

CBN-EP SB-F/S

Ball Nose CBN End Mills for Ultra High Hardness Materials

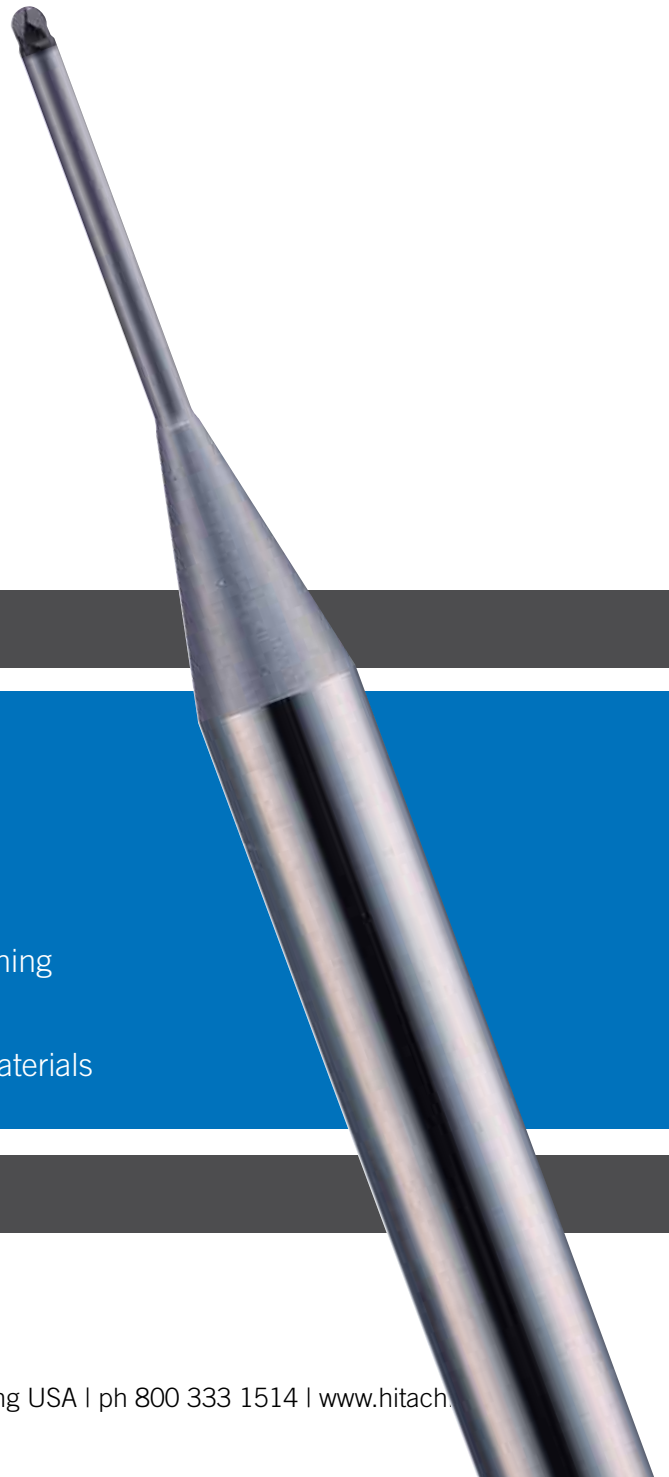
FEATURES

Two flute types are available: Fine and Strong

Long tool life even when direct cutting high hardness materials of 60HRC or higher

Cutting edge shape resists chipping, enabling stable finishing for extended periods

Ideal for machining small workpieces of high hardness materials



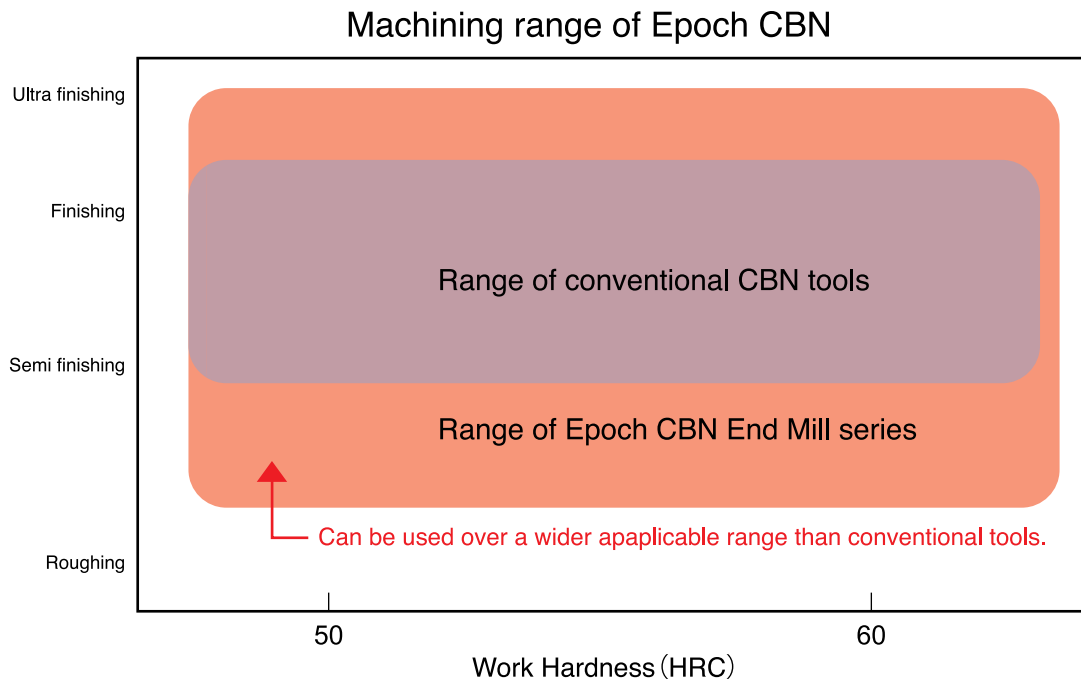
INTRODUCTION

Recently, the trend in moldmaking has been toward harder and harder materials, and cutting these materials is increasingly difficult. In order to respond to the demands for ultra-high precision, tool wear resistance is more critical, and recently alternative to carbide such as CBN are becoming more widely used.

Unlike the conventional geometry commonly seen on most CBN tools which focuses on rigidity, the geometry of this newly developed Epoch CBN End Mill series achieves both rigidity and cutting edge sharpness. This enables high-precision finishing machining over a long period of time in high-hardness materials.

FEATURES

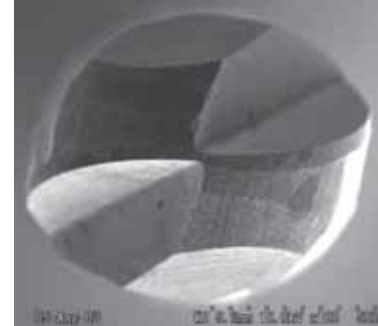
1. Machining Range of CBN Series



CBN-EPSB-F/S



2. Two Flute Types: Fine and Strong

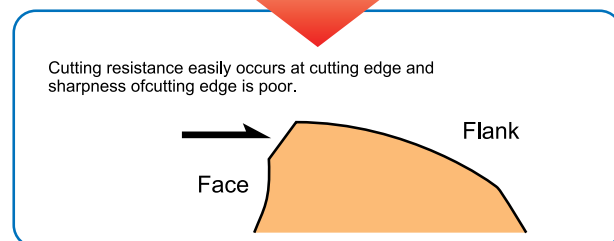
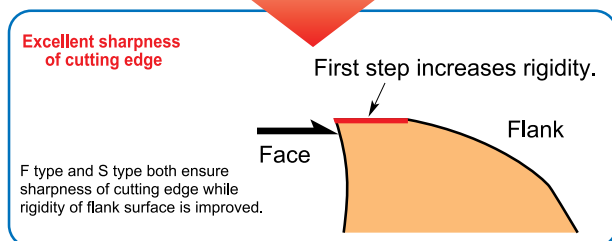
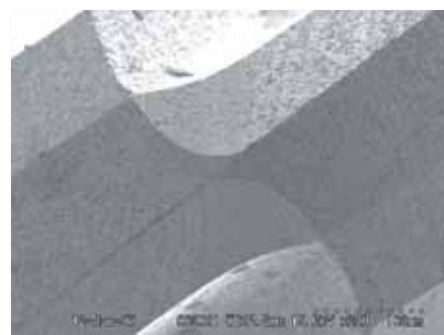
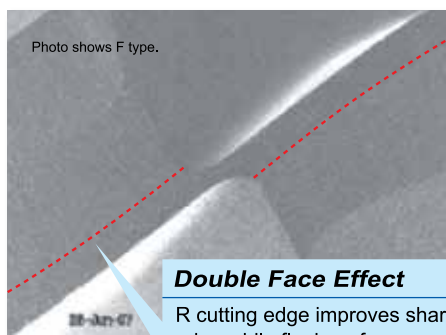


| Fine Type | | Strong Type |
|--|----------------------|--|
| Priority on high-accuracy machining geometry | Applications | Priority on deep machining |
| Geometry with priority on cutting performance enables higher machining accuracy. | Features | Enables stable machining even in environments where vibrations are likely. |
| L/D ≤ 5 | Basic Recommendation | L/D > 5 |

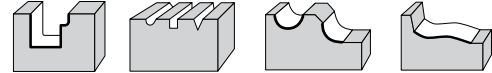
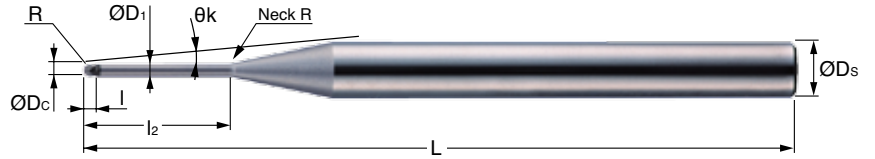
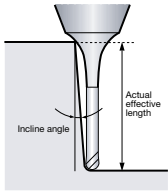
3. Double Face Shape of Cutting Edge

Double Face Shape

General CBN Tool



CBN-EPSB-F/S



| | | | |
|-----|--------|----|---------|
| R | ±0.005 | Dc | 0/-0.01 |
| φDs | h4 | | |

| Part No. | Stock | | Size (mm) | | | | | | | | | Actual Effective Length in Incline Angles | | | | |
|---------------------|-------|---|----------------|------|----------------|------|----------------|----|----------------|--------|-------|---|-------|-------|-------|-------|
| | F | S | D _c | R | l ₂ | l | D ₁ | L | D _s | Neck R | Øk | 0.5° | 1° | 1.5° | 2° | 3° |
| CBN-EPSB2002-0.5-□ | ● | □ | 0.2 | 0.10 | 0.50 | 0.12 | 0.18 | 50 | 4 | 1 | 11.45 | 0.67 | 0.70 | 0.72 | 0.75 | 0.80 |
| CBN-EPSB2002-1-□ | ● | □ | 0.2 | 0.10 | 1.00 | 0.12 | 0.18 | 50 | 4 | 1 | 10.88 | 1.19 | 1.24 | 1.28 | 1.32 | 1.38 |
| CBN-EPSB2003-0.75-□ | ● | □ | 0.3 | 0.15 | 0.75 | 0.18 | 0.27 | 50 | 4 | 1 | 11.17 | 0.95 | 0.99 | 1.02 | 1.05 | 1.10 |
| CBN-EPSB2003-1.5-□ | ● | □ | 0.3 | 0.15 | 1.50 | 0.18 | 0.27 | 50 | 4 | 1 | 10.36 | 1.73 | 1.79 | 1.83 | 1.88 | 2.03 |
| CBN-EPSB2004-1-□ | ● | □ | 0.4 | 0.20 | 1.00 | 0.24 | 0.37 | 50 | 4 | 1 | 10.91 | 1.21 | 1.25 | 1.29 | 1.32 | 1.38 |
| CBN-EPSB2004-2-□ | ● | □ | 0.4 | 0.20 | 2.00 | 0.24 | 0.37 | 50 | 4 | 1 | 9.88 | 2.25 | 2.31 | 2.37 | 2.43 | 2.68 |
| CBN-EPSB2005-1.5-□ | ● | □ | 0.5 | 0.25 | 1.50 | 0.30 | 0.47 | 50 | 4 | 1 | 10.39 | 1.73 | 1.78 | 1.83 | 1.87 | 2.00 |
| CBN-EPSB2005-3-□ | ● | □ | 0.5 | 0.25 | 3.00 | 0.30 | 0.47 | 50 | 4 | 1 | 9.00 | 3.28 | 3.36 | 3.46 | 3.62 | 3.99 |
| CBN-EPSB2006-1.5-□ | ● | □ | 0.6 | 0.30 | 1.50 | 0.36 | 0.57 | 50 | 4 | 1 | 10.40 | 1.73 | 1.78 | 1.82 | 1.86 | 1.98 |
| CBN-EPSB2006-3-□ | ● | □ | 0.6 | 0.30 | 3.00 | 0.36 | 0.57 | 50 | 4 | 1 | 8.98 | 3.28 | 3.36 | 3.46 | 3.61 | 3.97 |
| CBN-EPSB2008-2.5-□ | ● | □ | 0.8 | 0.40 | 2.50 | 0.48 | 0.77 | 50 | 4 | 1 | 9.37 | 2.76 | 2.83 | 2.89 | 2.99 | 3.28 |
| CBN-EPSB2008-5-□ | ● | □ | 0.8 | 0.40 | 5.00 | 0.48 | 0.77 | 50 | 4 | 1 | 7.48 | 5.33 | 5.48 | 5.72 | 5.99 | 6.60 |
| CBN-EPSB2010-2.5-□ | ● | □ | 1.0 | 0.50 | 2.50 | 0.60 | 0.96 | 50 | 4 | 1 | 9.31 | 2.77 | 2.84 | 2.89 | 3.00 | 3.28 |
| CBN-EPSB2010-5-□ | ● | □ | 1.0 | 0.50 | 5.00 | 0.60 | 0.96 | 50 | 4 | 1 | 7.34 | 5.34 | 5.50 | 5.74 | 5.99 | 6.60 |
| CBN-EPSB2010-10-□ | ● | □ | 1.0 | 0.50 | 10.00 | 0.60 | 0.96 | 50 | 4 | 1 | 5.15 | 10.50 | 10.95 | 11.44 | 11.98 | 13.23 |
| CBN-EPSB2015-5-□ | ● | □ | 1.5 | 0.75 | 5.00 | 0.90 | 1.44 | 50 | 4 | 1 | 6.94 | 5.36 | 5.53 | 5.75 | 6.00 | 6.58 |
| CBN-EPSB2015-10-□ | ● | □ | 1.5 | 0.75 | 10.00 | 0.90 | 1.44 | 50 | 4 | 1 | 4.68 | 10.54 | 10.98 | 11.46 | 11.98 | 13.22 |
| CBN-EPSB2020-5-□ | ● | □ | 2.0 | 1.00 | 5.00 | 1.20 | 1.92 | 50 | 4 | 1 | 6.42 | 5.38 | 5.56 | 5.77 | 6.01 | 6.56 |
| CBN-EPSB2020-10-□ | ● | □ | 2.0 | 1.00 | 10.00 | 1.20 | 1.92 | 50 | 4 | 1 | 4.12 | 10.58 | 11.01 | 11.48 | 11.99 | 13.20 |
| CBN-EPSB2020-20-□ | ● | □ | 2.0 | 1.00 | 20.00 | 1.20 | 1.92 | 55 | 4 | 1 | 2.40 | 21.00 | 21.90 | 22.88 | 23.96 | - |

*For the last digit of the part no. enter the type (F, S)

Actual measured mill diameter value is shown on case

□ = Stocked items in Japan

CBN-EP SB-F/S

CBN-EP SB-F/S Cutting Condition (Metric)



| Semi-Finishing to Finishing | | | | | Hardened Steels (-55HRC) HPM1, SKD61, SKT4 | | Hardened Steels (55-65HRC) SKD11,SKH51 | | Hardened Steels (65-68HRC) SKH,Welded HSS | | Hardened Steels (68-72HRC) HAP, Powdered HSS | |
|--------------------------------|------|----------------|----------------|----------------|---|----------------|---|----------------|--|----------------|---|----------------|
| Work Material | | | | | 100% | | 85% | | 70% | | 60% | |
| Ratio to standard depth of cut | | | | | 100% | | 85% | | 70% | | 60% | |
| D _c | R | l ₂ | Depth of cut | | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| | | | a _p | a _e | | | | | | | | |
| 0.2 | 0.10 | 0.50 | 0.006 | 0.018 | 50,000 | 1,800 | 48,000 | 1,510 | 45,000 | 1,220 | 43,000 | 970 |
| 0.2 | 0.10 | 1.00 | 0.005 | 0.015 | 46,000 | 1,660 | 44,000 | 1,390 | 42,000 | 1,130 | 39,000 | 880 |
| 0.3 | 0.15 | 0.75 | 0.01 | 0.030 | 50,000 | 1,800 | 47,000 | 1,480 | 45,000 | 1,220 | 42,000 | 950 |
| 0.3 | 0.15 | 1.50 | 0.008 | 0.024 | 45,000 | 1,620 | 42,000 | 1,320 | 40,000 | 1,080 | 38,000 | 860 |
| 0.4 | 0.20 | 1.00 | 0.015 | 0.045 | 46,000 | 2,210 | 44,000 | 1,850 | 42,000 | 1,510 | 39,000 | 1,170 |
| 0.4 | 0.20 | 2.00 | 0.012 | 0.036 | 41,000 | 1,970 | 39,000 | 1,640 | 37,000 | 1,330 | 35,000 | 1,050 |
| 0.5 | 0.25 | 1.50 | 0.025 | 0.075 | 46,000 | 2,480 | 44,000 | 2,080 | 41,000 | 1,660 | 39,000 | 1,320 |
| 0.5 | 0.25 | 3.00 | 0.02 | 0.060 | 41,000 | 2,210 | 39,000 | 1,840 | 37,000 | 1,500 | 35,000 | 1,180 |
| 0.6 | 0.30 | 1.50 | 0.03 | 0.090 | 42,000 | 2,520 | 40,000 | 2,100 | 38,000 | 1,710 | 36,000 | 1,350 |
| 0.6 | 0.30 | 3.00 | 0.025 | 0.075 | 38,000 | 2,280 | 36,000 | 1,890 | 34,000 | 1,530 | 32,000 | 1,200 |
| 0.8 | 0.40 | 2.50 | 0.04 | 0.120 | 42,000 | 2,770 | 40,000 | 2,310 | 38,000 | 1,880 | 36,000 | 1,490 |
| 0.8 | 0.40 | 5.00 | 0.032 | 0.096 | 38,000 | 2,510 | 36,000 | 2,080 | 34,000 | 1,680 | 32,000 | 1,320 |
| 1.0 | 0.50 | 2.50 | 0.05 | 0.150 | 38,200 | 2,750 | 36,300 | 2,290 | 34,000 | 1,840 | 32,000 | 1,440 |
| 1.0 | 0.50 | 5.00 | 0.04 | 0.120 | 34,400 | 2,480 | 32,700 | 2,060 | 31,000 | 1,670 | 29,000 | 1,310 |
| 1.0 | 0.50 | 10.00 | 0.01 | 0.030 | 26,700 | 1,550 | 25,400 | 1,290 | 24,000 | 1,040 | 23,000 | 830 |
| 1.5 | 0.75 | 5.00 | 0.07 | 0.210 | 32,000 | 2,560 | 30,400 | 2,130 | 29,000 | 1,740 | 27,000 | 1,350 |
| 1.5 | 0.75 | 10.00 | 0.02 | 0.060 | 22,500 | 1,440 | 21,400 | 1,200 | 20,000 | 960 | 19,000 | 760 |
| 2.0 | 1.00 | 5.00 | 0.08 | 0.240 | 28,000 | 2,910 | 26,600 | 2,420 | 25,000 | 1,950 | 24,000 | 1,560 |
| 2.0 | 1.00 | 10.00 | 0.065 | 0.195 | 25,100 | 2,610 | 23,900 | 2,170 | 23,000 | 1,790 | 21,000 | 1,370 |
| 2.0 | 1.00 | 20.00 | 0.017 | 0.051 | 19,600 | 1,650 | 18,600 | 1,370 | 18,000 | 1,130 | 17,000 | 890 |

| Ultra Finishing | | | | | Hardened Steels (-55HRC) HPM1, SKD61, SKT4 | | Hardened Steels (55-65HRC) SKD11,SKH51 | | Hardened Steels (65-68HRC) SKH, Welded HSS | | Hardened Steels (68-72HRC) HAP, Powdered HSS | |
|--------------------------------|------|----------------|----------------|----------------|---|----------------|---|----------------|---|----------------|---|----------------|
| Work Material | | | | | 100% | | 90% | | 80% | | 70% | |
| Ratio to standard depth of cut | | | | | 100% | | 90% | | 80% | | 70% | |
| D _c | R | l ₂ | Depth of cut | | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) | n (RPM) | vf (mm/min) |
| | | | a _p | a _e | | | | | | | | |
| 0.2 | 0.10 | 0.50 | 0.005 | 0.015 | 58,000 | 1,450 | 55,000 | 1,310 | 52,000 | 1,110 | 49,000 | 920 |
| 0.2 | 0.10 | 1.00 | 0.005 | 0.015 | 53,000 | 1,330 | 50,000 | 1,190 | 47,000 | 1,000 | 45,000 | 840 |
| 0.3 | 0.15 | 0.75 | 0.005 | 0.015 | 58,000 | 1,450 | 55,000 | 1,310 | 53,000 | 1,130 | 50,000 | 940 |
| 0.3 | 0.15 | 1.50 | 0.005 | 0.015 | 53,000 | 1,330 | 50,000 | 1,190 | 48,000 | 1,020 | 45,000 | 840 |
| 0.4 | 0.20 | 1.00 | 0.005 | 0.015 | 54,000 | 1,350 | 51,000 | 1,210 | 49,000 | 1,040 | 46,000 | 860 |
| 0.4 | 0.20 | 2.00 | 0.005 | 0.015 | 49,000 | 1,230 | 46,000 | 1,090 | 44,000 | 940 | 41,000 | 770 |
| 0.5 | 0.25 | 1.50 | 0.008 | 0.024 | 54,000 | 2,160 | 51,000 | 1,940 | 49,000 | 1,670 | 46,000 | 1,380 |
| 0.5 | 0.25 | 3.00 | 0.008 | 0.024 | 48,000 | 1,920 | 46,000 | 1,750 | 44,000 | 1,500 | 41,000 | 1,230 |
| 0.6 | 0.30 | 1.50 | 0.008 | 0.024 | 48,000 | 1,920 | 46,000 | 1,750 | 43,000 | 1,460 | 41,000 | 1,230 |
| 0.6 | 0.30 | 3.00 | 0.008 | 0.024 | 44,000 | 1,760 | 41,000 | 1,560 | 39,000 | 1,330 | 37,000 | 1,110 |
| 0.8 | 0.40 | 2.50 | 0.008 | 0.024 | 48,000 | 2,880 | 45,000 | 2,570 | 43,000 | 2,190 | 41,000 | 1,850 |
| 0.8 | 0.40 | 5.00 | 0.008 | 0.024 | 43,000 | 2,580 | 41,000 | 2,340 | 39,000 | 1,990 | 37,000 | 1,670 |
| 1.0 | 0.50 | 2.50 | 0.01 | 0.030 | 44,000 | 2,640 | 42,000 | 2,390 | 40,000 | 2,040 | 38,000 | 1,710 |
| 1.0 | 0.50 | 5.00 | 0.01 | 0.030 | 40,000 | 2,400 | 38,000 | 2,170 | 36,000 | 1,840 | 34,000 | 1,530 |
| 1.0 | 0.50 | 10.00 | 0.01 | 0.030 | 31,000 | 1,490 | 29,000 | 1,320 | 28,000 | 1,140 | 26,000 | 940 |
| 1.5 | 0.75 | 5.00 | 0.01 | 0.030 | 38,000 | 3,040 | 36,000 | 2,740 | 34,000 | 2,310 | 32,000 | 1,920 |
| 1.5 | 0.75 | 10.00 | 0.01 | 0.030 | 27,000 | 1,730 | 25,000 | 1,520 | 24,000 | 1,310 | 23,000 | 1,100 |
| 2.0 | 1.00 | 5.00 | 0.01 | 0.030 | 34,000 | 3,400 | 33,000 | 3,140 | 31,000 | 2,640 | 29,000 | 2,180 |
| 2.0 | 1.00 | 10.00 | 0.01 | 0.030 | 31,000 | 3,100 | 29,000 | 2,760 | 28,000 | 2,380 | 26,000 | 1,950 |
| 2.0 | 1.00 | 20.00 | 0.01 | 0.030 | 24,000 | 1,920 | 23,000 | 1,750 | 21,000 | 1,430 | 20,000 | 1,200 |