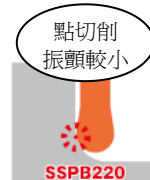
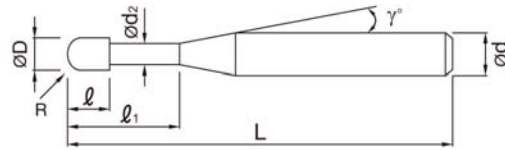


SSPB220 先端陶瓷螺旋刃全鎢鋼超硬圓球立銑刀

2-Flute Super Spiral Ball End Mills



- * 刃部採最適合精加工使用的螺旋刃圓球設計，提升刀具刃口的銳利度。
- * 採用NS獨特刃口形狀，可提高刀具耐崩性。
- * 採用了加強倒推拔設計，降低振顫影響，並延長刀具壽命及提高加工品質。
- * 下表首角為參考標準值。為了避免被削材與首角相互干涉，務必再確認實際測量值。

單位：mm

| R角 (R) | 有效長 (ℓ ₁) | 刃長 (ℓ) | 首下徑 (d ₂) | 首角 (γ) | 柄徑 (d) | 全長 (L) | 價(支)格 |
|--------|-----------------------|--------|-----------------------|--------|--------|--------|-----------|
| 0.1 | 0.3 | 0.15 | 0.18 | 15° | 4 | 50 | 17,240.00 |
| 0.1 | 0.6 | 0.15 | 0.18 | 15° | 4 | 50 | 17,800.00 |
| 0.15 | 0.3 | 0.23 | 0.28 | 15° | 4 | 50 | 16,950.00 |
| 0.15 | 0.5 | 0.23 | 0.28 | 15° | 4 | 50 | 17,240.00 |
| 0.15 | 0.75 | 0.23 | 0.28 | 15° | 4 | 50 | 17,520.00 |
| 0.2 | 0.5 | 0.3 | 0.37 | 15° | 4 | 50 | 15,320.00 |
| 0.2 | 0.75 | 0.3 | 0.37 | 15° | 4 | 50 | 15,600.00 |
| 0.2 | 1 | 0.3 | 0.37 | 15° | 4 | 50 | 15,880.00 |
| 0.2 | 1.2 | 0.3 | 0.37 | 15° | 4 | 50 | 16,160.00 |
| 0.25 | 1 | 0.38 | 0.46 | 15° | 4 | 50 | 15,880.00 |
| 0.3 | 1.2 | 0.5 | 0.56 | 15° | 4 | 50 | 14,640.00 |
| 0.3 | 1.5 | 0.5 | 0.56 | 15° | 4 | 50 | 14,920.00 |
| 0.4 | 1.6 | 0.6 | 0.76 | 15° | 4 | 50 | 14,640.00 |
| 0.4 | 2 | 0.6 | 0.76 | 15° | 4 | 50 | 14,920.00 |
| 0.5 | 2 | 0.7 | 0.95 | 15° | 4 | 50 | 14,640.00 |
| 0.5 | 2.5 | 0.7 | 0.95 | 15° | 4 | 50 | 14,920.00 |
| 0.6 | 2.4 | 0.8 | 1.15 | 15° | 4 | 50 | 15,260.00 |
| 0.6 | 3 | 0.8 | 1.15 | 15° | 4 | 50 | 15,540.00 |
| 0.75 | 3 | 1 | 1.45 | 15° | 4 | 52 | 15,260.00 |
| 0.75 | 3.8 | 1 | 1.45 | 15° | 4 | 52 | 15,540.00 |
| 1 | 4 | 1.2 | 1.94 | 15° | 4 | 52 | 15,540.00 |
| 1 | 5 | 1.2 | 1.94 | 15° | 4 | 52 | 15,540.00 |

SSPB220 切削條件參考表

Recommended Cutting Condition

| 被削材 | | 預硬鋼、燒入鋼 NAK80 · STAVAX · SKD61 (~52HRC) | | | | 燒入鋼 SKD11 · ELMAX (~62HRC) | | | | 高速鋼母材 SKH · HAP (~68HRC) | | | |
|------|------|---|-------|--------|-------------------|----------------------------------|-------|--------|-------------------|--------------------------------|-------|--------|-------------------|
| R角 | 有效長 | 切削深度 | | 進刀速度 | 回轉數 | 切削深度 | | 進刀速度 | 回轉數 | 切削深度 | | 進刀速度 | 回轉數 |
| | | ap mm | ae mm | mm/min | min ⁻¹ | ap mm | ae mm | mm/min | min ⁻¹ | ap mm | ae mm | mm/min | min ⁻¹ |
| 0.1 | 0.3 | 0.005 | 0.005 | 600 | 50,000 | 0.005 | 0.005 | 450 | 50,000 | 0.003 | 0.003 | 300 | 50,000 |
| 0.1 | 0.6 | 0.005 | 0.005 | 500 | 50,000 | 0.005 | 0.005 | 350 | 50,000 | 0.003 | 0.003 | 250 | 50,000 |
| 0.15 | 0.3 | 0.005 | 0.005 | 800 | 50,000 | 0.005 | 0.005 | 600 | 50,000 | 0.003 | 0.003 | 450 | 50,000 |
| 0.15 | 0.5 | 0.005 | 0.005 | 750 | 50,000 | 0.005 | 0.005 | 550 | 50,000 | 0.003 | 0.003 | 400 | 50,000 |
| 0.15 | 0.75 | 0.005 | 0.005 | 700 | 50,000 | 0.005 | 0.005 | 500 | 50,000 | 0.003 | 0.003 | 400 | 50,000 |
| 0.2 | 0.5 | 0.005 | 0.01 | 1,200 | 50,000 | 0.005 | 0.01 | 900 | 50,000 | 0.005 | 0.005 | 600 | 50,000 |
| 0.2 | 0.75 | 0.005 | 0.01 | 1,100 | 50,000 | 0.005 | 0.01 | 850 | 50,000 | 0.005 | 0.005 | 550 | 50,000 |
| 0.2 | 1 | 0.005 | 0.01 | 1,000 | 50,000 | 0.005 | 0.01 | 800 | 50,000 | 0.005 | 0.005 | 500 | 50,000 |
| 0.2 | 1.2 | 0.005 | 0.01 | 1,000 | 50,000 | 0.005 | 0.01 | 800 | 50,000 | 0.005 | 0.005 | 500 | 50,000 |
| 0.25 | 1 | 0.01 | 0.01 | 1,200 | 50,000 | 0.01 | 0.01 | 1,000 | 50,000 | 0.005 | 0.005 | 700 | 50,000 |
| 0.3 | 1.2 | 0.01 | 0.02 | 1,800 | 50,000 | 0.01 | 0.02 | 1,500 | 50,000 | 0.005 | 0.01 | 1,000 | 50,000 |
| 0.3 | 1.5 | 0.01 | 0.02 | 1,500 | 50,000 | 0.01 | 0.02 | 1,200 | 50,000 | 0.005 | 0.01 | 800 | 50,000 |
| 0.4 | 1.6 | 0.01 | 0.02 | 1,800 | 50,000 | 0.01 | 0.02 | 1,500 | 50,000 | 0.005 | 0.01 | 1,000 | 50,000 |
| 0.4 | 2 | 0.01 | 0.02 | 1,500 | 50,000 | 0.01 | 0.02 | 1,200 | 50,000 | 0.005 | 0.01 | 800 | 50,000 |
| 0.5 | 2 | 0.02 | 0.04 | 2,500 | 50,000 | 0.02 | 0.03 | 1,800 | 50,000 | 0.01 | 0.02 | 1,200 | 50,000 |
| 0.5 | 2.5 | 0.02 | 0.04 | 2,000 | 50,000 | 0.02 | 0.03 | 1,500 | 50,000 | 0.01 | 0.02 | 1,000 | 50,000 |
| 0.6 | 2.4 | 0.02 | 0.04 | 3,000 | 50,000 | 0.02 | 0.03 | 2,500 | 50,000 | 0.01 | 0.02 | 1,800 | 50,000 |
| 0.6 | 3 | 0.02 | 0.04 | 2,500 | 50,000 | 0.02 | 0.03 | 2,000 | 50,000 | 0.01 | 0.02 | 1,500 | 50,000 |
| 0.75 | 3 | 0.03 | 0.05 | 3,000 | 50,000 | 0.03 | 0.05 | 3,000 | 50,000 | 0.02 | 0.03 | 2,500 | 50,000 |
| 0.75 | 3.8 | 0.03 | 0.05 | 3,000 | 50,000 | 0.03 | 0.05 | 3,000 | 50,000 | 0.02 | 0.03 | 2,000 | 50,000 |
| 1 | 4 | 0.05 | 0.1 | 3,000 | 50,000 | 0.03 | 0.05 | 3,000 | 50,000 | 0.03 | 0.03 | 2,000 | 50,000 |
| 1 | 5 | 0.05 | 0.1 | 3,000 | 50,000 | 0.03 | 0.05 | 3,000 | 50,000 | 0.03 | 0.03 | 2,000 | 50,000 |

備考

- * 切削深度為中精加工及精加工的最大值。
- * 中精加工時，請留意均勻的殘量移除。
- * 設定加工條件及刀具路徑時，請留意負荷較大的端角部份。
- * 建議請使用油霧切削
- * 請依據機械設備之剛性及所要求的精度，調整切削條件，並依同比例調整回轉數及進刀速度。

SSPB220 高品質精加工切削條件參考表

Recommended Cutting Condition for Fine Finishing

| 被削材 | | 預硬鋼・燒入鋼 NAK80・STAVAX・SKD61 (~52HRC) | | | | 燒入鋼 SKD11・ELMAX (~62HRC) | | | | 高速鋼母材 SKH・HAP (~68HRC) | | | |
|------|------|---|-------|--------|-------------------|--------------------------------|-------|--------|-------------------|------------------------------|-------|--------|-------------------|
| R角 | 有效長 | 切削深度 | | 進刀速度 | 回轉數 | 切削深度 | | 進刀速度 | 回轉數 | 切削深度 | | 進刀速度 | 回轉數 |
| | | ap mm | ae mm | mm/min | min ⁻¹ | ap mm | ae mm | mm/min | min ⁻¹ | ap mm | ae mm | mm/min | min ⁻¹ |
| 0.1 | 0.3 | 0.003 | 0.003 | 450 | 50,000 | 0.002 | 0.002 | 350 | 50,000 | 0.002 | 0.002 | 250 | 50,000 |
| 0.1 | 0.6 | 0.003 | 0.003 | 400 | 50,000 | 0.002 | 0.002 | 300 | 50,000 | 0.002 | 0.002 | 200 | 50,000 |
| 0.15 | 0.3 | 0.004 | 0.004 | 550 | 50,000 | 0.002 | 0.002 | 400 | 50,000 | 0.002 | 0.002 | 300 | 50,000 |
| 0.15 | 0.5 | 0.004 | 0.004 | 500 | 50,000 | 0.002 | 0.002 | 350 | 50,000 | 0.002 | 0.002 | 250 | 50,000 |
| 0.15 | 0.75 | 0.004 | 0.004 | 500 | 50,000 | 0.002 | 0.002 | 350 | 50,000 | 0.002 | 0.002 | 250 | 50,000 |
| 0.2 | 0.5 | 0.005 | 0.005 | 700 | 50,000 | 0.003 | 0.003 | 500 | 50,000 | 0.003 | 0.003 | 400 | 50,000 |
| 0.2 | 0.75 | 0.005 | 0.005 | 650 | 50,000 | 0.003 | 0.003 | 450 | 50,000 | 0.003 | 0.003 | 350 | 50,000 |
| 0.2 | 1 | 0.005 | 0.005 | 600 | 50,000 | 0.003 | 0.003 | 400 | 50,000 | 0.003 | 0.003 | 300 | 50,000 |
| 0.2 | 1.2 | 0.005 | 0.005 | 600 | 50,000 | 0.003 | 0.003 | 400 | 50,000 | 0.003 | 0.003 | 300 | 50,000 |
| 0.25 | 1 | 0.007 | 0.007 | 700 | 50,000 | 0.004 | 0.004 | 500 | 50,000 | 0.004 | 0.004 | 400 | 50,000 |
| 0.3 | 1.2 | 0.01 | 0.01 | 800 | 50,000 | 0.005 | 0.005 | 600 | 50,000 | 0.005 | 0.005 | 500 | 50,000 |
| 0.3 | 1.5 | 0.01 | 0.01 | 700 | 50,000 | 0.005 | 0.005 | 500 | 50,000 | 0.005 | 0.005 | 400 | 50,000 |
| 0.4 | 1.6 | 0.01 | 0.01 | 1,000 | 50,000 | 0.005 | 0.005 | 800 | 50,000 | 0.005 | 0.005 | 600 | 50,000 |
| 0.4 | 2 | 0.01 | 0.01 | 800 | 50,000 | 0.005 | 0.005 | 600 | 50,000 | 0.005 | 0.005 | 500 | 50,000 |
| 0.5 | 2 | 0.02 | 0.02 | 1,200 | 50,000 | 0.01 | 0.01 | 1,000 | 50,000 | 0.01 | 0.01 | 800 | 50,000 |
| 0.5 | 2.5 | 0.02 | 0.02 | 1,000 | 50,000 | 0.01 | 0.01 | 800 | 50,000 | 0.01 | 0.01 | 600 | 50,000 |
| 0.6 | 2.4 | 0.02 | 0.02 | 1,500 | 50,000 | 0.01 | 0.01 | 1,200 | 50,000 | 0.01 | 0.01 | 1,000 | 50,000 |
| 0.6 | 3 | 0.02 | 0.02 | 1,200 | 50,000 | 0.01 | 0.01 | 1,000 | 50,000 | 0.01 | 0.01 | 800 | 50,000 |
| 0.75 | 3 | 0.02 | 0.02 | 1,800 | 50,000 | 0.01 | 0.01 | 1,500 | 50,000 | 0.01 | 0.01 | 1,200 | 50,000 |
| 0.75 | 3.8 | 0.02 | 0.02 | 1,500 | 50,000 | 0.01 | 0.01 | 1,200 | 50,000 | 0.01 | 0.01 | 1,000 | 50,000 |
| 1 | 4 | 0.03 | 0.03 | 2,000 | 50,000 | 0.02 | 0.02 | 1,500 | 50,000 | 0.02 | 0.02 | 1,200 | 50,000 |
| 1 | 5 | 0.03 | 0.03 | 2,000 | 50,000 | 0.02 | 0.02 | 1,500 | 50,000 | 0.02 | 0.02 | 1,200 | 50,000 |

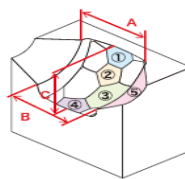
加工範例



精加工條件

| | |
|-------|----------------------------|
| 回轉數 | 40,000(min ⁻¹) |
| 進刀速度 | 1,500mm/min |
| 切削深度 | ap 0.01 x ae 0.007mm |
| 加工時間 | 1小時50分 |
| 總加工時間 | 3小時 |
| 加工長度 | 140M |

加工結果



加工尺寸

單位：mm

| | 目標值 | 實測值 | 誤差 |
|-----|--------|--------|--------|
| 寬度A | 19.329 | 19.327 | -0.002 |
| 寬度B | 18.629 | 18.627 | -0.002 |
| 高度C | 13.572 | 13.570 | -0.002 |

測定器：光學顯微鏡x100倍

 尺寸誤差2 μ m、面粗度為Rz0.7

實現了光潔的高品質加工面

 單位： μ m

| 測定位置 | (1) | (2) | (3) | (4) | (5) |
|------|------|------|------|------|------|
| Rz | 0.63 | 0.69 | 0.40 | 0.52 | 0.64 |

| | |
|------|---------------|
| 使用工具 | SSPB220 R 1x5 |
| 被削材 | ELMAX(59HRC) |
| 切削油 | 油霧切削 |
| 工件尺寸 | 30x30x30mm |