

无限白金Plus涂层 高硬度钢材 高效率加工用 小径3刃长颈球头铣刀

MUGEN COATING PREMIUM Plus

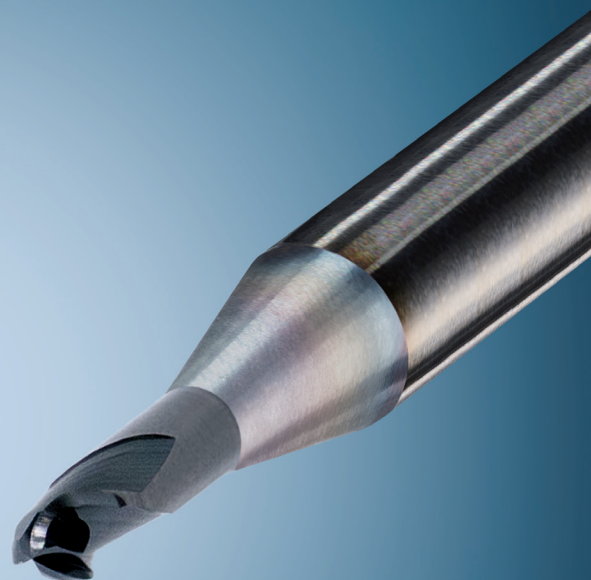
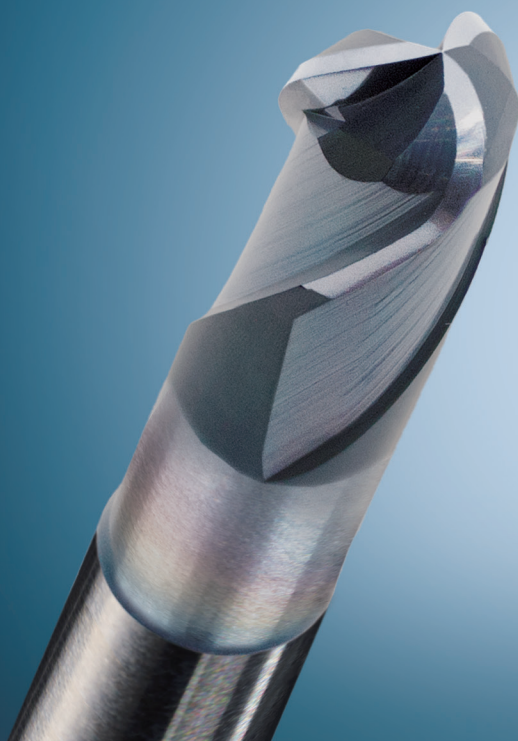
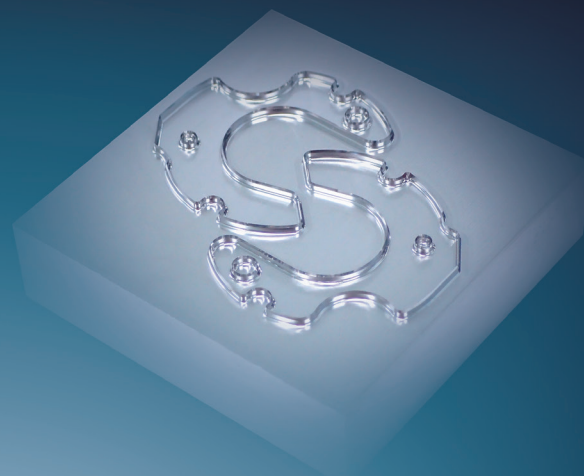
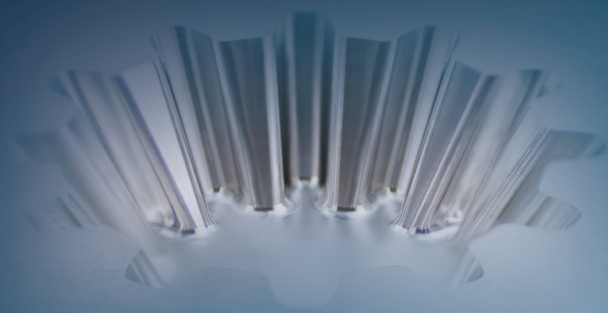
High Efficient 3-Flute Small-Diameter Long Neck Ball End Mill for Hardened Steel

MRBSH330

增加规格
Size Expansion

共 31 种规格
Total 31 sizes

H



提升刀刃刚性和排屑性能,进而实现“高效率·高精度”的模具加工

High-efficiency high-precision die machining with improved cutting edge rigidity and chip evacuation

无限白金Plus涂层
高硬度钢材高效率加工用小径3刃长颈球头铣刀

MUGEN COATING PREMIUM Plus
High Efficient 3-Flute Small-Diameter Long Neck Ball End Mill for Hardened Steel

MRBSH330

增加规格
Lineup Expansion



R0.1 ~ R3 共 31 种规格
Total 31 sizes



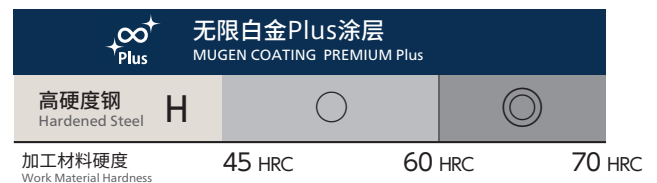
特色

Features

| | | |
|------------------|------------------------------|--|
| Feature 1 | 长寿命 Long tool life | 涂层 无限白金 Plus 涂层 Coating MUGEN COATING PREMIUM Plus |
|------------------|------------------------------|--|

对 60HRC ~ 70HRC 的加工材料效果出众
45 ~ 60HRC 也能实现与无限白金相同性能

MUGEN COATING PREMIUM Plus is suitable for machining above 60HRC
Demonstrates same performance with MUGEN COATING PREMIUM even on machining 45 ~ 60HRC



■与其他公司产品粗加工比较

Comparison with other tool brand on roughing process

切深量 a_p 0.23 × a_e 0.3 mm 情况下加工比较

Under the same rate of depth of cut

- 刀具尺寸：R1
Tool size
- 加工材料：HAP40 (64HRC)
Work Material
- 主轴转速：20,000 min⁻¹
Spindle speed
- 进给速度：2,400 mm/min
Feed

与其他公司相同刀具相比，
高进给粗加工也可实现长寿命
Realize long tool life during high speed
machining even comparing with the other
brand tool

| | 使用前 Before use | 60 分钟后 After 60min | 90 分钟后 After 90min | 120 分钟后 After 120min |
|--|-------------------|-----------------------|-----------------------|-------------------------|
| MRBSH330 R1×6 | | | | |
| 其他公司 A Other tool brand A 4刃球头铣刀 R1 4-flute ball end mill | | | | |
| 其他公司 B Other tool brand B 4刃球头铣刀 R1 4-flute ball end mill | | | | |

Feature
2

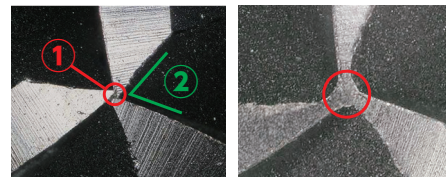
高效率
High efficiency

中心刃形状・不等分割・3刃・排屑性能

Cutting edge shape · Unequal flute spacing · 3-Flute · Chip evacuation

2-1

优化中心刃形状使得减轻切削负荷进而可设定大切深量
Optimized center ball shape reduces cutting load to enable high depth of cut



MRBSH330

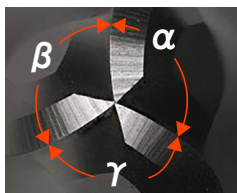
以往产品
Conventional

2-2

采用没有损害切屑排除性能的排屑空间形状
Optimized chip pocket design realizes smooth chip removal

2-3

不等分割抑制振刀现象
Unequal flute prevent chattering

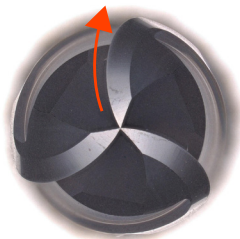


$\alpha \neq \beta \neq \gamma$

2-4

加工负荷大的大径刀具
采用强螺旋刀刃
切断排屑提升排屑性能
($R \geq 1.5$)

Adopting strong spiral gash for the large diameters to reduce cutting load, break up the chips to improve the chip removal ability unequal flute prevent chattering ($R \geq 1.5$)



MRBSH330



以往产品
Conventional

■与以往产品加工效率比较

Machining efficiency comparison with conventional product

- 加工材料：YXR7 (63HRC)
Work Material
- 冷却方式：油雾
Coolant : Oil mist
- 工件尺寸：50 × 50 mm
Work size



| 加工工序 Process | MRBSH330 | | 以往2刃球头铣刀 Conventional 2-flute ball end mill | |
|--|------------------------------|--------------------------------|--|-----------------------------|
| | 菱形槽部 Diamond shape pocket | 圆形槽部 Circle shape pocket | 菱形槽部 Diamond shape pocket | 圆形槽部 Circle shape pocket |
| 刀具尺寸 Tool size | R3 × 20 | R1.5 × 10 | R3 × 20 | R1.5 × 10 |
| 主轴转速 (min ⁻¹) Spindle speed | 7,000 | 15,000 | 7,000 | 15,000 |
| 进给速度 (mm/min) Feed | 3,000 | 2,600 | 2,000 | 1,800 |
| 切深量 (ap × ae mm) Depth of cut | 0.25 × 1 | 0.25 × 0.5 | 0.2 × 1 | 0.15 × 0.3 |
| 加工时间 Machining time | 42分9秒 42 min 9 sec | 16分23秒 16 min 23 sec | 73分11秒 73 min 11 sec | 55分34秒 55 min 34 sec |

总加工时间 减约55% !

Total machining time reduced by 55%



介绍 NS Connect
Introduction of NS Connect

读取刀具盒背面二维码可了解到各种有益信息
Scanning the barcode on the back of the case to get various information



- 刀具特色
Features
- 规格·切削条件
Size and Milling conditions
- 加工视频 等
Video of machining



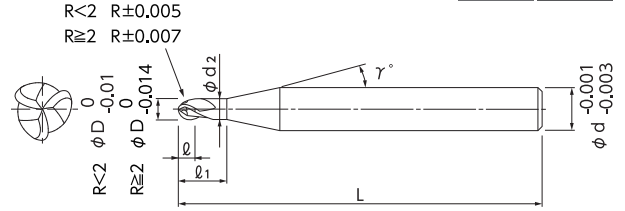
随时·随地
使用前可确认相关信息
Available to check the information anytime, anywhere before use

无限白金Plus涂层 高硬度钢材高效率加工用小径3刃长颈球头铣刀
MUGEN COATING PREMIUM Plus High Efficient 3-Flute small-diameter Long Neck Ball End Mill for Hardened Steel

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提升刀刃刚性和排屑性能， 进而实现“高效率·高精度”的模具加工

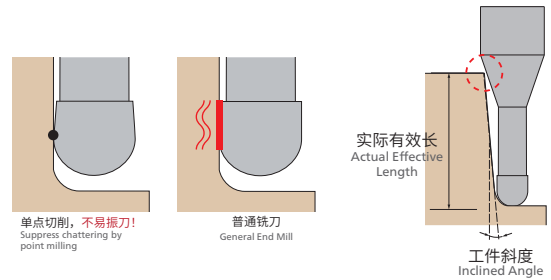
High-efficiency high-precision die machining with improved cutting edge rigidity and chip evacuation



- 优化了中心刃形状，可实现高切深的高效3刃球头铣刀。
- 对45 ~ 70HRC的高硬度钢材也兼具锋利度和耐磨损性，可实现长寿命、高效率加工。
- 柄径公差为 -0.001mm 至 -0.003mm 的高精度规格。
- High-efficiency 3-flute ball end mill optimizes a shape of central edge and enables high depth of cutting.
- Even hardened steel of 45 to 70HRC can be machining with long tool life and high efficiency.
- Shank diameter tolerance, high accuracy type, is -0.001 ~ -0.003.

加工材料 Work Material

| 高硬度钢 Hardened Steel | |
|------------------------|----------|
| 45~60HRC | 60~70HRC |
| | |



◆ 2023年1月增加规格 ※ Released in Jan, 2023.

单位 [尺寸: mm / 价格: 日元]
Unit [Size: mm / Retail Price: JPY]

| 产品代码 Code No. | (R)球头半径 Radius | (l1)颈长 Under Neck Length | (l)刃长 Length of Cut | (D)外径 Dia. | (d2)颈径 Neck Dia. | (γ)颈角 Neck Taper Angle | (d)柄径 Shank Dia. | (L)全长 Overall Length | 定价(日元) Retail Price | 相对于工件斜度的有效长 Actual effective length depending on inclined angle of workpiece | | | | |
|------------------|-------------------|-----------------------------|------------------------|---------------|---------------------|---------------------------|---------------------|-------------------------|------------------------|---|-------|-------|-------|-------|
| | | | | | | | | | | 30° | 1° | 1°30' | 2° | 3° |
| 08-0634-01003 | R0.1 | 0.3 | 0.15 | 0.2 | 0.18 | 12° | 4 | 45 | 10,500 | 0.35 | 0.36 | 0.38 | 0.39 | 0.42 |
| 08-0634-01005 | | 0.5 | 0.15 | 0.2 | 0.18 | 12° | 4 | 45 | 10,500 | 0.56 | 0.58 | 0.61 | 0.63 | 0.69 |
| 08-0634-01505 | R0.15 | 0.5 | 0.2 | 0.3 | 0.28 | 12° | 4 | 45 | 10,400 | 0.56 | 0.58 | 0.60 | 0.62 | 0.67 |
| 08-0634-01506 | | 0.6 | 0.2 | 0.3 | 0.28 | 12° | 4 | 45 | 10,400 | 0.66 | 0.69 | 0.71 | 0.74 | 0.81 |
| 08-0634-01507 | | 0.75 | 0.2 | 0.3 | 0.28 | 12° | 4 | 45 | 10,400 | 0.82 | 0.85 | 0.88 | 0.92 | 1.01 |
| 08-0634-01510 | | 1 | 0.2 | 0.3 | 0.28 | 12° | 4 | 45 | 10,400 | 1.08 | 1.12 | 1.17 | 1.22 | 1.34 |
| 08-0634-02005 | R0.2 | 0.5 | 0.3 | 0.4 | 0.37 | 12° | 4 | 45 | 7,100 | 0.58 | 0.60 | 0.62 | 0.64 | 0.69 |
| 08-0634-02008 | | 0.8 | 0.3 | 0.4 | 0.37 | 12° | 4 | 45 | 7,100 | 0.89 | 0.93 | 0.96 | 1.00 | 1.09 |
| 08-0634-02010 | | 1 | 0.3 | 0.4 | 0.37 | 12° | 4 | 45 | 7,100 | 1.10 | 1.14 | 1.19 | 1.24 | 1.35 |
| 08-0634-02510 | R0.25 | 1 | 0.35 | 0.5 | 0.46 | 12° | 4 | 45 | 7,100 | 1.13 | 1.16 | 1.21 | 1.26 | 1.37 |
| 08-0634-02515 | | 1.5 | 0.35 | 0.5 | 0.46 | 12° | 4 | 45 | 7,100 | 1.65 | 1.71 | 1.78 | 1.85 | 2.03 |
| 08-0634-03010 | R0.3 | 1 | 0.45 | 0.6 | 0.56 | 12° | 4 | 45 | 6,100 | 1.12 | 1.16 | 1.20 | 1.25 | 1.35 |
| 08-0634-03015 | | 1.5 | 0.45 | 0.6 | 0.56 | 12° | 4 | 45 | 6,100 | 1.64 | 1.71 | 1.77 | 1.84 | 2.02 |
| 08-0634-03020 | | 2 | 0.45 | 0.6 | 0.56 | 12° | 4 | 45 | 6,100 | 2.17 | 2.25 | 2.34 | 2.44 | 2.68 |
| 08-0634-05020 | R0.5 | 2 | 0.75 | 1 | 0.95 | 12° | 4 | 45 | 5,700 | 2.18 | 2.26 | 2.34 | 2.43 | 2.65 |
| 08-0634-05025 | | 2.5 | 0.75 | 1 | 0.95 | 12° | 4 | 45 | 5,700 | 2.70 | 2.80 | 2.91 | 3.03 | 3.31 |
| 08-0634-05030 | | 3 | 0.75 | 1 | 0.95 | 12° | 4 | 45 | 5,700 | 3.22 | 3.35 | 3.48 | 3.63 | 3.97 |
| 08-0634-07503 | R0.75 | 3 | 1.1 | 1.5 | 1.45 | 12° | 4 | 45 | 6,500 | 3.21 | 3.33 | 3.45 | 3.58 | 3.89 |
| 08-0634-07504 | | 4 | 1.1 | 1.5 | 1.45 | 12° | 4 | 45 | 6,500 | 4.26 | 4.41 | 4.59 | 4.78 | 5.22 |
| 08-0634-10003 | R1 | 3 | 1.5 | 2 | 1.94 | 12° | 4 | 45 | 5,100 | 3.23 | 3.33 | 3.44 | 3.56 | 3.85 |
| 08-0634-10004 | | 4 | 1.5 | 2 | 1.94 | 12° | 4 | 45 | 5,100 | 4.27 | 4.42 | 4.58 | 4.76 | 5.17 |
| 08-0634-10006 | | 6 | 1.5 | 2 | 1.94 | 12° | 4 | 45 | 5,100 | 6.36 | 6.60 | 6.86 | 7.15 | 7.83 |
| ◆ 08-0634-15006 | R1.5 | 6 | 2.5 | 3 | 2.85 | 12° | 6 | 60 | 7,000 | 6.56 | 6.78 | 7.03 | 7.31 | 7.95 |
| ◆ 08-0634-15008 | | 8 | 2.5 | 3 | 2.85 | 12° | 6 | 60 | 7,000 | 8.64 | 8.96 | 9.31 | 9.70 | 10.60 |
| ◆ 08-0634-15010 | | 10 | 2.5 | 3 | 2.85 | 12° | 6 | 60 | 7,000 | 10.73 | 11.14 | 11.59 | 12.09 | 13.26 |
| ◆ 08-0634-20008 | R2 | 8 | 3 | 4 | 3.8 | 12° | 6 | 65 | 7,400 | 8.74 | 9.05 | 9.38 | 9.74 | 10.60 |
| ◆ 08-0634-20010 | | 10 | 3 | 4 | 3.8 | 12° | 6 | 65 | 7,400 | 10.83 | 11.22 | 11.66 | 12.14 | 13.25 |
| ◆ 08-0634-20012 | | 12 | 3 | 4 | 3.8 | 12° | 6 | 65 | 7,400 | 12.91 | 13.40 | 13.94 | 14.53 | 15.91 |
| ◆ 08-0634-30010 | R3 | 10 | 6 | 6 | 5.7 | - | 6 | 65 | 8,800 | Free | Free | Free | Free | Free |
| ◆ 08-0634-30015 | | 15 | 6 | 6 | 5.7 | - | 6 | 65 | 8,800 | Free | Free | Free | Free | Free |
| ◆ 08-0634-30020 | | 20 | 6 | 6 | 5.7 | - | 6 | 65 | 8,800 | Free | Free | Free | Free | Free |

订购方式
How to Order

请指定 MRBSH330 球头半径(R)×颈长(l1)。
When you order, indicate MRBSH330(R)×(l1).

※(γ)为参考值。
※(γ) is reference value.

| 加工材料 Work Material | | | 高速钢·高硬度钢 High Speed Steels/Hardened Steels SKH51·SKD11 (~62HRC) | | | | 高速钢 High Speed Steels SKH55·HAP40 (~66HRC) | | | | 高速钢 High Speed Steels SKH57·HAP72 (~70HRC) | | | |
|-----------------------|-------------------------|------------------------|---|-------|--------------|-----------------------|--|-------|--------------|-----------------------|--|-------|--------------|-----------------------|
| R球头 半径 Radius | 颈长 Under Neck Length | L(颈长)/ D(外径) L/D | 切深量 Depth of Cut | | 进给速度 Feed | 主轴转速 Spindle Speed | 切深量 Depth of Cut | | 进给速度 Feed | 主轴转速 Spindle Speed | 切深量 Depth of Cut | | 进给速度 Feed | 主轴转速 Spindle Speed |
| | | | ap mm | ae mm | mm/min | min ⁻¹ | ap mm | ae mm | mm/min | min ⁻¹ | ap mm | ae mm | mm/min | min ⁻¹ |
| R0.1 | 0.3 | 1.5 | 0.006 | 0.007 | 450 | 40,000 | 0.004 | 0.005 | 300 | 40,000 | 0.004 | 0.005 | 220 | 40,000 |
| | 0.5 | 2.5 | 0.006 | 0.007 | 400 | 40,000 | 0.004 | 0.005 | 250 | 40,000 | 0.004 | 0.005 | 190 | 40,000 |
| R0.15 | 0.5 | 1.7 | 0.01 | 0.01 | 450 | 40,000 | 0.005 | 0.005 | 400 | 40,000 | 0.005 | 0.005 | 300 | 40,000 |
| | 0.6 | 2 | 0.007 | 0.007 | 450 | 40,000 | 0.005 | 0.005 | 350 | 40,000 | 0.005 | 0.005 | 270 | 40,000 |
| | 0.75 | 2.5 | 0.007 | 0.007 | 400 | 40,000 | 0.005 | 0.005 | 350 | 40,000 | 0.005 | 0.005 | 250 | 40,000 |
| R0.2 | 1 | 3.3 | 0.007 | 0.007 | 350 | 40,000 | 0.005 | 0.005 | 300 | 40,000 | 0.005 | 0.005 | 220 | 40,000 |
| | 0.5 | 1.25 | 0.035 | 0.04 | 1,100 | 40,000 | 0.013 | 0.02 | 850 | 40,000 | 0.013 | 0.02 | 650 | 35,000 |
| | 0.8 | 2 | 0.03 | 0.03 | 1,000 | 40,000 | 0.012 | 0.02 | 850 | 40,000 | 0.012 | 0.02 | 600 | 35,000 |
| R0.25 | 1 | 2.5 | 0.03 | 0.03 | 1,000 | 40,000 | 0.012 | 0.02 | 850 | 40,000 | 0.012 | 0.02 | 600 | 35,000 |
| | 1 | 2 | 0.03 | 0.03 | 1,300 | 40,000 | 0.015 | 0.02 | 1,000 | 35,000 | 0.015 | 0.02 | 700 | 30,000 |
| | 1.5 | 3 | 0.015 | 0.03 | 1,000 | 40,000 | 0.01 | 0.02 | 800 | 35,000 | 0.01 | 0.02 | 500 | 30,000 |
| R0.3 | 1 | 1.7 | 0.045 | 0.06 | 1,500 | 40,000 | 0.03 | 0.05 | 1,100 | 30,000 | 0.03 | 0.05 | 800 | 25,000 |
| | 1.5 | 2.5 | 0.045 | 0.06 | 1,500 | 40,000 | 0.03 | 0.05 | 1,100 | 30,000 | 0.03 | 0.05 | 800 | 25,000 |
| | 2 | 3.3 | 0.045 | 0.06 | 1,500 | 40,000 | 0.03 | 0.05 | 1,100 | 30,000 | 0.03 | 0.05 | 800 | 25,000 |
| R0.5 | 2 | 2 | 0.15 | 0.2 | 3,000 | 30,000 | 0.12 | 0.1 | 2,000 | 25,000 | 0.075 | 0.1 | 1,500 | 20,000 |
| | 2.5 | 2.5 | 0.15 | 0.2 | 3,000 | 30,000 | 0.12 | 0.1 | 2,000 | 25,000 | 0.075 | 0.1 | 1,500 | 20,000 |
| | 3 | 3 | 0.15 | 0.2 | 3,000 | 30,000 | 0.12 | 0.1 | 2,000 | 25,000 | 0.075 | 0.1 | 1,500 | 20,000 |
| R0.75 | 3 | 2 | 0.15 | 0.3 | 3,800 | 30,000 | 0.15 | 0.2 | 3,000 | 25,000 | 0.09 | 0.2 | 2,200 | 20,000 |
| | 4 | 2.7 | 0.15 | 0.3 | 3,000 | 25,000 | 0.15 | 0.2 | 2,400 | 22,000 | 0.09 | 0.2 | 1,800 | 18,000 |
| R1 | 3 | 1.5 | 0.3 | 0.5 | 3,800 | 25,000 | 0.22 | 0.3 | 3,000 | 20,000 | 0.15 | 0.3 | 2,200 | 16,000 |
| | 4 | 2 | 0.3 | 0.5 | 3,800 | 25,000 | 0.22 | 0.3 | 3,000 | 20,000 | 0.15 | 0.3 | 2,200 | 16,000 |
| | 6 | 3 | 0.3 | 0.3 | 3,000 | 22,000 | 0.22 | 0.3 | 2,400 | 20,000 | 0.15 | 0.3 | 1,800 | 16,000 |
| R1.5 | 6 | 2 | 0.3 | 0.6 | 3,800 | 18,000 | 0.25 | 0.5 | 3,000 | 15,000 | 0.15 | 0.5 | 2,250 | 12,000 |
| | 8 | 2.7 | 0.3 | 0.6 | 3,800 | 18,000 | 0.25 | 0.5 | 3,000 | 15,000 | 0.15 | 0.5 | 2,250 | 12,000 |
| R2 | 10 | 3.3 | 0.3 | 0.6 | 3,200 | 18,000 | 0.25 | 0.5 | 2,600 | 15,000 | 0.15 | 0.5 | 2,000 | 12,000 |
| | 8 | 2 | 0.3 | 0.8 | 3,800 | 15,000 | 0.25 | 0.6 | 3,000 | 12,000 | 0.18 | 0.6 | 2,250 | 9,500 |
| | 10 | 2.5 | 0.3 | 0.8 | 3,800 | 15,000 | 0.25 | 0.6 | 3,000 | 12,000 | 0.18 | 0.6 | 2,250 | 9,500 |
| R3 | 12 | 3 | 0.3 | 0.8 | 3,800 | 15,000 | 0.25 | 0.6 | 3,000 | 12,000 | 0.18 | 0.6 | 2,250 | 9,500 |
| | 10 | 1.7 | 0.38 | 1.2 | 3,800 | 8,000 | 0.25 | 1 | 3,000 | 7,000 | 0.18 | 1 | 2,250 | 5,500 |
| | 15 | 2.5 | 0.38 | 1.2 | 3,800 | 8,000 | 0.25 | 1 | 3,000 | 7,000 | 0.18 | 1 | 2,250 | 5,500 |
| | 20 | 3.3 | 0.38 | 1.2 | 3,800 | 8,000 | 0.25 | 1 | 3,000 | 7,000 | 0.18 | 1 | 2,250 | 5,500 |

备注
Notes

- ※1 切深量的ap表示为轴向切深量, ae表示步距量。
- ※2 请根据机床刚性和工件的夹持状态等调整切削参数。
- ※3 发生振刀等情况时, 请根据需要调整切深参数。
- ※4 R角等切削阻力大的部位, 请特别注意参数设定和刀路轨迹等。
- ※5 加工过程中的机械振动较大时, 请根据需要调整进给速度。
- ※6 排除不佳可能会导致刀具崩刃的和折断, 敬请注意。
- ※7 请以相同的比率调整主轴转速和进给速度。
- ※8 请尽量缩短刀具的伸出量。
- ※9 建议使用油雾冷却方式。
- ※1 Depth of Cut : ap = Axial Depth of Cut / ae = Radial Depth of Cut.
- ※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
- ※3 In case of chattering etc., please adjust cutting conditions if necessary.
- ※4 At point where cutting load is high such as at corners, pay attention to setting cutting conditions and tool paths particularly.
- ※5 If machine tool vibration is high during machining, adjust the feed rate as necessary.
- ※6 Attention to a risk of chipping and breakage when insufficient chip flow.
- ※7 Adjust both spindle speed and feed at the same rate.
- ※8 Overhang of end mill should be as short as possible from spindle nose.
- ※9 We recommend using oil mist coolant.

加工案例1

Machining case 1

YXM1 (62HRC) 锻造模具形状 YXM1 (62HRC) Forging mold

对高硬度钢进行大切削与高进给可实现高效率加工

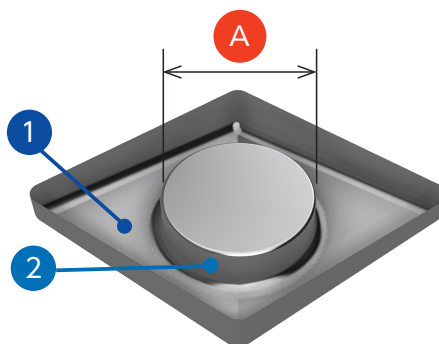
Realize high efficient machining on hardened steels with high depth of cut and high feed rate

加工材料：**YXM1 (62HRC)** SKH51同级产品
Work Material as the same as SKH51

工件尺寸：**100 × 100 mm**
Work size

冷却方式：**油雾**
Coolant: Oil mist

总加工时间：**3 小时 35 分**
Total machining time: 3 hr 35 min



单位
Unit [μm]

| 表面粗糙度 Surface roughness | | |
|----------------------------|-------------------------|--------------|
| | ① 5° 倾斜部 Inclined 5° | ② 侧面 Side |
| Ra | 0.34 | 0.24 |
| Rz | 1.88 | 1.51 |

单位
Unit [mm]

| | 前刀面 Rake | 底刃中心 Center | 加工时间 Machining time |
|---|-------------|----------------|--------------------------|
| MRBSH330 R3 × 15 粗加工 Roughing + 中精加工 Semi-finishing | | | 2 小时 14 分 2 hr 14 min |
| MRBSH330 R3 × 15 精加工 Finishing | | | 1 小时 21 分 1 hr 21 min |

| 精度 Accuracy | | A |
|----------------|---------------|---------------|
| 目标值 Target | 实测值 Actual | ϕ 40.006 |
| ϕ 40.000 | 误差 Error | + 0.006 |

单位
Unit [mm]

| 圆筒部倾倒量 Deflection at cylindrical part |
|--|
| 0.001 以下 |

| 加工工序 Process | 粗加工 Roughing | 中精加工 Semi-Finishing | 精加工 Finishing |
|--|--------------------------|------------------------|--------------------------|
| 使用刀具 Tool | MRBSH330 R3 × 15 | | MRBSH330 R3 × 15 |
| 主轴转速 [min^{-1}] Spindle speed | 7,000 | | 7,000 |
| 进给速度 [mm/min] Feed | 3,000 | 2,100 | 1,500 |
| 切深量 [mm] $a_p \times a_e$ Depth of cut | 0.25×1 | pf 0.2 | pf 0.1 |
| 余量 [mm] Stock | 0.05 | 0.03 | 0 |
| 加工时间 Machining time | 1 小时 43 分 1 hr 43 min | 31 分 31 min | 1 小时 21 分 1 hr 21 min |

加工案例2 Machining case 2

HAP40 (64HRC) 双层齿轮形状 HAP40 (64HRC) Two-stage pocket mold

对高硬度钢的复杂形状也可实现长寿命和高效加工

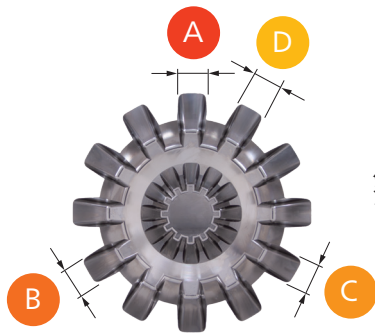
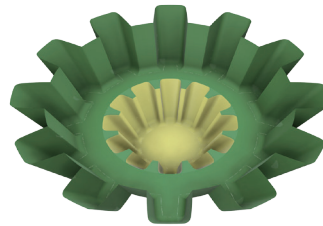
Realize long tool life and high efficiency machining for complex shapes even on hardened steels

加工材料：**HAP40 (64HRC)** SKH40同级产品
Work Material as the same as SKH40

工件尺寸：**100 × 100 mm**
Work size

冷却方式：**油雾**
Coolant: Oil mist

总加工时间：**13 小时 31 分**
Total machining time: 13 hr 31 min



加工顺序
Machining sequence → 单位 Unit [mm]

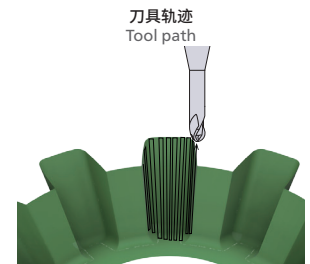
| 精度 Accuracy | | A | B | C | D |
|---------------------------|------------|---------|---------|---------|---------|
| 第1层 1 st stage | 实测值 Actual | 11.177 | 11.176 | 11.176 | 11.174 |
| | 误差 Error | - 0.003 | - 0.004 | - 0.004 | - 0.006 |
| 第2层 2 nd stage | 实测值 Actual | 6.579 | 6.578 | 6.577 | 6.577 |
| | 误差 Error | - 0.003 | - 0.004 | - 0.005 | - 0.005 |



表面粗糙度
Surface roughness

单位 Unit [μm]

| | 1 | 2 | 3 | 4 |
|----|-------|-------|-------|-------|
| Ra | 0.053 | 0.067 | 0.065 | 0.070 |



| 加工位置 Machining position | 第1层 1 st stage | | 第2层 2 nd stage | 第1层 1 st stage | | 第2层 2 nd stage | | |
|--|---------------------------|-----------------------|---------------------------|---------------------------|------------------------|---------------------------|--------------------------|--------------------------|
| | 粗加工 Roughing | 中粗加工 Semi-Roughing | 粗加工 Roughing | 中精加工 Semi-Finishing | 精加工 Finishing | 中粗加工 Semi-Roughing | 中精加工 Semi-Finishing | 精加工 Finishing |
| 使用刀具 Tool | MRBSH330 R3 × 20 | MRBSH330 R1.5 × 10 | | MRBSH330 R1.5 × 10 | MRBSH330 R1.5 × 10 | | MRBSH330 R1 × 6 | MRBSH330 R1 × 6 |
| 主轴转速 [min ⁻¹] Spindle speed | 7,000 | 15,000 | 15,000 | 10,000 | 10,000 | 15,000 | 13,000 | 13,000 |
| 进给速度 [mm/min] Feed | 2,500 | 2,000 | 2,500 | 1,800 | 1,500 | 1,500 | 1,500 | 1,300 |
| 切深量 [mm] ap × ae Depth of cut | 0.25 × 1 | 0.15 × 0.1 | 0.2 × 0.8 | 0.05 × 0.05 | 0.035 × 0.035 | 0.15 × 0.1 | 0.04 × 0.04 | 0.03 × 0.03 |
| 余量 [mm] Stock | 0.1 | 0.08 | 0.1 | 0.035 | 0 | 0.08 | 0.03 | 0 |
| 加工时间 Machining time | 2 小时 5 分 2 hr 5 min | 54 分 54 min | 38 分 38 min | 2 小时 30 分 2 hr 30 min | 4 小时 4 分 4 hr 4 min | 10 分 10 min | 1 小时 23 分 1 hr 23 min | 1 小时 47 分 1 hr 47 min |

日进工具株式会社

总公司・海外营业部

140-0014 东京都品川区大井 1-28-1 住友不动产大井町站前大厦 6 F
TEL. +81(3)-6423-1191 FAX. +81(3)-6423-1192
www.ns-tool.com

日进工具香港有限公司

香港九龙尖沙咀亚士厘道 33 号 九龙中心大厦 10 楼 1001-02 室
TEL. +852-2736-8686 FAX. +852-2736-0070
www.ns-tool.com.en

日进工具香港有限公司 深圳代表处

广东省深圳市罗湖区人民南路 2008 号 深圳嘉里中心大厦 1221 室
TEL. +86(755)-2265-2275

日进工具香港有限公司 苏州办事处

江苏省苏州市工业园区星都街 80 号 凤凰国际公寓 2107 室
TEL. +86(512)-6866-2275

www.ns-tool.com.cn (手机官网)



警告 CAUTION 使用上的安全注意事项 Attention on Safety

- 1) 拿起刀具使用时，请特别小心避免损坏刀刃。
- 2) 请勿空手触摸刀刃。
- 3) 为了安全，使用刀具时请带防护眼镜。
- 4) 选用适合刀具和实际加工内容的刀柄。刀柄装夹后将刀柄的偏摆量控制最低。
- 5) 加工工件必须固定好。
- 6) 请预先测量刀具及加工材料的尺寸。
- 7) 请根据工件形状和使用设备情况来调节切削参数。
- 8) 根据实际用途请选择适合的冷却方式。使用切削油时，请采取防火措施以免发生火花引起火灾等发生。
- 9) 加工过程中如发生异常现象（异常声音或烟雾）时，请立即停止机床。
- 10) 请勿改造刀具。
- 1) When removing tools from cases, be careful of getting-out of tools and don't touch directly the cutting edges.
- 2) Never touch the cutting edges directly with bare hand.
- 3) Use safety covers and eye protection, as tools may be broken.
- 4) Use holders, etc. that match the tools and nature of the processing operations. The tool should be firmly attached to the holder to prevent shaking.
- 5) The work materials clamp firmly.
- 6) Make sure of dimensions of tools and work pieces before starting operation.
- 7) It is necessary to adjust conditions according to the dimensions of work materials and the machine.
- 8) Select a cutting fluid appropriate to the particular usage. Using a non-water cutting fluid could lead to fires due to sparks generated during processing or heat caused by breakage. Ensure that you take proper fire-prevention measures.
- 9) If abnormal sound, etc. occurs during processing, stop the machine immediately.
- 10) Don't modify tools.

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23'01

MRBS330_C1_202301



■ 本册中列出的产品规格将来可能会发生改变，恕不另行通知。
Specifications may change without notice for improvement.