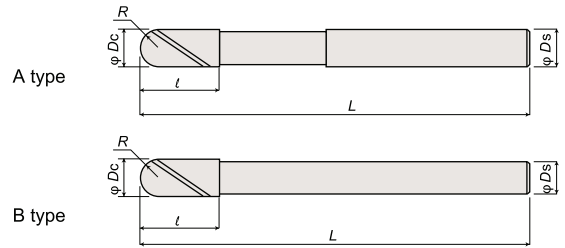


ดอกเอ็นมิลล์

EPOCH PANACEA BALL LONG SHANK HGOBLS2 (-)-PN



2Flutes



Long shank



R3 ~ R6 : ±0.005
R8 ~ R10 : ±0.01



Ds ≤ 6 : 0 ~ -0.005
6 < Ds ≤ 10 : 0 ~ -0.006
10 < Ds ≤ 18 : 0 ~ -0.008
18 < Ds : 0 ~ -0.009

(mm)

Provides good machined surface finish for rough machining with high cutting depth. Enables machining of a wide variety of subject materials.

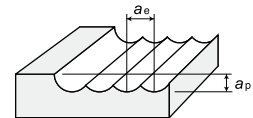
| Order No. | Stock | Size (mm) | | | | | | No. of flutes | Type |
|-------------------|-------|---------------|--------------|----------------|--------------------------------|------------------|---------------|---------------|------|
| | | R Ball radius | Dc Mill Dia. | ℓ Flute Length | ℓ ₂ Under Neck Dia. | L Overall length | Ds Shank Dia. | | |
| HGOBLS2060-45-PN | ● | 3 | 6 | 9 | 45 | 115 | 6 | 2 | A |
| HGOBLS2060-75-PN | ● | 3 | 6 | 9 | 75 | 150 | 6 | 2 | A |
| HGOBLS2080-55-PN | ● | 4 | 8 | 12 | 55 | 125 | 8 | 2 | A |
| HGOBLS2080-105-PN | ● | 4 | 8 | 12 | 105 | 180 | 8 | 2 | A |
| HGOBLS2100-PN | ● | 5 | 10 | 15 | - | 200 | 9 | 2 | B |
| HGOBLS2120-PN | ● | 6 | 12 | 18 | - | 220 | 11 | 2 | B |
| HGOBLS2160-PN | ● | 8 | 16 | 24 | - | 250 | 14 | 2 | B |
| HGOBLS2200-PN | ● | 10 | 20 | 30 | - | 250 | 18 | 2 | B |

● : Stocked Items.

Recommended cutting conditions

HGOB-PN

Twice the cutting depth enables high-efficiency cutting!



| Cutting segment | R Ball radius | Dc Tool dia. | ℓ Flute length | Copper Alloy, Aluminium alloy | | | | Cast Iron, Carbon Steel (150 ~ 200HB) FC250, S50C, S55C | | | | Stainless Steels (25 ~ 35HRC) SUS304, SUS316 | | | |
|-----------------|---------------|--------------|----------------|-------------------------------|------------------|-------|--------|---|------------------|-------|--------|--|------------------|-------|-------|
| | | | | Revolution min ⁻¹ | Feed rate mm/min | ap mm | ae mm | Revolution min ⁻¹ | Feed rate mm/min | ap mm | ae mm | Revolution min ⁻¹ | Feed rate mm/min | ap mm | ae mm |
| Roughing | 0.15 | 0.3 | 0.6 | 35,032 | 2,102 | 0.039 | 0.117 | 31,847 | 1,911 | 0.039 | 0.117 | 28,662 | 1,720 | 0.038 | 0.112 |
| | 0.2 | 0.4 | 0.8 | 35,032 | 2,102 | 0.052 | 0.156 | 31,847 | 1,911 | 0.052 | 0.156 | 28,662 | 1,720 | 0.050 | 0.150 |
| | 0.25 | 0.5 | 1 | 35,032 | 2,102 | 0.065 | 0.195 | 31,847 | 1,911 | 0.065 | 0.195 | 28,662 | 1,720 | 0.063 | 0.187 |
| | 0.3 | 0.6 | 1.2 | 29,193 | 2,335 | 0.078 | 0.234 | 26,539 | 2,123 | 0.078 | 0.234 | 23,885 | 1,911 | 0.075 | 0.225 |
| | 0.4 | 0.8 | 1.6 | 26,274 | 2,102 | 0.104 | 0.312 | 23,885 | 1,911 | 0.104 | 0.312 | 21,497 | 1,720 | 0.100 | 0.300 |
| | 0.5 | 1 | 2.5 | 28,025 | 2,803 | 0.130 | 0.390 | 25,478 | 2,548 | 0.130 | 0.390 | 22,930 | 2,293 | 0.125 | 0.375 |
| | 0.75 | 1.5 | 4 | 25,690 | 3,083 | 0.195 | 0.585 | 23,355 | 2,803 | 0.195 | 0.585 | 21,019 | 2,522 | 0.188 | 0.562 |
| | 1 | 2 | 5 | 24,522 | 3,433 | 0.260 | 0.780 | 22,293 | 3,121 | 0.260 | 0.780 | 20,064 | 2,809 | 0.250 | 0.750 |
| | 1.25 | 2.5 | 7 | 22,450 | 3,587 | 0.325 | 0.975 | 20,382 | 3,261 | 0.325 | 0.975 | 18,344 | 2,935 | 0.313 | 0.937 |
| | 1.5 | 3 | 8 | 21,019 | 3,783 | 0.390 | 1.170 | 19,108 | 3,439 | 0.390 | 1.170 | 17,197 | 3,096 | 0.375 | 1.125 |
| | 2 | 4 | 8 | 20,143 | 4,029 | 0.520 | 1.560 | 18,312 | 3,662 | 0.520 | 1.560 | 16,481 | 3,296 | 0.500 | 1.500 |
| | 2 | 4 | 8 | 20,143 | 4,834 | 0.520 | 1.560 | 18,312 | 4,395 | 0.520 | 1.560 | 16,481 | 3,955 | 0.500 | 1.500 |
| | 2.5 | 5 | 10 | 18,217 | 5,101 | 0.650 | 1.950 | 16,561 | 4,637 | 0.650 | 1.950 | 14,904 | 4,173 | 0.625 | 1.875 |
| | 3 | 6 | 12 | 15,764 | 5,045 | 0.780 | 2.340 | 14,331 | 4,586 | 0.780 | 2.340 | 12,898 | 4,127 | 0.750 | 2.250 |
| 4 | 8 | 14 | 12,699 | 4,572 | 1.040 | 3.120 | 11,545 | 4,156 | 1.040 | 3.120 | 10,390 | 3,740 | 1.000 | 3.000 | |
| 5 | 10 | 18 | 10,860 | 4,344 | 1.300 | 3.900 | 9,873 | 3,949 | 1.300 | 3.900 | 8,885 | 3,554 | 1.250 | 3.750 | |
| 6 | 12 | 22 | 9,634 | 4,239 | 1.560 | 4.680 | 8,758 | 3,854 | 1.560 | 4.680 | 7,882 | 3,468 | 1.500 | 4.500 | |
| 8 | 16 | 30 | 7,444 | 3,573 | 2.080 | 6.240 | 6,768 | 3,248 | 2.080 | 6.240 | 6,091 | 2,924 | 2.000 | 6.000 | |
| 10 | 20 | 38 | 5,955 | 3,097 | 2.600 | 7.800 | 5,414 | 2,815 | 2.600 | 7.800 | 4,873 | 2,534 | 2.500 | 7.500 | |
| Finishing | 0.15 | 0.3 | 0.6 | 44,586 | 1,783 | 0.015 | 0.015 | 37,155 | 1,486 | 0.015 | 0.015 | 33,439 | 1,204 | 0.015 | 0.015 |
| | 0.2 | 0.4 | 0.8 | 42,994 | 1,720 | 0.020 | 0.020 | 35,828 | 1,433 | 0.020 | 0.020 | 32,245 | 1,161 | 0.020 | 0.020 |
| | 0.25 | 0.5 | 1 | 42,038 | 1,682 | 0.025 | 0.025 | 35,032 | 1,401 | 0.025 | 0.025 | 31,529 | 1,135 | 0.025 | 0.025 |
| | 0.3 | 0.6 | 1.2 | 35,032 | 2,102 | 0.030 | 0.030 | 29,193 | 1,752 | 0.030 | 0.030 | 26,274 | 1,419 | 0.030 | 0.030 |
| | 0.4 | 0.8 | 1.6 | 31,051 | 1,863 | 0.040 | 0.040 | 25,876 | 1,553 | 0.040 | 0.040 | 23,288 | 1,258 | 0.040 | 0.040 |
| | 0.5 | 1 | 2.5 | 30,573 | 1,834 | 0.050 | 0.050 | 25,478 | 1,529 | 0.050 | 0.050 | 22,930 | 1,238 | 0.050 | 0.050 |

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| Cutting segment | R Ball radius | Dc Tool dia. | ℓ Flute length | Copper Alloy, Aluminium alloy | | | | Cast Iron, Carbon Steel (150 ~ 200HB) FC250, S50C, S55C | | | | Stainless Steels (25 ~ 35HRC) SUS304, SUS316 | | | |
|-----------------|---------------|--------------|----------------|-------------------------------|------------------|-------|-------|--|------------------|-------|-------|---|------------------|-------|-------|
| | | | | Revolution min ⁻¹ | Feed rate mm/min | ap mm | ae mm | Revolution min ⁻¹ | Feed rate mm/min | ap mm | ae mm | Revolution min ⁻¹ | Feed rate mm/min | ap mm | ae mm |
| Finishing | 0.75 | 1.5 | 4 | 29,299 | 1,758 | 0.075 | 0.075 | 24,416 | 1,465 | 0.075 | 0.075 | 21,975 | 1,187 | 0.075 | 0.075 |
| | 1 | 2 | 5 | 29,618 | 2,369 | 0.100 | 0.100 | 24,682 | 1,975 | 0.100 | 0.100 | 22,213 | 1,599 | 0.100 | 0.100 |
| | 1.25 | 2.5 | 7 | 28,280 | 2,262 | 0.125 | 0.125 | 23,567 | 1,885 | 0.125 | 0.125 | 21,210 | 1,527 | 0.125 | 0.125 |
| | 1.5 | 3 | 8 | 26,115 | 2,089 | 0.150 | 0.150 | 21,762 | 1,741 | 0.150 | 0.150 | 19,586 | 1,410 | 0.150 | 0.150 |
| | 2 | 4 | 8 | 24,363 | 1,949 | 0.200 | 0.200 | 20,303 | 1,624 | 0.200 | 0.200 | 18,272 | 1,316 | 0.200 | 0.200 |
| | 2 | 4 | 8 | 24,363 | 2,436 | 0.200 | 0.200 | 20,303 | 2,030 | 0.200 | 0.200 | 18,272 | 1,645 | 0.200 | 0.200 |
| | 2.5 | 5 | 10 | 22,548 | 2,255 | 0.250 | 0.250 | 18,790 | 1,879 | 0.250 | 0.250 | 16,911 | 1,522 | 0.250 | 0.250 |
| | 3 | 6 | 12 | 19,427 | 2,331 | 0.300 | 0.300 | 16,189 | 1,943 | 0.300 | 0.300 | 14,570 | 1,574 | 0.300 | 0.300 |
| | 4 | 8 | 14 | 16,003 | 1,920 | 0.400 | 0.400 | 13,336 | 1,600 | 0.400 | 0.400 | 12,002 | 1,296 | 0.400 | 0.400 |
| | 5 | 10 | 18 | 14,713 | 2,060 | 0.500 | 0.500 | 12,261 | 1,717 | 0.500 | 0.500 | 11,035 | 1,390 | 0.500 | 0.500 |
| HSS Endmill | 6 | 12 | 22 | 13,535 | 2,436 | 0.600 | 0.600 | 11,279 | 2,030 | 0.600 | 0.600 | 10,151 | 1,645 | 0.600 | 0.600 |
| | 8 | 16 | 30 | 10,868 | 2,174 | 0.800 | 0.800 | 9,057 | 1,811 | 0.800 | 0.800 | 8,151 | 1,467 | 0.800 | 0.800 |
| | 10 | 20 | 38 | 7,739 | 1,548 | 1.000 | 1.000 | 6,449 | 1,290 | 1.000 | 1.000 | 5,804 | 1,045 | 1.000 | 1.000 |

| Cutting segment | R Ball radius | Dc Tool dia. | ℓ Flute length | Alloy Steel (25 ~ 35HRC) HPM7, SKD61, SKT4 | | | | Pre-hardened Steel (35 ~ 45HB) HPM-MAGIC, CENA1, NAK80 | | | | Hardened Steel (45 ~ 52HRC) SKD61, HPM38, DAC-MAGIC | | | |
|-----------------|---------------|--------------|----------------|---|------------------|-------|-------|---|------------------|-------|-------|--|------------------|-------|-------|
| | | | | Revolution min ⁻¹ | Feed rate mm/min | ap mm | ae mm | Revolution min ⁻¹ | Feed rate mm/min | ap mm | ae mm | Revolution min ⁻¹ | Feed rate mm/min | ap mm | ae mm |
| Roughing | 0.15 | 0.3 | 0.6 | 28,662 | 1,634 | 0.036 | 0.108 | 25,796 | 1,393 | 0.035 | 0.103 | 22,930 | 1,176 | 0.033 | 0.099 |
| | 0.2 | 0.4 | 0.8 | 28,662 | 1,634 | 0.048 | 0.144 | 25,796 | 1,393 | 0.046 | 0.138 | 22,930 | 1,176 | 0.044 | 0.132 |
| | 0.25 | 0.5 | 1 | 28,662 | 1,634 | 0.060 | 0.180 | 25,796 | 1,393 | 0.058 | 0.172 | 22,930 | 1,176 | 0.055 | 0.165 |
| | 0.3 | 0.6 | 1.2 | 23,885 | 1,815 | 0.072 | 0.216 | 21,497 | 1,548 | 0.069 | 0.207 | 19,108 | 1,307 | 0.066 | 0.198 |
| | 0.4 | 0.8 | 1.6 | 21,497 | 1,634 | 0.096 | 0.288 | 19,347 | 1,393 | 0.092 | 0.276 | 17,197 | 1,176 | 0.088 | 0.264 |
| | 0.5 | 1 | 2.5 | 22,930 | 2,178 | 0.120 | 0.360 | 20,637 | 1,857 | 0.115 | 0.345 | 18,344 | 1,568 | 0.110 | 0.330 |
| | 0.75 | 1.5 | 4 | 21,019 | 2,396 | 0.180 | 0.540 | 18,917 | 2,043 | 0.173 | 0.517 | 16,815 | 1,725 | 0.165 | 0.495 |
| | 1 | 2 | 5 | 20,064 | 2,668 | 0.240 | 0.720 | 18,057 | 2,275 | 0.230 | 0.690 | 16,051 | 1,921 | 0.220 | 0.660 |
| | 1.25 | 2.5 | 7 | 18,344 | 2,788 | 0.300 | 0.900 | 16,510 | 2,377 | 0.288 | 0.862 | 14,675 | 2,008 | 0.275 | 0.825 |
| | 1.5 | 3 | 8 | 17,197 | 2,941 | 0.360 | 1.080 | 15,478 | 2,507 | 0.345 | 1.035 | 13,758 | 2,117 | 0.330 | 0.990 |
| | 2 | 4 | 8 | 16,481 | 3,131 | 0.480 | 1.440 | 14,833 | 2,670 | 0.460 | 1.380 | 13,185 | 2,255 | 0.440 | 1.320 |
| | 2 | 4 | 8 | 16,481 | 3,758 | 0.480 | 1.440 | 14,833 | 3,204 | 0.460 | 1.380 | 13,185 | 2,706 | 0.440 | 1.320 |
| | 2.5 | 5 | 10 | 14,904 | 3,965 | 0.600 | 1.800 | 13,414 | 3,380 | 0.575 | 1.725 | 11,924 | 2,855 | 0.550 | 1.650 |
| | 3 | 6 | 12 | 12,898 | 3,921 | 0.720 | 2.160 | 11,608 | 3,343 | 0.690 | 2.070 | 10,318 | 2,823 | 0.660 | 1.980 |
| | 4 | 8 | 14 | 10,390 | 3,553 | 0.960 | 2.880 | 9,351 | 3,030 | 0.920 | 2.760 | 8,312 | 2,558 | 0.880 | 2.640 |
| 5 | 10 | 18 | 8,885 | 3,376 | 1.200 | 3.600 | 7,997 | 2,879 | 1.150 | 3.450 | 7,108 | 2,431 | 1.100 | 3.300 | |
| 6 | 12 | 22 | 7,882 | 3,295 | 1.440 | 4.320 | 7,094 | 2,809 | 1.380 | 4.140 | 6,306 | 2,372 | 1.320 | 3.960 | |
| 8 | 16 | 30 | 6,091 | 2,777 | 1.920 | 5.760 | 5,482 | 2,368 | 1.840 | 5.520 | 4,873 | 2,000 | 1.760 | 5.280 | |
| 10 | 20 | 38 | 4,873 | 2,407 | 2.400 | 7.200 | 4,385 | 2,052 | 2.300 | 6.900 | 3,898 | 1,733 | 2.200 | 6.600 | |
| Finishing | 0.15 | 0.3 | 0.6 | 33,439 | 1,204 | 0.012 | 0.012 | 30,096 | 975 | 0.009 | 0.009 | 26,752 | 770 | 0.009 | 0.009 |
| | 0.2 | 0.4 | 0.8 | 32,245 | 1,161 | 0.016 | 0.016 | 29,021 | 940 | 0.012 | 0.012 | 25,796 | 743 | 0.012 | 0.012 |
| | 0.25 | 0.5 | 1 | 31,529 | 1,135 | 0.020 | 0.020 | 28,376 | 919 | 0.015 | 0.015 | 25,223 | 726 | 0.015 | 0.015 |
| | 0.3 | 0.6 | 1.2 | 26,274 | 1,419 | 0.024 | 0.024 | 23,646 | 1,149 | 0.018 | 0.018 | 21,019 | 908 | 0.018 | 0.018 |
| | 0.4 | 0.8 | 1.6 | 23,288 | 1,258 | 0.032 | 0.032 | 20,959 | 1,019 | 0.024 | 0.024 | 18,631 | 805 | 0.024 | 0.024 |
| | 0.5 | 1 | 2.5 | 22,930 | 1,238 | 0.040 | 0.040 | 20,637 | 1,003 | 0.030 | 0.030 | 18,344 | 792 | 0.030 | 0.030 |
| | 0.75 | 1.5 | 4 | 21,975 | 1,187 | 0.060 | 0.060 | 19,777 | 961 | 0.045 | 0.045 | 17,580 | 759 | 0.045 | 0.045 |
| | 1 | 2 | 5 | 22,213 | 1,599 | 0.080 | 0.080 | 19,992 | 1,295 | 0.060 | 0.060 | 17,771 | 1,024 | 0.060 | 0.060 |
| | 1.25 | 2.5 | 7 | 21,210 | 1,527 | 0.100 | 0.100 | 19,089 | 1,237 | 0.075 | 0.075 | 16,968 | 977 | 0.075 | 0.075 |
| | 1.5 | 3 | 8 | 19,586 | 1,410 | 0.120 | 0.120 | 17,627 | 1,142 | 0.090 | 0.090 | 15,669 | 903 | 0.090 | 0.090 |
| | 2 | 4 | 8 | 18,272 | 1,316 | 0.160 | 0.160 | 16,445 | 1,066 | 0.120 | 0.120 | 14,618 | 842 | 0.120 | 0.120 |
| | 2 | 4 | 8 | 18,272 | 1,645 | 0.160 | 0.160 | 16,445 | 1,332 | 0.120 | 0.120 | 14,618 | 1,052 | 0.120 | 0.120 |
| | 2.5 | 5 | 10 | 16,911 | 1,522 | 0.200 | 0.200 | 15,220 | 1,233 | 0.150 | 0.150 | 13,529 | 974 | 0.150 | 0.150 |
| | 3 | 6 | 12 | 14,570 | 1,574 | 0.240 | 0.240 | 13,113 | 1,275 | 0.180 | 0.180 | 11,656 | 1,007 | 0.180 | 0.180 |
| | 4 | 8 | 14 | 12,002 | 1,296 | 0.320 | 0.320 | 10,802 | 1,050 | 0.240 | 0.240 | 9,602 | 830 | 0.240 | 0.240 |
| 5 | 10 | 18 | 11,035 | 1,390 | 0.400 | 0.400 | 9,932 | 1,126 | 0.300 | 0.300 | 8,828 | 890 | 0.300 | 0.300 | |
| 6 | 12 | 22 | 10,151 | 1,645 | 0.480 | 0.480 | 9,136 | 1,332 | 0.360 | 0.360 | 8,121 | 1,052 | 0.360 | 0.360 | |
| 8 | 16 | 30 | 8,151 | 1,467 | 0.640 | 0.640 | 7,336 | 1,188 | 0.480 | 0.480 | 6,521 | 939 | 0.480 | 0.480 | |
| 10 | 20 | 38 | 5,804 | 1,045 | 0.800 | 0.800 | 5,224 | 846 | 0.600 | 0.600 | 4,643 | 669 | 0.600 | 0.600 | |

[NOTE]

- ① PN coating is less electro conductive. Therefore, electric transmitted measuring systems may not work.
- ② Use the appropriate coolant for the work material and machining shape.
- ③ Use a highly rigid and accurate machine as possible.
- ④ The pick feed in the table is a general condition; please select the ae according to the cusp height requested.
- ⑤ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
- ⑥ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.