.4 | 34.5 | 37.5 | 43.0 |
| 50.5 | 79.4 | 54.6 | 28.7 | 99.3 | 94.9 | 3.601 | 33.7 | 34.9 | 34.4 | 34.6 | 37.9 | 43.2 |
| 51.0 | 79.5 | 54.9 | 29.2 | 99.9 | 95.5 | 3.590 | 33.9 | 35.0 | 34.5 | 34.7 | 38.2 | 43.4 |
| 51.5 | 79.6 | 55.1 | 29.5 | 100.4 | 95.9 | 3.583 | 34.0 | 35.0 | 34.6 | 34.8 | 38.4 | 43.6 |
| 52.0 | 79.8 | 55.4 | 30.0 | 101.0 | 96.5 | 3.572 | 34.2 | 35.1 | 34.7 | 34.9 | 38.8 | 43.8 |
| 52.5 | 79.9 | 55.7 | 30.3 | 101.5 | 96.9 | 3.565 | 34.4 | 35.2 | 34.7 | 35.0 | 39.0 | 44.0 |
| 53.0 | 80.0 | 56.0 | 30.8 | 102.1 | 97.5 | 3.554 | 34.6 | 35.3 | 34.8 | 35.1 | 39.3 | 44.2 |
| 53.5 | 80.2 | 56.3 | 31.3 | 102.8 | 98.1 | 3.544 | 34.8 | 35.4 | 34.9 | 35.2 | 39.7 | 44.4 |
| 54.0 | 80.3 | 56.5 | 31.6 | 103.2 | 98.5 | 3.537 | 34.9 | 35.5 | 35.0 | 35.3 | 39.9 | 44.6 |
| 54.5 | 80.4 | 56.8 | 32.1 | 104.0 | 99.2 | 3.525 | 35.2 | 35.6 | 35.1 | 35.5 | 40.3 | 44.8 |
| 55.0 | 80.6 | 57.2 | 32.6 | 104.6 | 99.8 | 3.514 | 35.4 | 35.8 | 35.2 | 35.6 | 40.6 | 45.1 |
| 55.5 | 80.7 | 57.4 | 32.9 | 105.1 | 100.3 | 3.506 | 35.6 | 35.9 | 35.3 | 35.7 | 40.9 | 45.3 |
| 56.0 | 80.8 | 57.7 | 33.4 | 105.8 | 100.9 | 3.496 | 35.8 | 36.0 | 35.5 | 35.9 | 41.2 | 45.5 |
| 56.5 | 81.0 | 58.0 | 33.9 | 106.6 | 101.6 | 3.484 | 36.0 | 36.1 | 35.6 | 36.0 | 41.6 | 45.7 |
| 57.0 | 81.1 | 58.2 | 34.3 | 107.1 | 102.1 | 3.476 | 36.2 | 36.3 | 35.7 | 36.2 | 41.9 | 45.9 |
| 57.5 | 81.2 | 58.5 | 34.7 | 107.9 | 102.8 | 3.464 | 36.5 | 36.4 | 35.9 | 36.4 | 42.3 | 46.2 |
| 58.0 | 81.3 | 58.8 | 35.1 | 108.3 | 103.2 | 3.458 | 36.6 | 36.5 | 36.0 | 36.5 | 42.5 | 46.3 |
| 58.5 | 81.4 | 59.1 | 35.6 | 109.2 | 104.0 | 3.445 | 36.9 | 36.7 | 36.3 | 36.7 | 42.9 | 46.6 |
| 59.0 | 81.6 | 59.4 | 36.1 | 109.9 | 104.7 | 3.434 | 37.1 | 36.9 | 36.5 | 36.9 | 43.3 | 46.9 |
| 59.5 | 81.7 | 59.6 | 36.4 | 110.5 | 105.2 | 3.426 | 37.3 | 37.0 | 36.7 | 37.0 | 43.6 | 47.1 |
| 60.0 | 81.8 | 59.9 | 36.9 | 111.2 | 105.9 | 3.415 | 37.5 | 37.2 | 36.9 | 37.3 | 44.0 | 47.4 |
| 60.5 | 82.0 | 60.3 | 37.4 | 112.1 | 106.7 | 3.402 | 37.8 | 37.4 | 37.2 | 37.5 | 44.4 | 47.7 |
| 61.0 | 82.1 | 60.5 | 37.7 | 112.6 | 107.2 | 3.395 | 38.0 | 37.6 | 37.4 | 37.7 | 44.7 | 47.9 |

续表 4

| 洛 氏 | | 硬 度 | | | | | | | | | | 抗 拉 强 度 σ_s , 公斤力/毫米 ² | | | | | |
|------|-------|------|------|-------|-------|-------|-------|------|---|------|------|--|------|-----------------|------|-------------|-----|
| | | 氏 | | 洛 氏 | | 氏 | | 维 氏 | | 布 氏 | | 氏 | | 退 火、淬 火 人 工 时 效 | | 淬 火 自 然 时 效 | |
| | | HRB | HRF | HR15T | HR30T | HR45T | HV | HB | $P = 10D^2$ $d_{1.0}, 2d_s$ $4d_{s.0}$ 毫米 | LY11 | LY12 | LC4 | LD5 | LD10 | LY11 | LY12 | LD5 |
| 61.5 | 93.0 | 82.2 | 60.8 | 38.2 | 113.5 | 108.0 | 3.383 | 37.8 | 38.3 | 37.8 | 37.7 | 37.9 | 45.2 | 48.2 | | | |
| 62.0 | 93.2 | 82.3 | 61.0 | 38.5 | 114.0 | 108.5 | 3.375 | 38.0 | 38.5 | 38.0 | 38.0 | 38.1 | 45.5 | 48.3 | | | |
| 62.5 | 93.5 | 82.5 | 61.3 | 39.0 | 114.9 | 109.0 | 3.363 | 38.2 | 38.7 | 38.2 | 38.3 | 38.4 | 45.9 | 48.7 | | | |
| 63.0 | 93.8 | 82.6 | 61.6 | 39.5 | 115.8 | 109.5 | 3.351 | 38.5 | 39.0 | 38.5 | 38.7 | 38.7 | 46.3 | 49.0 | | | |
| 63.5 | 94.0 | 82.7 | 61.9 | 39.8 | 116.3 | 110.0 | 3.344 | 38.7 | 39.2 | 38.7 | 38.9 | 38.8 | 46.6 | 49.1 | | | |
| 64.0 | 94.3 | 82.9 | 62.2 | 40.3 | 117.3 | 110.5 | 3.331 | 39.0 | 39.5 | 39.0 | 39.4 | 39.2 | 47.1 | 49.5 | | | |
| 64.5 | 94.6 | 83.0 | 62.5 | 40.8 | 118.1 | 111.0 | 3.318 | 39.3 | 39.8 | 39.3 | 39.8 | 39.5 | 47.6 | 49.8 | | | |
| 65.0 | 94.8 | 83.1 | 62.7 | 41.1 | 118.5 | 111.5 | 3.305 | 39.5 | 40.0 | 39.5 | 40.1 | 39.7 | 47.9 | 50.0 | | | |
| 65.5 | 95.1 | 83.3 | 63.0 | 41.6 | 119.3 | 112.0 | 3.292 | 39.8 | 40.3 | 39.8 | 40.6 | 40.0 | 48.4 | 50.4 | | | |
| 66.0 | 95.4 | 83.4 | 63.3 | 42.1 | 120.6 | 113.8 | 3.278 | 40.1 | 40.6 | 40.1 | 41.1 | 40.3 | 48.8 | 50.7 | | | |
| 66.5 | 95.6 | 83.5 | 63.6 | 42.5 | 121.3 | 114.6 | 3.266 | 40.3 | 40.8 | 40.3 | 41.4 | 40.6 | 49.2 | 50.9 | | | |
| 67.0 | 95.9 | 83.7 | 63.9 | 43.0 | 122.3 | 116.1 | 3.253 | 40.7 | 41.1 | 40.7 | 42.0 | 40.9 | 49.7 | 51.2 | | | |
| 67.5 | 96.1 | 83.8 | 64.1 | 43.3 | 122.9 | 116.7 | 3.241 | 40.9 | 41.3 | 40.9 | 42.3 | 41.2 | 50.0 | 51.4 | | | |
| 68.0 | 96.4 | 83.9 | 64.4 | 43.8 | 124.0 | 117.7 | 3.228 | 41.3 | 41.7 | 41.3 | 43.0 | 41.6 | 50.6 | 51.8 | | | |
| 68.5 | 96.7 | 84.1 | 64.7 | 44.3 | 125.0 | 118.6 | 3.215 | 41.7 | 42.0 | 41.7 | 43.5 | 41.9 | 51.1 | 52.2 | | | |
| 69.0 | 96.9 | 84.2 | 64.9 | 44.6 | 125.6 | 119.2 | 3.202 | 41.9 | 42.2 | 41.9 | 43.9 | 42.1 | 51.4 | 52.4 | | | |
| 69.5 | 97.2 | 84.3 | 65.3 | 45.1 | 126.7 | 120.2 | 3.189 | 42.4 | 42.5 | 42.4 | 44.6 | 42.5 | 52.0 | 52.8 | | | |
| 70.0 | 97.5 | 84.4 | 65.6 | 45.6 | 127.8 | 121.2 | 3.176 | 42.8 | 42.9 | 42.8 | 45.2 | 42.9 | 52.5 | 53.1 | | | |
| 70.5 | 97.7 | 84.5 | 65.8 | 45.9 | 128.4 | 121.8 | 3.163 | 43.0 | 43.1 | 43.0 | 45.6 | 43.2 | 52.9 | 53.4 | | | |
| 71.0 | 98.0 | 84.7 | 66.1 | 46.4 | 129.5 | 122.8 | 3.150 | 43.5 | 43.5 | 43.5 | 46.2 | 43.6 | 53.4 | 53.8 | | | |
| 71.5 | 98.2 | 84.8 | 66.3 | 46.7 | 130.3 | 123.5 | 3.137 | 43.8 | 43.7 | 43.8 | 46.7 | 43.8 | 53.8 | 54.0 | | | |
| 72.0 | 98.5 | 84.9 | 66.7 | 47.2 | 131.4 | 124.5 | 3.124 | 44.2 | 44.1 | 44.2 | 47.3 | 44.2 | 54.4 | 54.4 | | | |
| 72.5 | 98.8 | 85.1 | 67.0 | 47.7 | 132.6 | 125.5 | 3.111 | 44.7 | 44.4 | 44.7 | 48.0 | 44.6 | 55.0 | 54.8 | | | |
| 73.0 | 99.0 | 85.2 | 67.2 | 48.0 | 133.3 | 126.3 | 3.098 | 44.9 | 44.7 | 44.9 | 48.4 | 44.9 | 55.4 | 55.1 | | | |
| 73.5 | 99.3 | 85.3 | 67.5 | 48.5 | 134.4 | 127.3 | 3.085 | 45.4 | 45.0 | 45.4 | 48.9 | 45.3 | 55.9 | 55.5 | | | |
| 74.0 | 99.6 | 85.5 | 67.8 | 49.0 | 135.6 | 128.4 | 3.072 | 45.8 | 45.4 | 45.8 | 49.5 | 45.7 | 56.5 | 55.9 | | | |
| 74.5 | 99.8 | 85.6 | 68.0 | 49.3 | 136.4 | 129.1 | 3.059 | 46.1 | 45.7 | 46.1 | 49.9 | 46.0 | 56.9 | 56.1 | | | |
| 75.0 | 100.1 | 85.7 | 68.4 | 49.8 | 137.5 | 130.2 | 3.046 | 46.6 | 46.1 | 46.6 | 50.4 | 46.4 | 57.5 | 56.5 | | | |
| 75.5 | 100.4 | 85.9 | 68.7 | 50.3 | 138.8 | 131.4 | 3.033 | 47.0 | 46.5 | 47.0 | 50.9 | 46.8 | 58.2 | — | | | |
| 76.0 | 100.6 | 86.0 | 68.9 | 50.7 | 139.6 | 132.1 | 3.020 | 47.3 | 46.7 | 47.3 | 51.1 | 47.1 | 58.6 | — | | | |
| 76.5 | 100.9 | 86.1 | 69.2 | 51.2 | 140.9 | 133.3 | 3.007 | 47.8 | 47.1 | 47.8 | 51.5 | 47.6 | 59.3 | — | | | |
| 77.0 | 101.1 | 86.2 | 69.4 | 51.5 | 141.7 | 134.0 | 3.000 | 48.0 | 47.4 | 48.0 | 51.7 | 47.8 | 59.7 | — | | | |
| 77.5 | 101.4 | 86.4 | 69.7 | 52.0 | 143.0 | 135.2 | 3.000 | 48.5 | 47.8 | 48.5 | 52.0 | 48.3 | 60.3 | — | | | |
| 78.0 | 101.7 | 86.5 | 70.1 | 52.5 | 144.3 | 136.4 | 3.000 | 48.9 | 48.2 | 48.9 | 52.2 | 48.8 | 61.0 | — | | | |
| 78.5 | 101.9 | 86.6 | 70.3 | 52.8 | 145.1 | 137.2 | 3.000 | 49.2 | 48.5 | 49.2 | — | 49.2 | 61.4 | — | | | |
| 79.0 | 102.2 | 86.8 | 70.6 | 53.3 | 146.5 | 138.9 | 3.000 | 49.7 | 49.0 | 49.7 | — | 49.8 | 62.2 | — | | | |
| 79.5 | 102.5 | 86.9 | 70.9 | 53.8 | 147.8 | 139.7 | 3.000 | 50.1 | 49.4 | 50.1 | — | 50.4 | — | — | | | |

| | | | | | | | | | | | | | |
|------|-------|------|------|------|-------|-------|-------|------|------|-----|-----|-----|-----|
| 80.0 | 102.7 | 87.0 | 71.1 | 54.1 | 148.8 | 140.6 | 2.975 | 49.7 | 50.4 | --- | --- | --- | --- |
| 80.5 | 103.0 | 87.2 | 71.5 | 54.6 | 150.2 | 141.9 | 2.962 | 50.2 | 50.8 | --- | --- | --- | --- |
| 81.0 | 103.3 | 87.3 | 71.8 | 55.1 | 151.6 | 143.2 | 2.949 | 50.6 | 51.3 | --- | --- | --- | --- |
| 81.5 | 103.5 | 87.4 | 72.0 | 55.4 | 152.6 | 144.1 | 2.939 | 50.9 | 51.6 | --- | --- | --- | --- |
| 82.0 | 103.8 | 87.5 | 72.3 | 55.9 | 154.1 | 145.5 | 2.926 | 51.4 | 52.1 | --- | --- | --- | --- |
| 82.5 | 104.0 | 87.6 | 72.5 | 56.2 | 155.1 | 146.4 | 2.917 | 51.7 | 52.4 | --- | --- | --- | --- |
| 83.0 | 104.3 | 87.8 | 72.8 | 56.7 | 156.6 | 147.8 | 2.903 | 52.2 | 52.9 | --- | --- | --- | --- |
| 83.5 | 104.6 | 87.9 | 73.2 | 57.2 | 158.2 | 149.3 | 2.889 | 52.7 | 53.4 | --- | --- | --- | --- |
| 84.0 | 104.8 | 88.0 | 73.4 | 57.6 | 159.2 | 150.2 | 2.881 | 53.1 | 53.8 | --- | --- | --- | --- |
| 84.5 | 105.1 | 88.2 | 73.7 | 58.0 | 160.8 | 151.7 | 2.867 | 53.6 | 54.4 | --- | --- | --- | --- |
| 85.0 | 105.4 | 88.3 | 74.0 | 58.5 | 162.5 | 153.2 | 2.853 | 54.1 | 55.1 | --- | --- | --- | --- |
| 85.5 | 105.6 | 88.4 | 74.2 | 58.9 | 163.5 | 154.2 | 2.844 | 54.5 | 55.5 | --- | --- | --- | --- |
| 86.0 | 105.9 | 88.6 | 74.6 | 59.4 | 165.2 | 155.7 | 2.830 | 55.0 | 56.3 | --- | --- | --- | --- |
| 86.5 | 106.1 | 88.7 | 74.8 | 59.7 | 166.3 | 156.7 | 2.821 | 55.3 | 56.8 | --- | --- | --- | --- |
| 87.0 | 106.4 | 88.8 | 75.1 | 60.2 | 168.0 | 158.3 | 2.807 | 55.9 | 57.7 | --- | --- | --- | --- |
| 87.5 | 106.7 | 89.0 | 75.4 | 60.7 | 169.6 | 159.8 | 2.794 | 56.4 | 58.7 | --- | --- | --- | --- |
| 88.0 | 106.9 | 89.1 | 75.6 | 61.0 | 170.7 | 160.8 | 2.785 | --- | 59.4 | --- | --- | --- | --- |
| 88.5 | 107.2 | 89.2 | 75.9 | 61.5 | 172.3 | 162.3 | 2.773 | --- | 60.4 | --- | --- | --- | --- |
| 89.0 | 107.5 | 89.4 | 76.3 | 62.0 | 173.9 | 163.8 | 2.763 | --- | 61.6 | --- | --- | --- | --- |
| 89.5 | 107.7 | 89.5 | 76.5 | 62.3 | 174.9 | 164.7 | 2.753 | --- | 62.3 | --- | --- | --- | --- |
| 90.0 | 108.0 | 89.6 | 76.8 | 62.8 | 176.4 | 166.1 | 2.742 | --- | 63.5 | --- | --- | --- | --- |
| 90.5 | 108.3 | 89.8 | 77.1 | 63.3 | 177.8 | 167.4 | 2.732 | --- | 64.6 | --- | --- | --- | --- |
| 91.0 | 108.5 | 89.9 | 77.3 | 63.6 | 178.8 | 168.3 | 2.724 | --- | 65.4 | --- | --- | --- | --- |
| 91.5 | 108.8 | 90.0 | 77.6 | 64.1 | 180.1 | 169.5 | 2.715 | --- | 66.5 | --- | --- | --- | --- |
| 92.0 | 109.0 | 90.1 | 77.9 | 64.4 | 181.0 | 170.3 | 2.709 | --- | 67.2 | --- | --- | --- | --- |

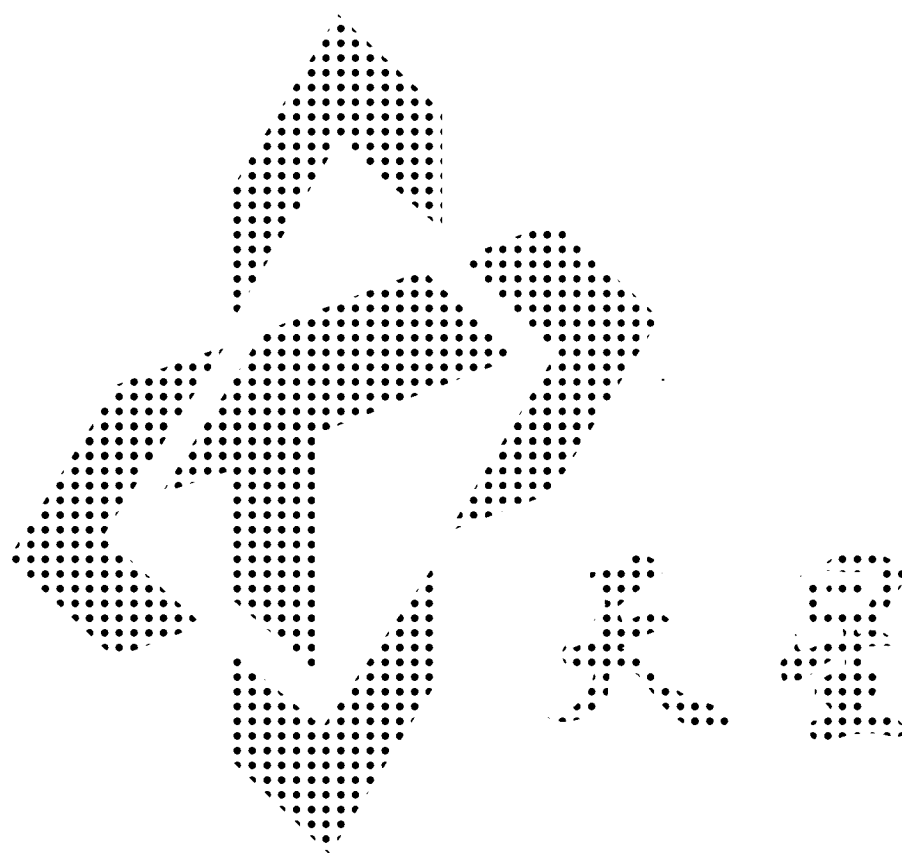
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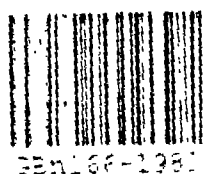
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