NS TOOL

「匠」心创先

无限白金涂层
4刃锥型长颈圆鼻铣刀

MUGEN COATING PREMIUM
4-Flute Taper Neck Corner Radius End Mill

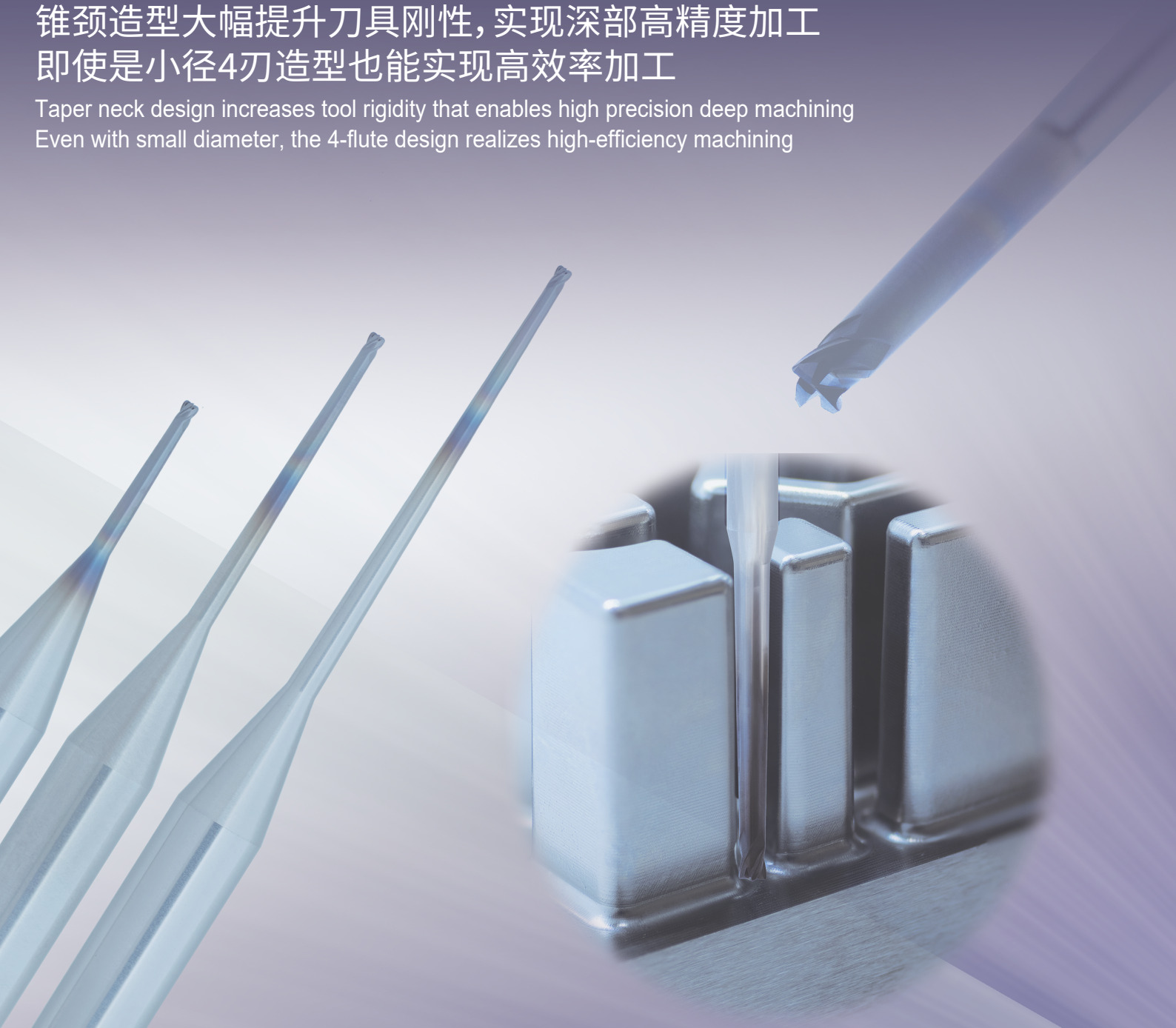
MTNH430R NEW

共 93 种规格
Total 93 sizes

P H

锥颈造型大幅提升刀具刚性，实现深部高精度加工
即使是小径4刃造型也能实现高效率加工

Taper neck design increases tool rigidity that enables high precision deep machining
Even with small diameter, the 4-flute design realizes high-efficiency machining



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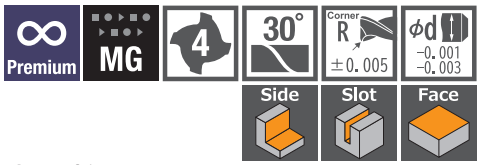
Release in Jul, 2025.



φ 0.2 × R0.03 ×颈角 1°× 1
Neck taper angle
～ φ 3 × R0.5 ×颈角 3°× 30.1
Neck taper angle

共 93 种规格
Total 93 sizes

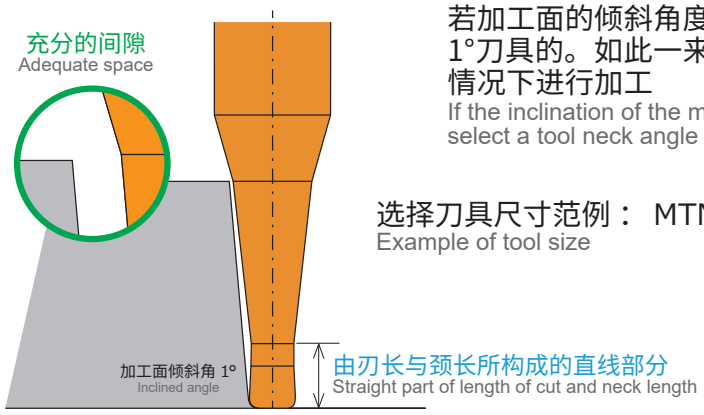
Point 1

选择与加工面倾斜角度相同的颈角刀具

Available the same neck angle as the inclined angle of the milling surface

如果倾斜角是 1° 那么选择 颈角为 1°的刀具

If the inclined angle is 1°, select tool neck taper angle with 1° as well



若加工面的倾斜角度为 1°，请选择颈部角度也为1°刀具的。如此一来，颈部就能在不干涉工件的情况下进行加工

If the inclination of the machining area is 1°, select a tool neck angle of 1° as well

选择刀具尺寸范例： MTNH430R φ 2 × R0.2 × **1°**× 20
Example of tool size

Point 2

为方便 CAD/CAM 编程人员设置参数，提供完整切削参数参考表

Recommended cutting conditions for CAD/CAM operators reference

新增了「粗加工」「清角加工」「中精加工」「精加工」的切削参数，以确保任何人都可以根据标准参考值创建刀具路径。

Newly added cutting conditions for "Roughing", "Stock Removal(Inner Corner)", "Semi-finishing", "Finishing" processes to ensure that anyone can create tool paths at anytime based on standard reference values

调质钢 Prehardened Steels HPM·NAK (～42HRC)

粗加工 Roughing						清角加工 Stock removal (Inner Corner)				
主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	切屑排出量 Material Removal Rate	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
min⁻¹	mm/min	ap mm	ae mm	mm	mm³/min	min⁻¹	mm/min	ap mm	ae mm	mm
30,000	410	0.005	0.05	0.007	0.1	30,000	330	0.004	0.04	0.007
30,000	260	0.004	0.05	0.005	0.05	30,000	210	0.003	0.04	0.005
30,000	190	0.004	0.05	0.005	0.04	30,000	150	0.003	0.04	0.005
30,000	370	0.005	0.05	0.007	0.09	30,000	300	0.004	0.04	0.007
30,000	300	0.005	0.05	0.007	0.08	30,000	240	0.004	0.04	0.007
30,000	410	0.007	0.05	0.009	0.14	30,000	330	0.005	0.04	0.009
30,000	260	0.006	0.05	0.007	0.08	30,000	210	0.004	0.04	0.007

调质钢 Prehardened Steels HPM·NAK (～42HRC)

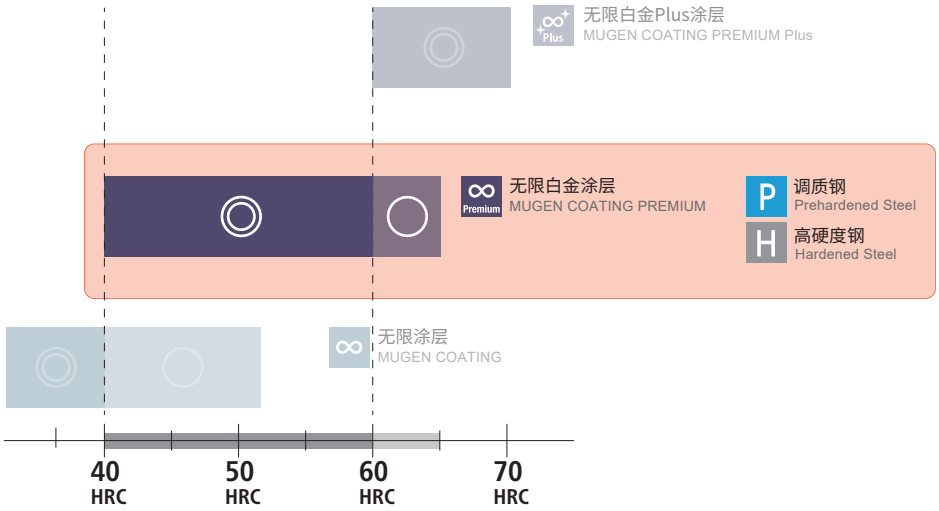
中精加工 Semi-Finishing					精加工 Finishing				
主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
min⁻¹	mm/min	ap mm	ae mm	mm	min⁻¹	mm/min	ap mm	ae mm	mm
30,000	310	0.004	0.038	0.003	30,000	290	0.003	0.035	0
30,000	200	0.003	0.038	0.002	30,000	180	0.002	0.035	0
30,000	140	0.003	0.038	0.002	30,000	130	0.002	0.035	0
30,000	280	0.004	0.038	0.003	30,000	260	0.003	0.035	0
30,000	230	0.004	0.038	0.003	30,000	210	0.003	0.035	0
30,000	310	0.005	0.038	0.004	30,000	290	0.004	0.035	0
30,000	200	0.004	0.038	0.003	30,000	180	0.003	0.035	0

特长
Features

Feature 1 延长刀具寿命 Long tool life — 无限白金涂层 MUGEN COATING PREMIUM

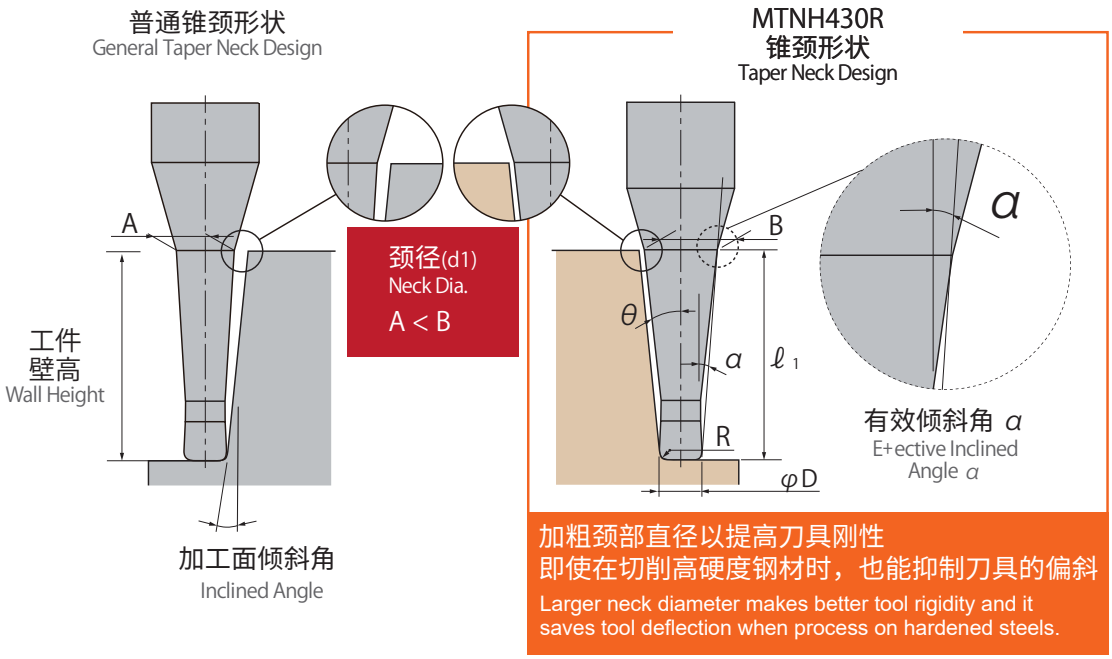
无限白金涂层是在无限涂层的基础上，针对高硬度钢直接加工时，可大幅提升刀具寿命的涂层
特别是针对加工硬度 40 ～ 65HRC 的材料时可实现显著的效果

MUGEN COATING PREMIUM is a further improvement of the conventional MUGEN COATING that drastically extends tool life during direct milling on hardened steels
Effectively machining on work materials with hardness from 40 to 65 HRC



Feature 2 高刚性 High rigidity — 最大限度提升刚性的锥颈造型 Taper neck design for maximum rigidity

通过最大限度提升刀具刚性，可抑制刀具偏斜实现高精度加工
Tool deflection is reduced by maximizing the rigidity to realize the high precision machining



加粗颈部直径以提高刀具刚性
即使在切削高硬度钢材时，也能抑制刀具的偏斜
Larger neck diameter makes better tool rigidity and it saves tool deflection when process on hardened steels.

锥颈造型大幅提升刀具刚性，实现深沟高精度加工
即使是小径4刃造型也能实现高效率加工

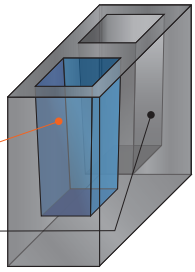
Taper neck design increases tool rigidity that enables high precision deep machining
Even with small diameter, the 4-flute design realizes high-efficiency machining

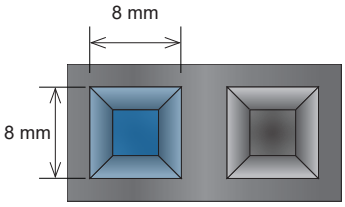
■与长颈铣刀的加工比较
Comparison with long neck end mill

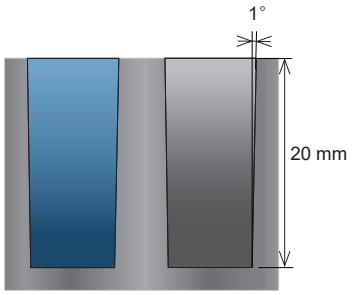
加工材料：DAC-MAGIC （44HRC）
Work material
冷却方式：油雾
Coolant　Oil mist

用MTNH430R加工
Machined by MTNH430R

用以往产品加工
Machined by conventional tool



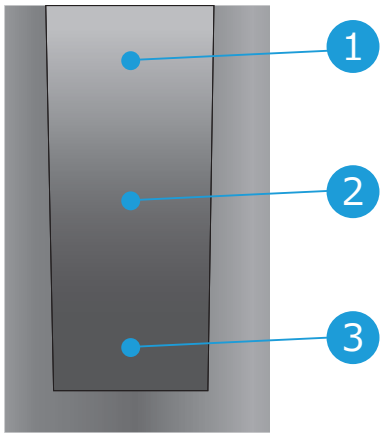




使用刀具 Tool	MTNH430R ϕ2×R0.3×1°×20			以往产品 Conventional ϕ2×R0.3×20		
加工工序 Machining process	粗加工 Roughing	中精加工 Semi-finishing	精加工 Finishing	粗加工 Roughing	中精加工 Semi-finishing	精加工 Finishing
主轴转速 [min^{-1}] Spindle speed	10,000			8,000		
切削速度 [m/min] Cutting speed	62.8			50.24		
进给速度 [mm/min] Feed	1,500	800	800	650	650	650
每刃进给量 [mm/rev] Feed per tooth	0.0375	0.02	0.02	0.02	0.02	0.02
切深量 ap × ae [mm] Depth of cut	0.07×1	0.05×0.02	0.02×0.02	0.02×0.6	0.02×0.02	0.02×0.02
余量 [mm] Stock allowance	0.04	0.02	-	0.04	0.02	-
加工时间 Machining time	28 分钟 28 min	13 分钟 13 min	33 分钟 33 min	2 小时 36 分钟 2hr 36 min	38 分钟 38 min	38 分钟 38 min
总加工时间 Total machining time	1 小时 14 分钟 1 hr 14 min			3 小时 52 分钟 3 hr 52 min		

通过使用高刚性的 MTNH430R，可实现稳定的加工精度，并在加工时间（成本）削减方面发挥显著效果。
By using the high-rigidity tool MTNH430R, machining accuracy can be easily stabilized, resulting in a significant reduction in machining time and cost.

面粗度
Surface roughness

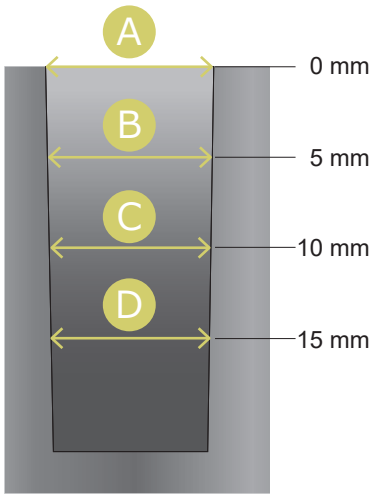


单位 [μm]
Unit

测量位置 Measuring position	MTNH430R ϕ2×R0.3×1°×20	以往产品 Conventional ϕ2×R0.3×20
1	Ra：0.132 Rz：0.908	Ra：0.362 Rz：2.486
2	Ra：0.206 Rz：1.240	Ra：0.291 Rz：1.564
3	Ra：0.192 Rz：1.216	Ra：0.300 Rz：1.652

采用锥颈造型提升刀具刚性，抑制在深沟加工时产生的振刀现象，实现高品质加工面
Taper neck shape increases tool rigidity, suppresses chattering even at deep-area machining, and achieves high surface quality.

加工精度 Accuracy



单位[mm] Unit

测量位置 Measuring position	目标值 Target	MTNH430R ϕ2×R0.3×1°×20		以往产品 Conventional ϕ2×R0.3×20	
		实测值 Actual	误差 Error	实测值 Actual	误差 Error
A	8.000	7.992	-0.008	7.992	-0.008
B	7.825	7.816	-0.009	7.788	-0.037
C	7.651	7.637	-0.014	7.610	-0.041
D	7.476	7.457	-0.019	7.436	-0.04
角度 Angle	1°	1°1'19"	+1'19"	1°3'43"	+3'43"

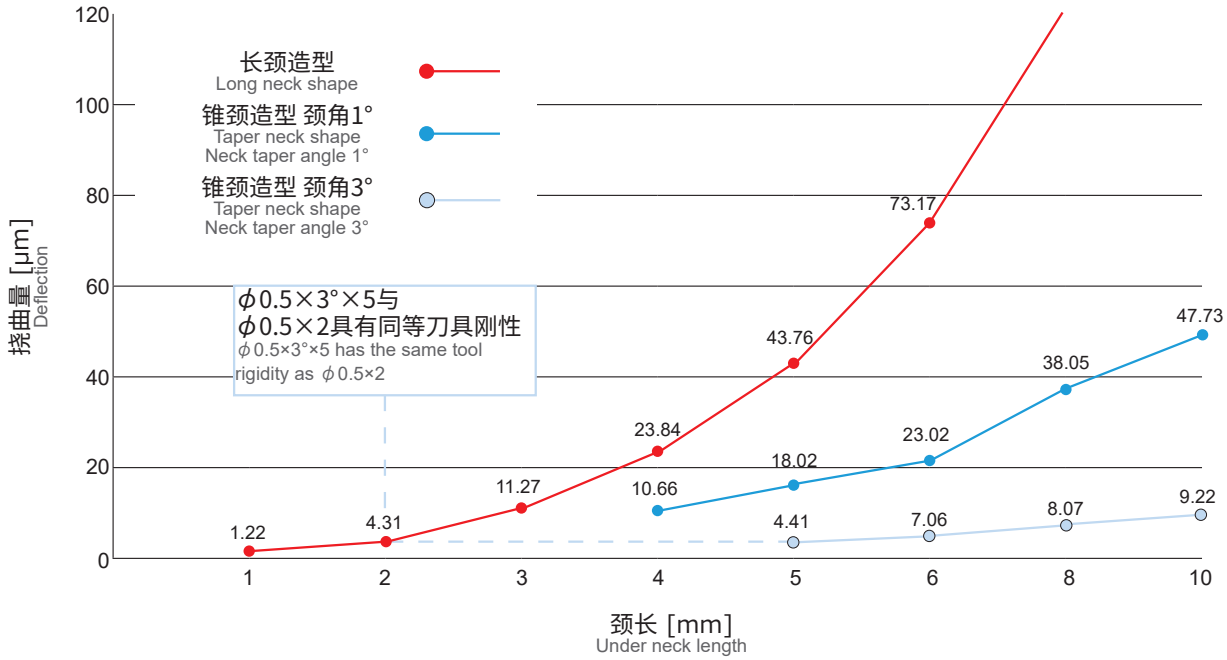
MTNH430R 的锥颈造型提升刀具刚性，抑制刀具偏斜实现高精度加工
MTNH430R, featuring a tapered neck design that enhances tool rigidity, enables high-precision machining by minimizing tool deflection.

■与长颈铣刀的刚性比较

Tool ridigity comparison with long neck end mill

比较外径 ϕ 0.5 的刀具，颈部形状不同时，在刃尖施加 1N 荷重时的时的挠曲量

Deflection comparison under 1 N load on ϕ 0.5, neck shape variation



MTNH430R New

规格 φ0.2×R0.03×颈角1°×1～φ3×R0.5×颈角3°×30.1
Size φ0.2×R0.03×neck taper angle1°×1～φ3×R0.5×neck taper angle3°×30.1

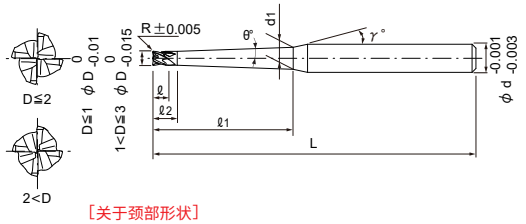
Premium ≦65 HRC

无限白金涂层
4刃锥型长颈圆鼻铣刀
MUGEN COATING PREMIUM 4-Flute Taper Neck Corner Radius End Mill

共 93 种规格
Total 93 sizes

锥颈造型大幅提升刀具刚性，实现深部高精度加工
即使是小径4刃造型也能实现高效率加工
Taper neck design increases tool rigidity that enables high precision deep machining
Even with small diameter, the 4-flute design realizes high-efficiency machining

MG | 4 | 30° | Corner R ±0.005 | φd -0.001 -0.003 | Side | Slot | Face

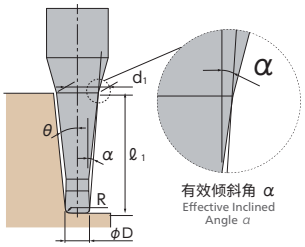


- 即使加工深部也能抑制刀具偏斜的锥颈造型圆鼻铣刀实现高精度加工。
- 最优化的倒锥造型结合无限白金涂层，在加工高硬度钢时能更好的发挥功能。
- 即使是小径，也采用4刃设计，共93种规格。

- Corner radius end mill with taper neck design that enables high precision deep machining with minimal deflection.
- Optimized taper neck design and MUGEN COATING PREMIUM realizes higher ability for hardened steels.
- 4-flute design even with small diameter, lineup of 93 sizes in total.

[关于颈部形状]
标示的颈角 2（γ）仅供参考。
当担心被加工材料与颈部干涉时，请务必进行实测确认。
(Neck Shape)
(γ) is reference value. Tool measurement required in order to avoid interference to the work material.

直径 φ0.2 ～ φ2 的底刀，刃口不延伸至中心。请注意可能会有未加工残留。
Please be aware of remaining stock since there is no cutting edge on its center from φ 0.2 to φ 2.



加工材料 Work Material

调质钢 Prehardened Steel P	高硬度钢 Hardened Steel H	
	40～60HRC	～65HRC
◎	◎	○

◆ 2025年7月发布 ※Release in Jul, 2025.
※颈角（θ）可以选择与加工面倾斜角度相同的角度，但这角度并不代表刀具的整体形状。
※ Please select the tool with the same neck angle as the inclined angle of the milling surface. It does not indicate the shape of the tool.

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

产品代码 Code No.	外径(D) Dia.	角半径(R) Corner Radius	颈角(θ) Neck Taper Angle	颈长(ℓ1) Under Neck Length	颈径(d1) Neck Dia.	刃长(ℓ) Length of Cut	颈长2(ℓ2) Under Neck Length 2	颈角2(γ) Neck Taper Angle 2	有效斜度(α) Effective Inclined Angle	柄径(d) Shank Dia.	全长(L) Overall Length	定价(日元) Retail Price
◆ 08-00777-02311	0.2	R0.03	1°	1	0.22	0.15	0.4	12°	0°59′	4	45	14,400
◆ 08-00777-02312				1.5	0.24	0.15	0.4	12°	0°59′	4	45	14,400
◆ 08-00777-02313				2	0.26	0.15	0.4	12°	0°59′	4	45	14,400
◆ 08-00777-02342			3°	1.5	0.34	0.15	0.4	12°	2°59′	4	45	14,400
◆ 08-00777-02343				2	0.39	0.15	0.4	12°	2°59′	4	45	14,400
◆ 08-00777-02411		R0.05	1°	1	0.22	0.15	0.4	12°	0°59′	4	45	14,400
◆ 08-00777-02412				1.5	0.24	0.15	0.4	12°	0°59′	4	45	14,400
◆ 08-00777-02413				2	0.26	0.15	0.4	12°	0°59′	4	45	14,400
◆ 08-00777-02442			3°	1.5	0.34	0.15	0.4	12°	2°59′	4	45	14,400
◆ 08-00777-02443				2	0.39	0.15	0.4	12°	2°59′	4	45	14,400
◆ 08-00777-03312	0.3	R0.03	1°	1.5	0.34	0.25	0.6	12°	0°59′	4	45	14,000
◆ 08-00777-03313				2	0.35	0.25	0.6	12°	0°59′	4	45	14,000
◆ 08-00777-03315				3	0.39	0.25	0.6	12°	0°59′	4	45	14,000
◆ 08-00777-03343			3°	2	0.49	0.25	0.6	12°	2°59′	4	45	14,000
◆ 08-00777-03345				3	0.6	0.25	0.6	12°	2°59′	4	45	14,000
◆ 08-00777-03412		R0.05	1°	1.5	0.34	0.25	0.6	12°	0°59′	4	45	14,000
◆ 08-00777-03413				2	0.35	0.25	0.6	12°	0°59′	4	45	14,000
◆ 08-00777-03415				3	0.39	0.25	0.6	12°	0°59′	4	45	14,000
◆ 08-00777-03443			3°	2	0.49	0.25	0.6	12°	2°59′	4	45	14,000
◆ 08-00777-03445				3	0.6	0.25	0.6	12°	2°59′	4	45	14,000
◆ 08-00777-05411	0.5	R0.05	1°	4	0.62	0.4	1	12°	0°59′	4	45	8,400
◆ 08-00777-05412				5	0.65	0.4	1	12°	0°59′	4	45	8,400
◆ 08-00777-05413				6	0.69	0.4	1	12°	0°59′	4	45	8,400
◆ 08-00777-05415				8	0.76	0.4	1	12°	0°59′	4	45	8,400
◆ 08-00777-05417				10	0.83	0.4	1	12°	0°59′	4	45	8,500
◆ 08-00777-05442			3°	5	1	0.4	1	12°	2°59′	4	45	8,400
◆ 08-00777-05445				8	1.31	0.4	1	12°	2°59′	4	45	8,400
◆ 08-00777-05447				10	1.52	0.4	1	12°	2°59′	4	45	8,500
◆ 08-00777-05511		R0.1	1°	4	0.61	0.4	1	12°	0°59′	4	45	8,400
◆ 08-00777-05512				5	0.65	0.4	1	12°	0°59′	4	45	8,400
◆ 08-00777-05513				6	0.68	0.4	1	12°	0°59′	4	45	8,400
◆ 08-00777-05515				8	0.75	0.4	1	12°	0°59′	4	45	8,400
◆ 08-00777-05517				10	0.82	0.4	1	12°	0°59′	4	45	8,500
◆ 08-00777-05542			3°	5	0.99	0.4	1	12°	2°59′	4	45	8,400
◆ 08-00777-05545				8	1.31	0.4	1	12°	2°59′	4	45	8,400
◆ 08-00777-05547				10	1.52	0.4	1	12°	2°59′	4	45	8,500

订购方式 How to Order
请指定 MTNH430R 的外径(D)×角半径(R)×颈角(θ)×颈长(ℓ1)。
When you order, indicate MTNH430R (D)×(R)×(θ)×(ℓ1).

※(γ)为参考值。
※(γ) is reference value.

※颈角（θ）可以选择与加工面倾斜角度相同的角度，但这角度并不代表刀具的整体形状。
※ Please select the tool with the same neck angle as the inclined angle of the milling surface.It does not indicate the shape of the tool.

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

产品代码 Code No.	外径(D) Dia.	角半径(R) Corner Radius	颈角(θ) Neck Taper Angle	颈长(ℓ_1) Under Neck Length	颈径(d_1) Neck Dia.	刃长(ℓ) Length of Cut	颈长2(ℓ_2) Under Neck Length 2	颈角2(γ) Neck Taper Angle 2	有效斜度(α) Effective Inclined Angle	柄径 (d) Shank Dia.	全长(L) Overall Length	定价(日元) Retail Price
08-00777-10511	1	R0.1	1°	10	1.3	0.8	2	12°	0°59′	6	60	8,200
08-00777-10512				15	1.47	0.8	2	12°	0°59′	6	60	8,300
08-00777-10513				20	1.65	0.8	2	12°	0°59′	6	60	8,400
08-00777-10514				25	1.82	0.8	2	12°	0°59′	6	70	9,500
08-00777-10515				30	2	0.8	2	12°	0°59′	6	70	9,600
08-00777-10542			3°	15	2.52	0.8	2	12°	2°59′	6	60	8,300
08-00777-10611		R0.2	1°	10	1.3	0.8	2	12°	0°59′	6	60	8,200
08-00777-10612				15	1.47	0.8	2	12°	0°59′	6	60	8,300
08-00777-10613				20	1.65	0.8	2	12°	0°59′	6	60	8,400
08-00777-10614				25	1.82	0.8	2	12°	0°59′	6	70	9,500
08-00777-10615				30	1.99	0.8	2	12°	0°59′	6	70	9,600
08-00777-10642			3°	15	2.51	0.8	2	12°	2°59′	6	60	8,300
08-00777-10711		R0.3	1°	10	1.29	0.8	2	12°	0°59′	6	60	8,200
08-00777-10712				15	1.47	0.8	2	12°	0°59′	6	60	8,300
08-00777-10713				20	1.64	0.8	2	12°	0°59′	6	60	8,400
08-00777-10714				25	1.82	0.8	2	12°	0°59′	6	70	9,500
08-00777-10715				30	1.99	0.8	2	12°	0°59′	6	70	9,600
08-00777-10742			3°	15	2.5	0.8	2	12°	2°59′	6	60	8,300
08-00777-15612	1.5	R0.2	1°	15	1.97	1.2	3	12°	0°59′	6	60	8,200
08-00777-15613				20	2.14	1.2	3	12°	0°59′	6	60	8,300
08-00777-15615				30	2.49	1.2	3	12°	0°59′	6	70	9,400
08-00777-15643			3°	20	3.53	1.2	3	12°	2°59′	6	60	8,300
08-00777-15712		R0.3	1°	15	1.97	1.2	3	12°	0°59′	6	60	8,200
08-00777-15713				20	2.14	1.2	3	12°	0°59′	6	60	8,300
08-00777-15715				30	2.49	1.2	3	12°	0°59′	6	70	9,400
08-00777-15743			3°	20	3.52	1.2	3	12°	2°59′	6	60	8,300
08-00777-15812		R0.5	1°	15	1.96	1.2	3	12°	0°59′	6	60	8,200
08-00777-15813				20	2.13	1.2	3	12°	0°59′	6	60	8,300
08-00777-15815				30	2.48	1.2	3	12°	0°59′	6	70	9,400
08-00777-15843			3°	20	3.5	1.2	3	12°	2°59′	6	60	8,300
08-00777-20613	2	R0.2	1°	20	2.64	1.6	4	12°	0°59′	6	60	8,300
08-00777-20615				30	2.99	1.6	4	12°	0°59′	6	70	9,400
08-00777-20617				40	3.34	1.6	4	12°	0°59′	6	80	10,800
08-00777-20645			3°	30	5.07	1.6	4	12°	2°59′	6	70	9,400
08-00777-20713		R0.3	1°	20	2.64	1.6	4	12°	0°59′	6	60	8,300
08-00777-20715				30	2.99	1.6	4	12°	0°59′	6	70	9,400
08-00777-20717				40	3.34	1.6	4	12°	0°59′	6	80	10,800
08-00777-20745			3°	30	5.06	1.6	4	12°	2°59′	6	70	9,400
08-00777-20813		R0.5	1°	20	2.63	1.6	4	12°	0°59′	6	60	8,300
08-00777-20815				30	2.98	1.6	4	12°	0°59′	6	70	9,400
08-00777-20817				40	3.33	1.6	4	12°	0°59′	6	80	10,800
08-00777-20845			3°	30	5.04	1.6	4	12°	2°59′	6	70	9,400
08-00777-30611	3	R0.2	1°	30	3.94	2.5	6	12°	0°59′	6	70	11,500
08-00777-30613				40	4.29	2.5	6	12°	0°59′	6	80	12,900
08-00777-30615				50	4.64	2.5	6	12°	0°59′	6	90	13,500
08-00777-30617				60	4.99	2.5	6	12°	0°59′	6	100	14,200
08-00777-30642			3°	29.8	6	2.5	6	-	2°59′	6	70	11,300
08-00777-30711		R0.3	1°	30	3.93	2.5	6	12°	0°59′	6	70	11,500
08-00777-30713				40	4.28	2.5	6	12°	0°59′	6	80	12,900
08-00777-30715				50	4.63	2.5	6	12°	0°59′	6	90	13,500
08-00777-30717				60	4.98	2.5	6	12°	0°59′	6	100	14,200
08-00777-30742			3°	29.9	6	2.5	6	-	2°59′	6	70	11,300
08-00777-30811		R0.5	1°	30	3.93	2.5	6	12°	0°59′	6	70	11,500
08-00777-30813				40	4.28	2.5	6	12°	0°59′	6	80	12,900
08-00777-30815				50	4.63	2.5	6	12°	0°59′	6	90	13,500
08-00777-30817				60	4.98	2.5	6	12°	0°59′	6	100	14,200
08-00777-30842			3°	30.1	6	2.5	6	-	2°59′	6	70	11,300

MTNH430R New

切削参数参考表 Recommended Conditions

加工材料 Work Material					调质钢 Prehardened Steels HPM·NAK (~42HRC)										
					粗加工 Roughing						清角加工 Stock removal (Inner Corner)				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	切屑排出量 Material Removal Rate	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	mm^3/min	min^{-1}	mm/min	a_p mm	a_e mm	mm
0.2	R0.03	1°	1	5	30,000	410	0.005	0.05	0.007	0.1	30,000	330	0.004	0.04	0.007
			1.5	7.5	30,000	260	0.004	0.05	0.005	0.05	30,000	210	0.003	0.04	0.005
			2	10	30,000	190	0.004	0.05	0.005	0.04	30,000	150	0.003	0.04	0.005
		3°	1.5	7.5	30,000	370	0.005	0.05	0.007	0.09	30,000	300	0.004	0.04	0.007
			2	10	30,000	300	0.005	0.05	0.007	0.08	30,000	240	0.004	0.04	0.007
	R0.05	1°	1	5	30,000	410	0.007	0.05	0.009	0.14	30,000	330	0.005	0.04	0.009
			1.5	7.5	30,000	260	0.006	0.05	0.007	0.08	30,000	210	0.004	0.04	0.007
			2	10	30,000	190	0.005	0.05	0.005	0.05	30,000	150	0.003	0.04	0.005
		3°	1.5	7.5	30,000	370	0.007	0.05	0.009	0.13	30,000	300	0.005	0.04	0.009
			2	10	30,000	300	0.006	0.05	0.007	0.09	30,000	240	0.005	0.04	0.007
0.3	R0.03	1°	1.5	5	30,000	520	0.011	0.1	0.009	0.57	30,000	420	0.008	0.08	0.009
			2	6.7	30,000	400	0.008	0.1	0.008	0.32	30,000	320	0.006	0.08	0.008
			3	10	30,000	300	0.005	0.1	0.006	0.15	30,000	240	0.004	0.08	0.006
		3°	2	6.7	30,000	520	0.011	0.1	0.009	0.57	30,000	420	0.008	0.08	0.009
			3	10	30,000	420	0.008	0.1	0.008	0.34	30,000	340	0.006	0.08	0.008
	R0.05	1°	1.5	5	30,000	520	0.015	0.1	0.011	0.78	30,000	420	0.011	0.08	0.011
			2	6.7	30,000	400	0.011	0.1	0.009	0.44	30,000	320	0.008	0.08	0.009
			3	10	30,000	300	0.008	0.1	0.006	0.24	30,000	240	0.006	0.08	0.006
		3°	2	6.7	30,000	520	0.015	0.1	0.011	0.78	30,000	420	0.011	0.08	0.011
			3	10	30,000	420	0.011	0.1	0.01	0.46	30,000	340	0.009	0.08	0.01
0.5	R0.05	1°	4	8	30,000	800	0.016	0.16	0.012	2.05	30,000	640	0.012	0.128	0.012
			5	10	26,300	680	0.013	0.16	0.01	1.41	21,000	540	0.01	0.128	0.01
			6	12	25,600	610	0.011	0.16	0.008	1.07	20,500	490	0.008	0.128	0.008
			8	16	24,500	520	0.008	0.12	0.005	0.5	20,500	420	0.006	0.096	0.005
			10	20	23,800	310	0.006	0.08	0.004	0.15	19,000	250	0.004	0.064	0.004
		3°	5	10	30,000	860	0.019	0.16	0.014	2.61	24,000	690	0.014	0.128	0.014
			8	16	30,000	790	0.015	0.16	0.011	1.9	24,000	630	0.012	0.128	0.011
			10	20	30,000	760	0.014	0.16	0.01	1.7	24,000	610	0.011	0.128	0.01
	R0.1	1°	4	8	30,000	800	0.016	0.16	0.012	2.05	24,000	640	0.012	0.128	0.012
			5	10	26,300	680	0.013	0.16	0.01	1.41	21,000	540	0.01	0.128	0.01
			6	12	25,600	610	0.011	0.16	0.008	1.07	20,500	490	0.008	0.128	0.008
			8	16	24,500	520	0.008	0.12	0.005	0.5	19,600	420	0.006	0.096	0.005
			10	20	23,800	310	0.006	0.08	0.004	0.15	19,000	250	0.004	0.064	0.004
		3°	5	10	30,000	860	0.019	0.16	0.014	2.61	24,000	690	0.014	0.128	0.014
			8	16	30,000	790	0.015	0.16	0.011	1.9	24,000	630	0.012	0.128	0.011
			10	20	30,000	760	0.014	0.16	0.01	1.7	24,000	610	0.011	0.128	0.01
1	R0.1	1°	10	10	17,500	1,130	0.035	0.35	0.023	13.84	14,000	900	0.028	0.28	0.023
			15	15	15,100	570	0.015	0.25	0.008	2.14	12,100	460	0.012	0.2	0.008
			20	20	13,800	420	0.01	0.1	0.006	0.42	11,000	330	0.008	0.08	0.006
			25	25	12,900	360	0.005	0.05	0.004	0.09	10,300	290	0.004	0.04	0.004
			30	30	12,300	310	0.003	0.03	0.004	0.03	9,800	250	0.002	0.024	0.004
		3°	15	15	18,800	1,560	0.041	0.35	0.026	22.39	15,000	1,250	0.032	0.28	0.026
	R0.2	1°	10	10	17,500	1,130	0.035	0.35	0.023	13.84	14,000	900	0.028	0.28	0.023
			15	15	15,100	570	0.015	0.25	0.008	2.14	12,100	460	0.012	0.2	0.008
			20	20	13,800	420	0.01	0.1	0.006	0.42	11,000	330	0.008	0.08	0.006
			25	25	12,900	360	0.005	0.05	0.004	0.09	10,300	290	0.004	0.04	0.004
			30	30	12,300	310	0.003	0.03	0.004	0.03	9,800	250	0.002	0.024	0.004
		3°	15	15	18,800	1,560	0.041	0.35	0.026	22.39	15,000	1,250	0.032	0.28	0.026
	R0.3	1°	10	10	17,500	1,130	0.035	0.35	0.023	13.84	14,000	900	0.028	0.28	0.023
			15	15	15,100	570	0.015	0.25	0.008	2.14	12,100	460	0.012	0.2	0.008
			20	20	13,800	420	0.01	0.1	0.006	0.42	11,000	330	0.008	0.08	0.006
			25	25	12,900	360	0.005	0.05	0.004	0.09	10,300	290	0.004	0.04	0.004
			30	30	12,300	310	0.003	0.03	0.004	0.03	9,800	250	0.002	0.024	0.004
		3°	15	15	18,800	1,560	0.041	0.35	0.026	22.39	15,000	1,250	0.032	0.28	0.026

切削参数参考表 Recommended Conditions

加工材料 Work Material					调质钢 Prehardened Steels HPM·NAK (～42HRC)										
					粗加工 Roughing						清角加工 Stock removal (Inner Corner)				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	切屑排出量 Material Removal Rate	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	mm^3/min	min^{-1}	mm/min	a_p mm	a_e mm	mm
1.5	R0.2	1°	15	10	15,700	1,150	0.05	0.55	0.038	31.63	12,600	920	0.04	0.44	0.038
			20	13.3	13,800	630	0.03	0.4	0.011	7.56	11,000	500	0.024	0.32	0.011
			30	20	11,800	430	0.01	0.15	0.007	0.65	9,400	340	0.008	0.12	0.007
		3°	20	13.3	17,700	1,590	0.065	0.55	0.046	56.84	14,200	1,270	0.052	0.44	0.046
	R0.3	1°	15	10	15,700	1,150	0.05	0.55	0.038	31.63	12,600	920	0.04	0.44	0.038
			20	13.3	13,800	630	0.03	0.4	0.011	7.56	11,000	500	0.024	0.32	0.011
			30	20	11,800	430	0.01	0.15	0.007	0.65	9,400	340	0.008	0.12	0.007
		3°	20	13.3	17,700	1,590	0.065	0.55	0.046	56.84	14,200	1,270	0.052	0.44	0.046
	R0.5	1°	15	10	15,700	1,150	0.05	0.55	0.038	31.63	12,600	920	0.04	0.44	0.038
			20	13.3	13,800	630	0.03	0.4	0.011	7.56	11,000	500	0.024	0.32	0.011
			30	20	11,800	430	0.01	0.15	0.007	0.65	9,400	340	0.008	0.12	0.007
		3°	20	13.3	17,700	1,590	0.065	0.55	0.046	56.84	14,200	1,270	0.052	0.44	0.046
2	R0.2	1°	20	10	12,500	1,170	0.07	0.7	0.046	57.33	10,000	940	0.056	0.56	0.046
			30	15	9,500	740	0.04	0.5	0.029	14.8	7,600	590	0.032	0.4	0.022
			40	20	7,900	440	0.03	0.2	0.023	2.64	6,300	350	0.024	0.16	0.017
		3°	30	15	14,400	1,570	0.08	0.7	0.053	87.92	11,500	1,260	0.064	0.56	0.053
	R0.3	1°	20	10	12,500	1,170	0.07	0.7	0.046	57.33	10,000	940	0.056	0.56	0.046
			30	15	9,500	740	0.04	0.5	0.029	14.8	7,600	590	0.032	0.4	0.029
			40	20	7,900	440	0.03	0.2	0.023	2.64	6,300	350	0.024	0.16	0.023
		3°	30	15	14,400	1,570	0.08	0.7	0.053	87.92	11,500	1,260	0.064	0.56	0.053
	R0.5	1°	20	10	12,500	1,170	0.07	0.7	0.046	57.33	10,000	940	0.056	0.56	0.046
			30	15	9,500	740	0.04	0.5	0.029	14.8	7,600	590	0.032	0.4	0.029
			40	20	7,900	440	0.03	0.2	0.023	2.64	6,300	350	0.024	0.16	0.023
		3°	30	15	14,400	1,570	0.08	0.7	0.053	87.92	11,500	1,260	0.064	0.56	0.053
3	R0.2	1°	30	10	8,900	1,190	0.08	1	0.061	95.2	7,100	950	0.064	0.8	0.06
			40	13.3	7,800	650	0.06	0.8	0.032	31.2	6,200	520	0.048	0.64	0.032
			50	16.7	7,000	530	0.045	0.6	0.026	14.31	5,600	420	0.036	0.48	0.026
			60	20	6,500	450	0.035	0.3	0.023	4.73	5,200	360	0.028	0.24	0.023
		3°	29.8	9.9	11,200	1,640	0.1	1	0.065	164	9,000	1,310	0.08	0.8	0.065
	R0.3	1°	30	10	8,900	1,190	0.08	1	0.061	95.2	7,100	950	0.064	0.8	0.06
			40	13.3	7,700	650	0.06	0.8	0.032	31.2	6,200	520	0.048	0.64	0.032
			50	16.7	7,000	530	0.045	0.6	0.026	14.31	5,600	420	0.036	0.48	0.026
			60	20	6,500	450	0.035	0.3	0.023	4.73	5,200	360	0.028	0.24	0.023
		3°	29.9	10	11,200	1,640	0.1	1	0.065	164	9,000	1,310	0.08	0.8	0.065
	R0.5	1°	30	10	8,900	1,190	0.08	1	0.061	95.2	7,100	950	0.064	0.8	0.06
			40	13.3	7,700	650	0.06	0.8	0.032	31.2	6,200	520	0.048	0.64	0.032
			50	16.7	7,000	530	0.045	0.6	0.026	14.31	5,600	420	0.036	0.48	0.026
			60	20	6,500	450	0.035	0.3	0.023	4.73	5,200	360	0.028	0.24	0.023
		3°	30.1	10	11,200	1,640	0.1	1	0.065	164	9,000	1,310	0.08	0.8	0.065

备 注 Notes

※1 切深量的 ap 表示为轴向切深量，ae 表示步距量。
※2 请根据机械刚性、被加工材料的夹持状态等调整切削条件。
※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 对于 Z 轴方向的切削进给方法，建议使用螺旋(Helical)及倾斜(Ramp)方式。
※6 当机床的最高主轴转速低于以上参考值时，请以相同比率调整主轴转速和进给速度。
※7 请尽量缩短刀具的伸出量。
※8 建议使用油雾冷却方式。
※9 在加工较深部位时，请特别注意冷却液的供应以及切屑的排出。
※10 加工的余量为参考值，请根据前一工序的加工状态和要求精度进行调整。
※11 清角加工的刀具选择参考：前一道工序(粗加工)使用的刀具直径约为清角加工刀具的 1.5 倍(如下例所示)
请根据前一道工序(粗加工)所留下的余量，调整切削深度与进给速度。
(例)前工序(粗加工)：φ3 × R0.5 ➡ 清角加工：φ2 × R0.2

※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 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
※5 Recommend to apply helical or ramping for approaching into axial direction.
※6 If the maximum spindle speed of the machine tool is lower than the reference value,please reduce the spindle speed and feed rate at the same rate.
※7 Length of tool overhang must be as short as possible.
※8 Oil mist coolant is recommended.
※9 Coolant supply and chip disposal in the deep portion are very important.
※10 The stock allowance for this tool is a guideline. Please adjust it according to the machining condition of the previous process and the required accuracy.
※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied.
Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
Example
Roughing: φ3 × R0.5 ➡ Stock removal (inner corner): φ2 × R0.2

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切削参数参考表 Recommended Conditions

加工材料 Work Material					调质钢 Prehardened Steels HPM·NAK (~42HRC)									
					中精加工 Semi-Finishing					精加工 Finishing				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	min^{-1}	mm/min	a_p mm	a_e mm	mm
0.2	R0.03	1°	1	5	30,000	310	0.004	0.038	0.003	30,000	290	0.003	0.035	0
			1.5	7.5	30,000	200	0.003	0.038	0.002	30,000	180	0.002	0.035	0
			2	10	30,000	140	0.003	0.038	0.002	30,000	130	0.002	0.035	0
		3°	1.5	7.5	30,000	280	0.004	0.038	0.003	30,000	260	0.003	0.035	0
			2	10	30,000	230	0.004	0.038	0.003	30,000	210	0.003	0.035	0
	R0.05	1°	1	5	30,000	310	0.005	0.038	0.004	30,000	290	0.004	0.035	0
			1.5	7.5	30,000	200	0.004	0.038	0.003	30,000	180	0.003	0.035	0
			2	10	30,000	140	0.003	0.038	0.002	30,000	130	0.002	0.035	0
		3°	1.5	7.5	30,000	280	0.005	0.038	0.004	30,000	260	0.004	0.035	0
			2	10	30,000	230	0.004	0.038	0.003	30,000	210	0.003	0.035	0
0.3	R0.03	1°	1.5	5	30,000	390	0.006	0.075	0.003	30,000	360	0.003	0.07	0
			2	6.7	30,000	300	0.006	0.075	0.002	30,000	280	0.002	0.07	0
			3	10	30,000	230	0.004	0.075	0.002	30,000	210	0.002	0.07	0
		3°	2	6.7	30,000	390	0.006	0.075	0.003	30,000	360	0.003	0.07	0
			3	10	30,000	320	0.006	0.075	0.002	30,000	290	0.002	0.07	0
	R0.05	1°	1.5	5	30,000	390	0.006	0.075	0.005	30,000	360	0.005	0.07	0
			2	6.7	30,000	300	0.006	0.075	0.003	30,000	280	0.003	0.07	0
			3	10	30,000	230	0.004	0.075	0.002	30,000	210	0.002	0.07	0
		3°	2	6.7	30,000	390	0.006	0.075	0.005	30,000	360	0.005	0.07	0
			3	10	30,000	320	0.006	0.075	0.004	30,000	290	0.004	0.07	0
0.5	R0.05	1°	4	8	30,000	600	0.007	0.12	0.005	30,000	560	0.005	0.112	0
			5	10	21,000	510	0.006	0.12	0.004	21,000	480	0.004	0.112	0
			6	12	20,500	460	0.005	0.12	0.003	20,500	430	0.003	0.112	0
			8	16	20,500	390	0.003	0.09	0.002	20,500	360	0.002	0.084	0
			10	20	19,000	230	0.002	0.06	0.002	19,000	220	0.002	0.056	0
		3°	5	10	24,000	650	0.008	0.12	0.006	24,000	600	0.006	0.112	0
			8	16	24,000	590	0.006	0.12	0.005	24,000	550	0.005	0.112	0
			10	20	24,000	570	0.006	0.12	0.004	24,000	530	0.004	0.112	0
	R0.1	1°	4	8	24,000	600	0.007	0.12	0.005	24,000	560	0.005	0.112	0
			5	10	21,000	510	0.006	0.12	0.004	21,000	480	0.004	0.112	0
			6	12	20,500	460	0.005	0.12	0.003	20,500	430	0.003	0.112	0
			8	16	19,600	390	0.003	0.09	0.002	19,600	360	0.002	0.084	0
			10	20	19,000	230	0.002	0.06	0.002	19,000	220	0.002	0.056	0
		3°	5	10	24,000	650	0.008	0.12	0.006	24,000	600	0.006	0.112	0
			8	16	24,000	590	0.006	0.12	0.005	24,000	550	0.005	0.112	0
			10	20	24,000	570	0.006	0.12	0.004	24,000	530	0.004	0.112	0
1	R0.1	1°	10	10	14,000	850	0.013	0.263	0.01	14,000	790	0.01	0.245	0
			15	15	12,100	430	0.004	0.188	0.004	12,100	400	0.004	0.175	0
			20	20	11,000	310	0.003	0.075	0.003	11,000	300	0.003	0.07	0
			25	25	10,300	270	0.002	0.038	0.002	10,300	250	0.002	0.035	0
			30	30	9,800	230	0.002	0.023	0.002	9,800	220	0.002	0.021	0
		3°	15	15	15,000	1,170	0.015	0.263	0.011	15,000	1,090	0.011	0.245	0
	R0.2	1°	10	10	14,000	850	0.013	0.263	0.01	14,000	790	0.01	0.245	0
			15	15	12,100	430	0.004	0.188	0.004	12,100	400	0.004	0.175	0
			20	20	11,000	310	0.003	0.075	0.003	11,000	300	0.003	0.07	0
			25	25	10,300	270	0.002	0.038	0.002	10,300	250	0.002	0.035	0
			30	30	9,800	230	0.002	0.023	0.002	9,800	220	0.002	0.021	0
		3°	15	15	15,000	1,170	0.015	0.263	0.011	15,000	1,090	0.011	0.245	0
	R0.3	1°	10	10	14,000	850	0.013	0.263	0.01	14,000	790	0.01	0.245	0
			15	15	12,100	430	0.004	0.188	0.004	12,100	400	0.004	0.175	0
			20	20	11,000	310	0.003	0.075	0.003	11,000	300	0.003	0.07	0
			25	25	10,300	270	0.002	0.038	0.002	10,300	250	0.002	0.035	0
			30	30	9,800	230	0.002	0.023	0.002	9,800	220	0.002	0.021	0
		3°	15	15	15,000	1,170	0.015	0.263	0.011	15,000	1,090	0.011	0.245	0

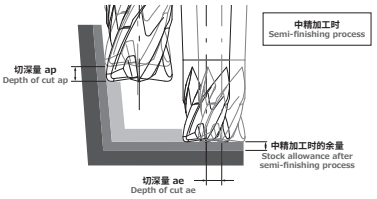
切削参数参考表 Recommended Conditions

加工材料 Work Material					调质钢 Prehardened Steels HPM·NAK (~42HRC)									
					中精加工 Semi-Finishing					精加工 Finishing				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	min^{-1}	mm/min	a_p mm	a_e mm	mm
1.5	R0.2	1°	15	10	12,600	860	0.021	0.413	0.017	12,600	810	0.017	0.385	0
			20	13.3	11,000	470	0.006	0.3	0.005	11,000	440	0.005	0.28	0
			30	20	9,400	320	0.004	0.113	0.003	9,400	300	0.003	0.105	0
		3°	20	13.3	14,200	1,190	0.026	0.413	0.02	14,200	1,110	0.02	0.385	0
	R0.3	1°	15	10	12,600	860	0.021	0.413	0.017	12,600	810	0.017	0.385	0
			20	13.3	11,000	470	0.006	0.3	0.005	11,000	440	0.005	0.28	0
			30	20	9,400	320	0.004	0.113	0.003	9,400	300	0.003	0.105	0
		3°	20	13.3	14,200	1,190	0.026	0.413	0.02	14,200	1,110	0.02	0.385	0
	R0.5	1°	15	10	12,600	860	0.021	0.413	0.017	12,600	810	0.017	0.385	0
			20	13.3	11,000	470	0.006	0.3	0.005	11,000	440	0.005	0.28	0
			30	20	9,400	320	0.004	0.113	0.003	9,400	300	0.003	0.105	0
		3°	20	13.3	14,200	1,190	0.026	0.413	0.02	14,200	1,110	0.02	0.385	0
2	R0.2	1°	20	10	10,000	880	0.026	0.525	0.02	10,000	820	0.02	0.49	0
			30	15	7,600	560	0.016	0.375	0.013	7,600	520	0.013	0.35	0
			40	20	6,300	330	0.013	0.15	0.01	6,300	320	0.01	0.14	0
		3°	30	15	11,500	1,180	0.03	0.525	0.023	11,500	1,100	0.023	0.49	0
	R0.3	1°	20	10	10,000	880	0.026	0.525	0.02	10,000	820	0.02	0.49	0
			30	15	7,600	560	0.016	0.375	0.013	7,600	520	0.013	0.35	0
			40	20	6,300	330	0.013	0.15	0.01	6,300	320	0.01	0.14	0
		3°	30	15	11,500	1,180	0.03	0.525	0.023	11,500	1,100	0.023	0.49	0
	R0.5	1°	20	10	10,000	880	0.026	0.525	0.02	10,000	820	0.02	0.49	0
			30	15	7,600	560	0.016	0.375	0.013	7,600	520	0.013	0.35	0
			40	20	6,300	330	0.013	0.15	0.01	6,300	320	0.01	0.14	0
		3°	30	15	11,500	1,180	0.03	0.525	0.023	11,500	1,100	0.023	0.49	0
3	R0.2	1°	30	10	7,100	890	0.034	0.75	0.027	7,100	830	0.027	0.7	0
			40	13.3	6,200	490	0.018	0.6	0.014	6,200	460	0.014	0.56	0
			50	16.7	5,600	400	0.015	0.45	0.011	5,600	370	0.011	0.42	0
			60	20	5,200	340	0.013	0.225	0.01	5,200	320	0.01	0.21	0
		3°	29.8	9.9	9,000	1,230	0.056	0.75	0.03	9,000	1,150	0.043	0.7	0
	R0.3	1°	30	10	7,100	890	0.034	0.75	0.027	7,100	830	0.027	0.7	0
			40	13.3	6,200	490	0.018	0.6	0.014	6,200	460	0.014	0.56	0
			50	16.7	5,600	400	0.015	0.45	0.011	5,600	370	0.011	0.42	0
			60	20	5,200	340	0.013	0.225	0.01	5,200	320	0.01	0.21	0
		3°	29.9	10	9,000	1,230	0.056	0.75	0.03	9,000	1,150	0.043	0.7	0
	R0.5	1°	30	10	7,100	890	0.034	0.75	0.027	7,100	830	0.027	0.7	0
			40	13.3	6,200	490	0.018	0.6	0.014	6,200	460	0.014	0.56	0
			50	16.7	5,600	400	0.015	0.45	0.011	5,600	370	0.011	0.42	0
			60	20	5,200	340	0.013	0.225	0.01	5,200	320	0.01	0.21	0
		3°	30.1	10	9,000	1,230	0.056	0.75	0.03	9,000	1,150	0.043	0.7	0

备 注 Notes

※1 切深量的 ap 表示为轴向切深量，ae 表示步距量。
※2 请根据机械刚性、被加工材料的夹持状态等调整切削条件。
※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 对于 Z 轴方向的切削进给方法，建议使用螺旋(Helical)及倾斜(Ramp)方式。
※6 当机床的最高主轴转速低于以上参考值时，请以相同比率调整主轴转速和进给速度。
※7 请尽量缩短刀具的伸出量。
※8 建议使用油雾冷却方式。
※9 在加工较深部位时，请特别注意冷却液的供应以及切屑的排出。
※10 加工的余量为参考值，请根据前一工序的加工状态和要求精度进行调整。
※11 清角加工的刀具选择参考：前一道工序(粗加工)使用的刀具直径约为清角加工刀具的 1.5 倍(如下例所示)
请根据前一道工序(粗加工)所留下的余量，调整切削深度与进给速度。
(例)前工序(粗加工)：φ3 × R0.5 ➡ 清角加工：φ2 × R0.2

※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 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
※5 Recommend to apply helical or ramping for approaching into axial direction.
※6 If the maximum spindle speed of the machine tool is lower than the reference value,please reduce the spindle speed and feed rate at the same rate.
※7 Length of tool overhang must be as short as possible.
※8 Oil mist coolant is recommended.
※9 Coolant supply and chip disposal in the deep portion are very important.
※10 The stock allowance for this tool is a guideline. Please adjust it according to the machining condition of the previous process and the required accuracy.
※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied.
Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
Example
Roughing: φ3 × R0.5 ➡ Stock removal (inner corner): φ2 × R0.2



MTNH430R New

切削参数参考表 Recommended Conditions

加工材料 Work Material					高硬度钢 Hardened Steels HPM38·STAVAX·SKD61 (~55HRC)										
					粗加工 Roughing						清角加工 Stock removal (Inner Corner)				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	切屑排出量 Material Removal Rate	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	mm^3/min	min^{-1}	mm/min	a_p mm	a_e mm	mm
0.2	R0.03	1°	1	5	30,000	360	0.003	0.04	0.006	0.04	30,000	290	0.003	0.032	0.006
			1.5	7.5	30,000	210	0.002	0.04	0.004	0.02	30,000	170	0.002	0.032	0.004
			2	10	30,000	150	0.002	0.04	0.004	0.01	30,000	120	0.002	0.032	0.004
		3°	1.5	7.5	30,000	320	0.003	0.04	0.005	0.04	30,000	260	0.003	0.032	0.005
			2	10	30,000	240	0.003	0.04	0.005	0.03	30,000	190	0.003	0.032	0.005
	R0.05	1°	1	5	30,000	360	0.003	0.04	0.006	0.04	30,000	290	0.003	0.032	0.006
			1.5	7.5	30,000	210	0.002	0.04	0.004	0.02	30,000	170	0.002	0.032	0.004
			2	10	30,000	150	0.002	0.04	0.004	0.01	30,000	120	0.002	0.032	0.004
		3°	1.5	7.5	30,000	320	0.003	0.04	0.005	0.04	30,000	260	0.003	0.032	0.005
			2	10	30,000	240	0.003	0.04	0.005	0.03	30,000	190	0.003	0.032	0.005
0.3	R0.03	1°	1.5	5	30,000	430	0.003	0.08	0.006	0.1	30,000	340	0.003	0.064	0.006
			2	6.7	30,000	320	0.003	0.08	0.005	0.08	30,000	260	0.003	0.064	0.005
			3	10	26,300	200	0.002	0.08	0.004	0.03	21,000	160	0.002	0.064	0.004
		3°	2	6.7	30,000	430	0.003	0.08	0.006	0.1	30,000	340	0.003	0.064	0.006
			3	10	30,000	330	0.003	0.08	0.005	0.08	30,000	260	0.003	0.064	0.005
	R0.05	1°	1.5	5	30,000	430	0.003	0.08	0.006	0.1	30,000	340	0.003	0.064	0.006
			2	6.7	30,000	320	0.003	0.08	0.006	0.08	30,000	260	0.003	0.064	0.006
			3	10	26,300	200	0.002	0.08	0.004	0.03	21,000	160	0.002	0.064	0.004
		3°	2	6.7	30,000	430	0.003	0.08	0.006	0.1	30,000	340	0.003	0.064	0.006
			3	10	30,000	330	0.003	0.08	0.006	0.08	30,000	260	0.003	0.064	0.006
0.5	R0.05	1°	4	8	25,000	690	0.006	0.15	0.012	0.62	20,000	550	0.006	0.12	0.012
			5	10	25,000	580	0.005	0.15	0.008	0.44	20,000	460	0.005	0.12	0.008
			6	12	25,000	450	0.004	0.15	0.007	0.27	20,000	360	0.004	0.12	0.007
			8	16	19,500	320	0.003	0.1	0.005	0.1	15,600	260	0.003	0.08	0.005
			10	20	17,900	260	0.002	0.05	0.004	0.03	14,300	210	0.002	0.04	0.004
		3°	5	10	25,000	750	0.007	0.15	0.012	0.79	20,000	600	0.007	0.12	0.012
			8	16	25,000	660	0.006	0.15	0.01	0.59	20,000	530	0.006	0.12	0.01
			10	20	25,000	620	0.005	0.15	0.009	0.47	20,000	500	0.005	0.12	0.009
	R0.1	1°	4	8	25,000	690	0.006	0.15	0.01	0.62	20,000	550	0.006	0.12	0.01
			5	10	25,000	580	0.005	0.15	0.008	0.44	20,000	460	0.005	0.12	0.008
			6	12	25,000	450	0.004	0.15	0.007	0.27	20,000	360	0.004	0.12	0.007
			8	16	19,500	320	0.003	0.1	0.005	0.1	15,600	260	0.003	0.08	0.005
			10	20	17,900	260	0.002	0.05	0.004	0.03	14,300	210	0.002	0.04	0.004
		3°	5	10	25,000	750	0.007	0.15	0.012	0.79	20,000	600	0.007	0.12	0.012
			8	16	25,000	660	0.006	0.15	0.01	0.59	20,000	530	0.006	0.12	0.01
			10	20	25,000	620	0.005	0.15	0.009	0.47	20,000	500	0.005	0.12	0.009
1	R0.1	1°	10	10	14,700	940	0.015	0.3	0.01	4.23	11,800	750	0.012	0.24	0.01
			15	15	12,400	480	0.008	0.2	0.007	0.77	9,900	380	0.006	0.16	0.007
			20	20	11,300	360	0.006	0.06	0.005	0.13	9,000	290	0.004	0.048	0.005
			25	25	10,600	300	0.004	0.03	0.004	0.04	8,500	240	0.003	0.024	0.004
			30	30	10,100	260	0.002	0.02	0.004	0.01	8,100	210	0.002	0.016	0.004
		3°	15	15	15,500	1,270	0.018	0.3	0.012	6.86	12,400	1,020	0.014	0.24	0.012
	R0.2	1°	10	10	14,700	940	0.015	0.3	0.01	4.23	11,800	750	0.012	0.24	0.01
			15	15	12,400	480	0.008	0.2	0.007	0.77	9,900	380	0.006	0.16	0.007
			20	20	11,300	360	0.006	0.06	0.005	0.13	9,000	290	0.004	0.048	0.005
			25	25	10,600	300	0.004	0.03	0.004	0.04	8,500	240	0.003	0.024	0.004
			30	30	10,100	260	0.002	0.02	0.004	0.01	8,100	210	0.002	0.016	0.004
		3°	15	15	15,500	1,270	0.018	0.3	0.012	6.86	12,400	1,020	0.014	0.24	0.012
	R0.3	1°	10	10	14,700	940	0.015	0.3	0.01	4.23	11,800	750	0.012	0.24	0.01
			15	15	12,400	480	0.008	0.2	0.007	0.77	9,900	380	0.006	0.16	0.007
			20	20	11,300	360	0.006	0.06	0.005	0.13	9,000	290	0.004	0.048	0.005
			25	25	10,600	300	0.004	0.03	0.004	0.04	8,500	240	0.003	0.024	0.004
			30	30	10,100	260	0.002	0.02	0.004	0.01	8,100	210	0.002	0.016	0.004
		3°	15	15	15,500	1,270	0.018	0.3	0.012	6.86	12,400	1,020	0.014	0.24	0.012

切削参数参考表 Recommended Conditions

加工材料 Work Material					高硬度钢 Hardened Steels HPM38·STAVAX·SKD61 (～55HRC)										
					粗加工 Roughing						清角加工 Stock removal (Inner Corner)				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	切屑排出量 Material Removal Rate	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	mm^3/min	min^{-1}	mm/min	a_p mm	a_e mm	mm
1.5	R0.2	1°	15	10	12,700	950	0.025	0.5	0.028	11.88	10,200	760	0.02	0.4	0.028
			20	13.3	10,700	530	0.01	0.35	0.01	1.86	8,600	420	0.008	0.28	0.01
			30	20	8,600	360	0.006	0.1	0.006	0.22	6,900	290	0.005	0.08	0.006
		3°	20	13.3	14,900	1,280	0.03	0.5	0.033	19.2	11,900	1,020	0.024	0.4	0.033
	R0.3	1°	15	10	12,700	950	0.025	0.5	0.028	11.88	10,200	760	0.02	0.4	0.028
			20	13.3	10,700	530	0.01	0.35	0.01	1.86	8,600	420	0.008	0.28	0.01
			30	20	8,600	360	0.006	0.1	0.006	0.22	6,900	290	0.005	0.08	0.006
		3°	20	13.3	14,900	1,280	0.03	0.5	0.033	19.2	11,900	1,020	0.024	0.4	0.033
	R0.5	1°	15	10	12,700	950	0.025	0.5	0.028	11.88	10,200	760	0.02	0.4	0.028
			20	13.3	10,700	530	0.01	0.35	0.01	1.86	8,600	420	0.008	0.28	0.01
			30	20	8,600	360	0.006	0.1	0.006	0.22	6,900	290	0.005	0.08	0.006
		3°	20	13.3	14,900	1,280	0.03	0.5	0.033	19.2	11,900	1,020	0.024	0.4	0.033
2	R0.2	1°	20	10	10,800	960	0.03	0.6	0.035	17.28	8,600	770	0.024	0.48	0.035
			30	15	7,500	630	0.02	0.4	0.02	5.04	6,000	500	0.016	0.32	0.02
			40	20	6,200	370	0.015	0.18	0.015	1	5,000	300	0.012	0.144	0.015
		3°	30	15	12,100	1,270	0.035	0.6	0.041	26.67	9,700	1,020	0.028	0.48	0.041
	R0.3	1°	20	10	10,800	960	0.03	0.6	0.035	17.28	8,600	770	0.024	0.48	0.035
			30	15	7,500	630	0.02	0.4	0.02	5.04	6,000	500	0.016	0.32	0.02
			40	20	6,200	370	0.015	0.18	0.015	1	5,000	300	0.012	0.144	0.015
		3°	30	15	12,100	1,270	0.035	0.6	0.041	26.67	9,700	1,020	0.028	0.48	0.041
	R0.5	1°	20	10	10,800	960	0.03	0.6	0.035	17.28	8,600	770	0.024	0.48	0.035
			30	15	7,500	630	0.02	0.4	0.02	5.04	6,000	500	0.016	0.32	0.02
			40	20	6,200	370	0.015	0.18	0.015	1	5,000	300	0.012	0.144	0.015
		3°	30	15	12,100	1,270	0.035	0.6	0.041	26.67	9,700	1,020	0.028	0.48	0.041
3	R0.2	1°	30	10	7,400	970	0.04	0.8	0.041	31.04	5,900	780	0.031	0.64	0.041
			40	13.3	6,400	530	0.03	0.7	0.028	11.13	5,100	420	0.024	0.56	0.028
			50	16.7	5,800	430	0.025	0.5	0.024	5.38	4,600	340	0.02	0.4	0.024
			60	20	5,300	370	0.02	0.2	0.02	1.48	4,200	300	0.016	0.16	0.02
		3°	29.8	9.9	9,200	1,340	0.05	0.8	0.064	53.6	7,400	1,070	0.04	0.64	0.064
	R0.3	1°	30	10	7,400	970	0.04	0.8	0.041	31.04	5,900	780	0.031	0.64	0.041
			40	13.3	6,400	530	0.03	0.7	0.028	11.13	5,100	420	0.024	0.56	0.028
			50	16.7	5,800	430	0.025	0.5	0.024	5.38	4,600	340	0.02	0.4	0.024
			60	20	5,300	370	0.02	0.2	0.02	1.48	4,200	300	0.016	0.16	0.02
		3°	29.9	10	9,200	1,340	0.05	0.8	0.064	53.6	7,400	1,070	0.04	0.64	0.064
	R0.5	1°	30	10	7,400	970	0.04	0.8	0.041	31.04	5,900	780	0.031	0.64	0.041
			40	13.3	6,400	530	0.03	0.7	0.028	11.13	5,100	420	0.024	0.56	0.028
			50	16.7	5,800	430	0.025	0.5	0.024	5.38	4,600	340	0.02	0.4	0.024
			60	20	5,300	370	0.02	0.2	0.02	1.48	4,200	300	0.016	0.16	0.02
		3°	30.1	10	9,200	1,340	0.05	0.8	0.064	53.6	7,400	1,070	0.04	0.64	0.064

备 注 Notes

※1 切深量的 ap 表示为轴向切深量，ae 表示步距量。
※2 请根据机械刚性、被加工材料的夹持状态等调整切削条件。
※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 对于 Z 轴方向的切削进给方法，建议使用螺旋(Helical)及倾斜(Ramp)方式。
※6 当机床的最高主轴转速低于以上参考值时，请以相同比率调整主轴转速和进给速度。
※7 请尽量缩短刀具的伸出量。
※8 建议使用油雾冷却方式。
※9 在加工较深部位时，请特别注意冷却液的供应以及切屑的排出。
※10 加工的余量为参考值，请根据前一工序的加工状态和要求精度进行调整。
※11 清角加工的刀具选择参考：前一道工序(粗加工)使用的刀具直径约为清角加工刀具的 1.5 倍(如下例所示)
请根据前一道工序(粗加工)所留下的余量，调整切削深度与进给速度。
(例)前工序(粗加工)：φ3 × R0.5 ➡ 清角加工：φ2 × R0.2

※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 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
※5 Recommend to apply helical or ramping for approaching into axial direction.
※6 If the maximum spindle speed of the machine tool is lower than the reference value,please reduce the spindle speed and feed rate at the same rate.
※7 Length of tool overhang must be as short as possible.
※8 Oil mist coolant is recommended.
※9 Coolant supply and chip disposal in the deep portion are very important.
※10 The stock allowance for this tool is a guideline. Please adjust it according to the machining condition of the previous process and the required accuracy.
※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied.
Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
Example
Roughing: φ3 × R0.5 ➡ Stock removal (inner corner): φ2 × R0.2

MTNH430R New

切削参数参考表 Recommended Conditions

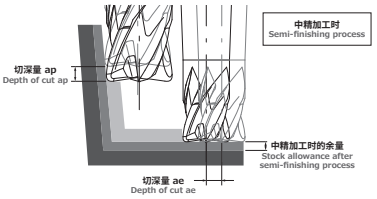
加工材料 Work Material					高硬度钢 Hardened Steels HPM38·STAVAX·SKD61 (~55HRC)									
					中精加工 Semi-Finishing					精加工 Finishing				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	min^{-1}	mm/min	a_p mm	a_e mm	mm
0.2	R0.03	1°	1	5	30,000	270	0.003	0.03	0.003	30,000	250	0.003	0.028	0
			1.5	7.5	30,000	160	0.002	0.03	0.002	30,000	150	0.002	0.028	0
			2	10	30,000	110	0.002	0.03	0.002	30,000	110	0.002	0.028	0
		3°	1.5	7.5	30,000	240	0.003	0.03	0.002	30,000	220	0.002	0.028	0
			2	10	30,000	180	0.003	0.03	0.002	30,000	170	0.002	0.028	0
	R0.05	1°	1	5	30,000	270	0.003	0.03	0.003	30,000	250	0.003	0.028	0
			1.5	7.5	30,000	160	0.002	0.03	0.002	30,000	150	0.002	0.028	0
			2	10	30,000	110	0.002	0.03	0.002	30,000	110	0.002	0.028	0
		3°	1.5	7.5	30,000	240	0.003	0.03	0.002	30,000	220	0.002	0.028	0
			2	10	30,000	180	0.003	0.03	0.002	30,000	170	0.002	0.028	0
0.3	R0.03	1°	1.5	5	30,000	320	0.003	0.06	0.003	30,000	300	0.003	0.056	0
			2	6.7	30,000	240	0.003	0.06	0.002	30,000	220	0.002	0.056	0
			3	10	21,000	150	0.002	0.06	0.002	21,000	140	0.002	0.056	0
		3°	2	6.7	30,000	320	0.003	0.06	0.003	30,000	300	0.003	0.056	0
			3	10	30,000	250	0.003	0.06	0.002	30,000	230	0.002	0.056	0
	R0.05	1°	1.5	5	30,000	320	0.003	0.06	0.003	30,000	300	0.003	0.056	0
			2	6.7	30,000	240	0.003	0.06	0.003	30,000	220	0.003	0.056	0
			3	10	21,000	150	0.002	0.06	0.002	21,000	140	0.002	0.056	0
		3°	2	6.7	30,000	320	0.003	0.06	0.003	30,000	300	0.003	0.056	0
			3	10	30,000	250	0.003	0.06	0.003	30,000	230	0.003	0.056	0
0.5	R0.05	1°	4	8	20,000	520	0.006	0.113	0.006	20,000	480	0.006	0.105	0
			5	10	20,000	440	0.005	0.113	0.003	20,000	410	0.003	0.105	0
			6	12	20,000	340	0.004	0.113	0.003	20,000	320	0.003	0.105	0
			8	16	15,600	240	0.003	0.075	0.002	15,600	220	0.002	0.07	0
			10	20	14,300	200	0.002	0.038	0.002	14,300	180	0.002	0.035	0
		3°	5	10	20,000	560	0.007	0.113	0.005	20,000	530	0.005	0.105	0
			8	16	20,000	500	0.006	0.113	0.004	20,000	460	0.004	0.105	0
			10	20	20,000	470	0.005	0.113	0.004	20,000	430	0.004	0.105	0
	R0.1	1°	4	8	20,000	520	0.006	0.113	0.004	20,000	480	0.004	0.105	0
			5	10	20,000	440	0.005	0.113	0.003	20,000	410	0.003	0.105	0
			6	12	20,000	340	0.004	0.113	0.003	20,000	320	0.003	0.105	0
			8	16	15,600	240	0.003	0.075	0.002	15,600	220	0.002	0.07	0
			10	20	14,300	200	0.002	0.038	0.002	14,300	180	0.002	0.035	0
		3°	5	10	20,000	560	0.007	0.113	0.005	20,000	530	0.005	0.105	0
			8	16	20,000	500	0.006	0.113	0.004	20,000	460	0.004	0.105	0
			10	20	20,000	470	0.005	0.113	0.004	20,000	430	0.004	0.105	0
1	R0.1	1°	10	10	11,800	700	0.006	0.225	0.004	11,800	650	0.004	0.21	0
			15	15	9,900	360	0.004	0.15	0.003	9,900	340	0.003	0.14	0
			20	20	9,000	270	0.003	0.045	0.002	9,000	250	0.002	0.042	0
			25	25	8,500	230	0.002	0.023	0.002	8,500	210	0.002	0.021	0
			30	30	8,100	200	0.002	0.015	0.002	8,100	180	0.002	0.014	0
		3°	15	15	12,400	950	0.007	0.225	0.005	12,400	890	0.005	0.21	0
	R0.2	1°	10	10	11,800	700	0.006	0.225	0.004	11,800	650	0.004	0.21	0
			15	15	9,900	360	0.004	0.15	0.003	9,900	340	0.003	0.14	0
			20	20	9,000	270	0.003	0.045	0.002	9,000	250	0.002	0.042	0
			25	25	8,500	230	0.002	0.023	0.002	8,500	210	0.002	0.021	0
			30	30	8,100	200	0.002	0.015	0.002	8,100	180	0.002	0.014	0
		3°	15	15	12,400	950	0.007	0.225	0.005	12,400	890	0.005	0.21	0
	R0.3	1°	10	10	11,800	700	0.006	0.225	0.004	11,800	650	0.004	0.21	0
			15	15	9,900	360	0.004	0.15	0.003	9,900	340	0.003	0.14	0
			20	20	9,000	270	0.003	0.045	0.002	9,000	250	0.002	0.042	0
			25	25	8,500	230	0.002	0.023	0.002	8,500	210	0.002	0.021	0
			30	30	8,100	200	0.002	0.015	0.002	8,100	180	0.002	0.014	0
		3°	15	15	12,400	950	0.007	0.225	0.005	12,400	890	0.005	0.21	0

加工材料 Work Material					高硬度钢 Hardened Steels HPM38·STAVAX·SKD61 (～55HRC)									
					中精加工 Semi-Finishing					精加工 Finishing				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	min^{-1}	mm/min	a_p mm	a_e mm	mm
1.5	R0.2	1°	15	10	10,200	710	0.016	0.375	0.012	10,200	660	0.012	0.35	0
			20	13.3	8,600	400	0.006	0.263	0.004	8,600	370	0.004	0.245	0
			30	20	6,900	270	0.004	0.075	0.002	6,900	250	0.002	0.07	0
		3°	20	13.3	11,900	960	0.019	0.375	0.014	11,900	900	0.014	0.35	0
	R0.3	1°	15	10	10,200	710	0.016	0.375	0.012	10,200	660	0.012	0.35	0
			20	13.3	8,600	400	0.006	0.263	0.004	8,600	370	0.004	0.245	0
			30	20	6,900	270	0.004	0.075	0.002	6,900	250	0.002	0.07	0
		3°	20	13.3	11,900	960	0.019	0.375	0.014	11,900	900	0.014	0.35	0
	R0.5	1°	15	10	10,200	710	0.016	0.375	0.012	10,200	660	0.012	0.35	0
			20	13.3	8,600	400	0.006	0.263	0.004	8,600	370	0.004	0.245	0
			30	20	6,900	270	0.004	0.075	0.002	6,900	250	0.002	0.07	0
		3°	20	13.3	11,900	960	0.019	0.375	0.014	11,900	900	0.014	0.35	0
2	R0.2	1°	20	10	8,600	720	0.02	0.45	0.015	8,600	670	0.015	0.42	0
			30	15	6,000	470	0.012	0.3	0.008	6,000	440	0.008	0.28	0
			40	20	5,000	280	0.009	0.135	0.006	5,000	260	0.006	0.126	0
		3°	30	15	9,700	950	0.024	0.45	0.017	9,700	890	0.017	0.42	0
	R0.3	1°	20	10	8,600	720	0.02	0.45	0.015	8,600	670	0.015	0.42	0
			30	15	6,000	470	0.012	0.3	0.008	6,000	440	0.008	0.28	0
			40	20	5,000	280	0.009	0.135	0.006	5,000	260	0.006	0.126	0
		3°	30	15	9,700	950	0.024	0.45	0.017	9,700	890	0.017	0.42	0
	R0.5	1°	20	10	8,600	720	0.02	0.45	0.015	8,600	670	0.015	0.42	0
			30	15	6,000	470	0.012	0.3	0.008	6,000	440	0.008	0.28	0
			40	20	5,000	280	0.009	0.135	0.006	5,000	260	0.006	0.126	0
		3°	30	15	9,700	950	0.024	0.45	0.017	9,700	890	0.017	0.42	0
3	R0.2	1°	30	10	5,900	730	0.024	0.6	0.017	5,900	680	0.017	0.56	0
			40	13.3	5,100	400	0.016	0.525	0.012	5,100	370	0.012	0.49	0
			50	16.7	4,600	320	0.014	0.375	0.01	4,600	300	0.01	0.35	0
			60	20	4,200	280	0.012	0.15	0.008	4,200	260	0.008	0.14	0
		3°	29.8	9.9	7,400	1,010	0.037	0.6	0.027	7,400	940	0.027	0.56	0
	R0.3	1°	30	10	5,900	730	0.024	0.6	0.017	5,900	680	0.017	0.56	0
			40	13.3	5,100	400	0.016	0.525	0.012	5,100	370	0.012	0.49	0
			50	16.7	4,600	320	0.014	0.375	0.01	4,600	300	0.01	0.35	0
			60	20	4,200	280	0.012	0.15	0.008	4,200	260	0.008	0.14	0
		3°	29.9	10	7,400	1,010	0.037	0.6	0.027	7,400	940	0.027	0.56	0
	R0.5	1°	30	10	5,900	730	0.024	0.6	0.017	5,900	680	0.017	0.56	0
			40	13.3	5,100	400	0.016	0.525	0.012	5,100	370	0.012	0.49	0
			50	16.7	4,600	320	0.014	0.375	0.01	4,600	300	0.01	0.35	0
			60	20	4,200	280	0.012	0.15	0.008	4,200	260	0.008	0.14	0
		3°	30.1	10	7,400	1,010	0.037	0.6	0.027	7,400	940	0.027	0.56	0

备 注 Notes

※1 切深量的 ap 表示为轴向切深量，ae 表示步距量。
※2 请根据机械刚性、被加工材料的夹持状态等调整切削条件。
※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 对于 Z 轴方向的切削进给方法，建议使用螺旋(Helical)及倾斜(Ramp)方式。
※6 当机床的最高主轴转速低于以上参考值时，请以相同比率调整主轴转速和进给速度。
※7 请尽量缩短刀具的伸出量。
※8 建议使用油雾冷却方式。
※9 在加工较深部位时，请特别注意冷却液的供应以及切屑的排出。
※10 加工的余量为参考值，请根据前一工序的加工状态和要求精度进行调整。
※11 清角加工的刀具选择参考：前一道工序(粗加工)使用的刀具直径约为清角加工刀具的 1.5 倍(如下例所示)
请根据前一道工序(粗加工)所留下的余量，调整切削深度与进给速度。
(例)前工序(粗加工)：φ3 × R0.5 ➡ 清角加工：φ2 × R0.2

※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 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
※5 Recommend to apply helical or ramping for approaching into axial direction.
※6 If the maximum spindle speed of the machine tool is lower than the reference value,please reduce the spindle speed and feed rate at the same rate.
※7 Length of tool overhang must be as short as possible.
※8 Oil mist coolant is recommended.
※9 Coolant supply and chip disposal in the deep portion are very important.
※10 The stock allowance for this tool is a guideline. Please adjust it according to the machining condition of the previous process and the required accuracy.
※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied.
Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
Example
Roughing: φ3 × R0.5 ➡ Stock removal (inner corner): φ2 × R0.2



MTNH430R New

切削参数参考表 Recommended Conditions

加工材料 Work Material					高硬度钢 Hardened Steels SKD11·PD613 (~62HRC)										
					粗加工 Roughing						清角加工 Stock removal (Inner Corner)				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	切屑排出量 Material Removal Rate	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	mm^3/min	min^{-1}	mm/min	a_p mm	a_e mm	mm
0.2	R0.03	1°	1	5	30,000	280	0.003	0.02	0.004	0.017	30,000	260	0.002	0.018	0.004
			1.5	7.5	30,000	170	0.002	0.02	0.002	0.007	30,000	150	0.001	0.018	0.002
			2	10	30,000	120	0.001	0.02	0.002	0.002	30,000	110	0.001	0.018	0.002
		3°	1.5	7.5	30,000	250	0.002	0.02	0.004	0.01	30,000	230	0.002	0.018	0.004
			2	10	30,000	200	0.002	0.02	0.003	0.008	30,000	180	0.002	0.018	0.003
	R0.05	1°	1	5	30,000	280	0.003	0.02	0.005	0.017	30,000	260	0.003	0.018	0.005
			1.5	7.5	30,000	170	0.002	0.02	0.004	0.007	30,000	150	0.002	0.018	0.004
			2	10	30,000	120	0.002	0.02	0.002	0.005	30,000	110	0.001	0.018	0.002
		3°	1.5	7.5	30,000	250	0.003	0.02	0.005	0.015	30,000	230	0.003	0.018	0.005
			2	10	30,000	200	0.003	0.02	0.004	0.012	30,000	180	0.002	0.018	0.004
0.3	R0.03	1°	1.5	5	30,000	360	0.003	0.04	0.005	0.04	30,000	320	0.003	0.036	0.005
			2	6.7	30,000	230	0.003	0.04	0.005	0.03	30,000	210	0.003	0.036	0.005
			3	10	26,300	160	0.002	0.04	0.003	0.01	21,000	150	0.002	0.036	0.003
		3°	2	6.7	30,000	350	0.003	0.04	0.005	0.04	30,000	310	0.003	0.036	0.005
			3	10	30,000	280	0.003	0.04	0.005	0.03	30,000	250	0.003	0.036	0.005
	R0.05	1°	1.5	5	30,000	360	0.003	0.04	0.005	0.04	30,000	320	0.003	0.036	0.005
			2	6.7	30,000	230	0.003	0.04	0.005	0.03	30,000	210	0.003	0.036	0.005
			3	10	26,300	160	0.002	0.04	0.003	0.01	21,000	150	0.002	0.036	0.003
		3°	2	6.7	30,000	350	0.003	0.04	0.005	0.04	30,000	310	0.003	0.036	0.005
			3	10	30,000	240	0.003	0.04	0.005	0.03	30,000	220	0.003	0.036	0.005
0.5	R0.05	1°	4	8	23,000	590	0.004	0.1	0.007	0.24	18,400	530	0.004	0.09	0.007
			5	10	23,000	370	0.003	0.1	0.005	0.11	18,400	340	0.003	0.09	0.005
			6	12	23,000	320	0.003	0.1	0.004	0.1	18,400	290	0.002	0.09	0.004
			8	16	17,500	210	0.002	0.07	0.004	0.03	14,000	190	0.002	0.056	0.004
			10	20	15,900	190	0.002	0.03	0.004	0.01	12,700	170	0.002	0.027	0.004
		3°	5	10	23,000	650	0.005	0.1	0.008	0.33	18,400	580	0.004	0.09	0.008
			8	16	23,000	570	0.004	0.1	0.006	0.23	18,400	510	0.003	0.09	0.006
			10	20	23,000	520	0.004	0.1	0.006	0.21	18,400	470	0.003	0.09	0.006
	R0.1	1°	4	8	23,000	590	0.004	0.1	0.007	0.24	18,400	530	0.004	0.09	0.007
			5	10	23,000	370	0.003	0.1	0.005	0.11	18,400	340	0.003	0.09	0.005
			6	12	23,000	320	0.003	0.1	0.004	0.1	18,400	290	0.002	0.09	0.004
			8	16	17,500	210	0.002	0.07	0.004	0.03	14,000	190	0.002	0.056	0.004
			10	20	15,900	190	0.002	0.03	0.004	0.01	12,700	170	0.002	0.027	0.004
		3°	5	10	23,000	650	0.005	0.1	0.008	0.33	18,400	580	0.004	0.09	0.008
			8	16	23,000	570	0.004	0.1	0.006	0.23	18,400	510	0.003	0.09	0.006
			10	20	23,000	520	0.004	0.1	0.006	0.21	18,400	470	0.003	0.09	0.006
1	R0.1	1°	10	10	12,700	800	0.008	0.25	0.005	1.6	10,200	720	0.006	0.225	0.005
			15	15	10,600	410	0.005	0.12	0.004	0.25	8,500	370	0.004	0.108	0.004
			20	20	9,700	260	0.004	0.05	0.004	0.05	7,800	250	0.003	0.045	0.004
			25	25	9,100	260	0.003	0.025	0.004	0.02	7,300	230	0.002	0.023	0.004
			30	30	8,700	230	0.002	0.015	0.004	0.01	7,000	200	0.002	0.014	0.004
		3°	15	15	13,500	1,020	0.009	0.25	0.006	2.3	10,800	910	0.007	0.225	0.006
	R0.2	1°	10	10	12,700	800	0.008	0.25	0.005	1.6	10,200	720	0.006	0.225	0.005
			15	15	10,600	410	0.005	0.12	0.004	0.25	8,500	370	0.004	0.108	0.004
			20	20	9,700	260	0.004	0.05	0.004	0.05	7,800	250	0.003	0.045	0.004
			25	25	9,100	260	0.003	0.025	0.004	0.02	7,300	230	0.002	0.023	0.004
			30	30	8,700	230	0.002	0.015	0.004	0.01	7,000	200	0.002	0.014	0.004
		3°	15	15	13,500	1,020	0.009	0.25	0.006	2.3	10,800	910	0.007	0.225	0.006
	R0.3	1°	10	10	12,700	800	0.008	0.25	0.005	1.6	10,200	720	0.006	0.225	0.005
			15	15	10,600	410	0.005	0.12	0.004	0.25	8,500	370	0.004	0.108	0.004
			20	20	9,700	260	0.004	0.05	0.004	0.05	7,800	250	0.003	0.045	0.004
			25	25	9,100	260	0.003	0.025	0.004	0.02	7,300	230	0.002	0.023	0.004
			30	30	8,700	230	0.002	0.015	0.004	0.01	7,000	200	0.002	0.014	0.004
		3°	15	15	13,500	1,020	0.009	0.25	0.006	2.3	10,800	910	0.007	0.225	0.006

切削参数参考表 Recommended Conditions

加工材料 Work Material					高硬度钢 Hardened Steels SKD11·PD613 (～62HRC)										
					粗加工 Roughing						清角加工 Stock removal (Inner Corner)				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	切屑排出量 Material Removal Rate	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	mm^3/min	min^{-1}	mm/min	a_p mm	a_e mm	mm
1.5	R0.2	1°	15	10	10,700	810	0.017	0.4	0.017	5.51	8,600	730	0.013	0.36	0.017
			20	13.3	8,800	430	0.007	0.3	0.007	0.9	7,000	380	0.005	0.27	0.007
			30	20	6,800	270	0.004	0.08	0.004	0.09	5,400	250	0.003	0.072	0.004
		3°	20	13.3	12,900	1,090	0.025	0.4	0.024	10.9	10,300	980	0.02	0.36	0.024
	R0.3	1°	15	10	10,700	810	0.017	0.4	0.017	5.51	8,600	730	0.013	0.36	0.017
			20	13.3	8,800	430	0.007	0.3	0.007	0.9	7,000	380	0.005	0.27	0.007
			30	20	6,800	270	0.004	0.08	0.004	0.09	5,400	250	0.003	0.072	0.004
		3°	20	13.3	12,900	1,090	0.025	0.4	0.024	10.9	10,300	980	0.02	0.36	0.024
	R0.5	1°	15	10	10,700	810	0.017	0.4	0.017	5.51	8,600	730	0.013	0.36	0.017
			20	13.3	8,800	430	0.007	0.3	0.007	0.9	7,000	380	0.005	0.27	0.007
			30	20	6,800	270	0.004	0.08	0.004	0.09	5,400	250	0.003	0.072	0.004
		3°	20	13.3	12,900	1,090	0.025	0.4	0.024	10.9	10,300	980	0.02	0.36	0.024
2	R0.2	1°	20	10	9,300	820	0.02	0.5	0.024	8.2	7,400	740	0.016	0.45	0.024
			30	15	6,600	500	0.01	0.3	0.009	1.5	5,300	450	0.008	0.27	0.009
			40	20	5,600	280	0.008	0.15	0.005	0.34	4,500	260	0.006	0.135	0.005
		3°	30	15	10,300	1,090	0.025	0.5	0.03	13.63	8,200	980	0.02	0.45	0.03
	R0.3	1°	20	10	9,300	820	0.02	0.5	0.024	8.2	7,400	740	0.016	0.45	0.024
			30	15	6,600	500	0.01	0.3	0.009	1.5	5,300	450	0.008	0.27	0.009
			40	20	5,600	280	0.008	0.15	0.005	0.34	4,500	260	0.006	0.135	0.005
		3°	30	15	10,300	1,090	0.025	0.5	0.03	13.63	8,200	980	0.02	0.45	0.03
	R0.5	1°	20	10	9,300	820	0.02	0.5	0.024	8.2	7,400	740	0.016	0.45	0.024
			30	15	6,600	500	0.01	0.3	0.009	1.5	5,300	450	0.008	0.27	0.009
			40	20	5,600	280	0.008	0.15	0.005	0.34	4,500	260	0.006	0.135	0.005
		3°	30	15	10,300	1,090	0.025	0.5	0.03	13.63	8,200	980	0.02	0.45	0.03
3	R0.2	1°	30	10	6,400	830	0.025	0.7	0.026	14.53	5,100	750	0.02	0.63	0.026
			40	13.3	5,500	430	0.015	0.6	0.017	3.87	4,400	380	0.012	0.54	0.017
			50	16.7	4,900	340	0.012	0.4	0.014	1.63	3,900	310	0.009	0.36	0.014
			60	20	4,600	290	0.01	0.18	0.012	0.52	3,700	260	0.008	0.162	0.012
		3°	29.8	9.9	7,900	1,160	0.04	0.7	0.06	32.48	6,300	1,040	0.037	0.63	0.06
	R0.3	1°	30	10	6,400	830	0.025	0.7	0.026	14.53	5,100	750	0.02	0.63	0.026
			40	13.3	5,500	430	0.015	0.6	0.017	3.87	4,400	380	0.012	0.54	0.017
			50	16.7	4,900	340	0.012	0.4	0.014	1.63	3,900	310	0.009	0.36	0.014
			60	20	4,600	290	0.01	0.18	0.012	0.52	3,700	260	0.008	0.162	0.012
		3°	29.9	10	7,900	1,160	0.04	0.7	0.06	32.48	6,300	1,040	0.037	0.63	0.06
	R0.5	1°	30	10	6,400	830	0.025	0.7	0.026	14.53	5,100	750	0.02	0.63	0.026
			40	13.3	5,500	430	0.015	0.6	0.017	3.87	4,400	380	0.012	0.54	0.017
			50	16.7	4,900	340	0.012	0.4	0.014	1.63	3,900	310	0.009	0.36	0.014
			60	20	4,600	290	0.01	0.18	0.012	0.52	3,700	260	0.008	0.162	0.012
		3°	30.1	10	7,900	1,160	0.04	0.7	0.06	32.48	6,300	1,040	0.037	0.63	0.06

备 注 Notes

※1 切深量的 ap 表示为轴向切深量，ae 表示步距量。
※2 请根据机械刚性、被加工材料的夹持状态等调整切削条件。
※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 对于 Z 轴方向的切削进给方法，建议使用螺旋(Helical)及倾斜(Ramp)方式。
※6 当机床的最高主轴转速低于以上参考值时，请以相同比率调整主轴转速和进给速度。
※7 请尽量缩短刀具的伸出量。
※8 建议使用油雾冷却方式。
※9 在加工较深部位时，请特别注意冷却液的供应以及切屑的排出。
※10 加工的余量为参考值，请根据前一工序的加工状态和要求精度进行调整。
※11 清角加工的刀具选择参考：前一道工序(粗加工)使用的刀具直径约为清角加工刀具的 1.5 倍(如下例所示)
请根据前一道工序(粗加工)所留下的余量，调整切削深度与进给速度。
(例)前工序(粗加工)：φ3 × R0.5 ➡ 清角加工：φ2 × R0.2

※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 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
※5 Recommend to apply helical or ramping for approaching into axial direction.
※6 If the maximum spindle speed of the machine tool is lower than the reference value,please reduce the spindle speed and feed rate at the same rate.
※7 Length of tool overhang must be as short as possible.
※8 Oil mist coolant is recommended.
※9 Coolant supply and chip disposal in the deep portion are very important.
※10 The stock allowance for this tool is a guideline. Please adjust it according to the machining condition of the previous process and the required accuracy.
※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied.
Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
Example
Roughing: φ3 × R0.5 ➡ Stock removal (inner corner): φ2 × R0.2

MTNH430R New

切削参数参考表 Recommended Conditions

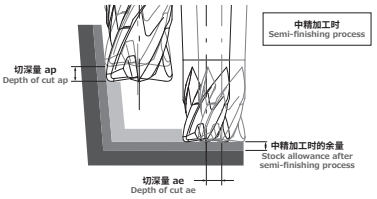
加工材料 Work Material					高硬度钢 Hardened Steels SKD11·PD613 (~62HRC)									
					中精加工 Semi-Finishing					精加工 Finishing				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	min^{-1}	mm/min	a_p mm	a_e mm	mm
0.2	R0.03	1°	1	5	30,000	220	0.002	0.015	0.002	30,000	200	0.002	0.014	0
			1.5	7.5	30,000	140	0.001	0.015	0.001	30,000	120	0.001	0.014	0
			2	10	30,000	100	0.001	0.015	0.001	30,000	80	0.001	0.014	0
		3°	1.5	7.5	30,000	200	0.002	0.015	0.002	30,000	180	0.002	0.014	0
			2	10	30,000	160	0.002	0.015	0.001	30,000	140	0.001	0.014	0
	R0.05	1°	1	5	30,000	220	0.003	0.015	0.002	30,000	200	0.002	0.014	0
			1.5	7.5	30,000	140	0.002	0.015	0.002	30,000	120	0.002	0.014	0
			2	10	30,000	100	0.001	0.015	0.001	30,000	80	0.001	0.014	0
		3°	1.5	7.5	30,000	200	0.003	0.015	0.002	30,000	180	0.002	0.014	0
			2	10	30,000	160	0.002	0.015	0.002	30,000	140	0.002	0.014	0
0.3	R0.03	1°	1.5	5	30,000	290	0.003	0.03	0.002	30,000	250	0.002	0.028	0
			2	6.7	30,000	180	0.003	0.03	0.002	30,000	160	0.002	0.028	0
			3	10	21,000	130	0.002	0.03	0.001	21,000	110	0.001	0.028	0
		3°	2	6.7	30,000	280	0.003	0.03	0.002	30,000	250	0.002	0.028	0
			3	10	30,000	220	0.003	0.03	0.002	30,000	200	0.002	0.028	0
	R0.05	1°	1.5	5	30,000	290	0.003	0.03	0.002	30,000	250	0.002	0.028	0
			2	6.7	30,000	180	0.003	0.03	0.002	30,000	160	0.002	0.028	0
			3	10	21,000	130	0.002	0.03	0.001	21,000	110	0.001	0.028	0
		3°	2	6.7	30,000	280	0.003	0.03	0.002	30,000	250	0.002	0.028	0
			3	10	30,000	190	0.003	0.03	0.002	30,000	170	0.002	0.028	0
0.5	R0.05	1°	4	8	18,400	470	0.004	0.075	0.003	18,400	410	0.003	0.07	0
			5	10	18,400	300	0.003	0.075	0.002	18,400	260	0.002	0.07	0
			6	12	18,400	260	0.002	0.075	0.002	18,400	220	0.002	0.07	0
			8	16	14,000	170	0.002	0.053	0.002	14,000	150	0.002	0.049	0
			10	20	12,700	150	0.002	0.023	0.002	12,700	130	0.002	0.021	0
		3°	5	10	18,400	520	0.004	0.075	0.004	18,400	460	0.004	0.07	0
			8	16	18,400	460	0.003	0.075	0.003	18,400	400	0.003	0.07	0
			10	20	18,400	420	0.003	0.075	0.003	18,400	360	0.003	0.07	0
	R0.1	1°	4	8	18,400	470	0.004	0.075	0.003	18,400	410	0.003	0.07	0
			5	10	18,400	300	0.003	0.075	0.002	18,400	260	0.002	0.07	0
			6	12	18,400	260	0.002	0.075	0.002	18,400	220	0.002	0.07	0
			8	16	14,000	170	0.002	0.053	0.002	14,000	150	0.002	0.049	0
			10	20	12,700	150	0.002	0.023	0.002	12,700	130	0.002	0.021	0
		3°	5	10	18,400	520	0.004	0.075	0.004	18,400	460	0.004	0.07	0
			8	16	18,400	460	0.003	0.075	0.003	18,400	400	0.003	0.07	0
			10	20	18,400	420	0.003	0.075	0.003	18,400	360	0.003	0.07	0
1	R0.1	1°	10	10	10,200	630	0.003	0.188	0.002	10,200	550	0.002	0.175	0
			15	15	8,500	330	0.002	0.09	0.002	8,500	290	0.002	0.084	0
			20	20	7,800	230	0.002	0.038	0.002	7,800	200	0.002	0.035	0
			25	25	7,300	210	0.002	0.019	0.002	7,300	180	0.002	0.018	0
			30	30	7,000	180	0.002	0.011	0.002	7,000	160	0.002	0.011	0
		3°	15	15	10,800	820	0.004	0.188	0.002	10,800	710	0.002	0.175	0
	R0.2	1°	10	10	10,200	630	0.003	0.188	0.002	10,200	550	0.002	0.175	0
			15	15	8,500	330	0.002	0.09	0.002	8,500	290	0.002	0.084	0
			20	20	7,800	230	0.002	0.038	0.002	7,800	200	0.002	0.035	0
			25	25	7,300	210	0.002	0.019	0.002	7,300	180	0.002	0.018	0
			30	30	7,000	180	0.002	0.011	0.002	7,000	160	0.002	0.011	0
		3°	15	15	10,800	820	0.004	0.188	0.002	10,800	710	0.002	0.175	0
	R0.3	1°	10	10	10,200	630	0.003	0.188	0.002	10,200	550	0.002	0.175	0
			15	15	8,500	330	0.002	0.09	0.002	8,500	290	0.002	0.084	0
			20	20	7,800	230	0.002	0.038	0.002	7,800	200	0.002	0.035	0
			25	25	7,300	210	0.002	0.019	0.002	7,300	180	0.002	0.018	0
			30	30	7,000	180	0.002	0.011	0.002	7,000	160	0.002	0.011	0
		3°	15	15	10,800	820	0.004	0.188	0.002	10,800	710	0.002	0.175	0

加工材料 Work Material					高硬度钢 Hardened Steels SKD11·PD613 (～62HRC)									
					中精加工 Semi-Finishing					精加工 Finishing				
外径 Dia.	角半径 Corner Radius	颈角 Neck Taper Angle	颈长 Under Neck Length	L(颈长)/D(外径) L/D	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance	主轴转速 Spindle Speed	进给速度 Feed	切深量 Depth of Cut		余量 Stock Allowance
					min^{-1}	mm/min	a_p mm	a_e mm	mm	min^{-1}	mm/min	a_p mm	a_e mm	mm
1.5	R0.2	1°	15	10	8,600	640	0.01	0.3	0.007	8,600	560	0.007	0.28	0
			20	13.3	7,000	340	0.004	0.225	0.003	7,000	300	0.003	0.21	0
			30	20	5,400	230	0.002	0.06	0.002	5,400	200	0.002	0.056	0
		3°	20	13.3	10,300	870	0.014	0.3	0.01	10,300	760	0.01	0.28	0
	R0.3	1°	15	10	8,600	640	0.01	0.3	0.007	8,600	560	0.007	0.28	0
			20	13.3	7,000	340	0.004	0.225	0.003	7,000	300	0.003	0.21	0
			30	20	5,400	230	0.002	0.06	0.002	5,400	200	0.002	0.056	0
		3°	20	13.3	10,300	870	0.014	0.3	0.01	10,300	760	0.01	0.28	0
	R0.5	1°	15	10	8,600	640	0.01	0.3	0.007	8,600	560	0.007	0.28	0
			20	13.3	7,000	340	0.004	0.225	0.003	7,000	300	0.003	0.21	0
			30	20	5,400	230	0.002	0.06	0.002	5,400	200	0.002	0.056	0
		3°	20	13.3	10,300	870	0.014	0.3	0.01	10,300	760	0.01	0.28	0
2	R0.2	1°	20	10	7,400	650	0.014	0.375	0.01	7,400	570	0.01	0.35	0
			30	15	5,300	400	0.005	0.225	0.004	5,300	350	0.004	0.21	0
			40	20	4,500	230	0.003	0.113	0.002	4,500	200	0.002	0.105	0
		3°	30	15	8,200	870	0.018	0.375	0.012	8,200	760	0.012	0.35	0
	R0.3	1°	20	10	7,400	650	0.014	0.375	0.01	7,400	570	0.01	0.35	0
			30	15	5,300	400	0.005	0.225	0.004	5,300	350	0.004	0.21	0
			40	20	4,500	230	0.003	0.113	0.002	4,500	200	0.002	0.105	0
		3°	30	15	8,200	870	0.018	0.375	0.012	8,200	760	0.012	0.35	0
	R0.5	1°	20	10	7,400	650	0.014	0.375	0.01	7,400	570	0.01	0.35	0
			30	15	5,300	400	0.005	0.225	0.004	5,300	350	0.004	0.21	0
			40	20	4,500	230	0.003	0.113	0.002	4,500	200	0.002	0.105	0
		3°	30	15	8,200	870	0.018	0.375	0.012	8,200	760	0.012	0.35	0
3	R0.2	1°	30	10	5,100	660	0.015	0.525	0.011	5,100	580	0.011	0.49	0
			40	13.3	4,400	340	0.01	0.45	0.007	4,400	300	0.007	0.42	0
			50	16.7	3,900	270	0.008	0.3	0.006	3,900	240	0.006	0.28	0
			60	20	3,700	230	0.007	0.135	0.005	3,700	200	0.005	0.126	0
		3°	29.8	9.9	6,300	930	0.035	0.525	0.025	6,300	810	0.025	0.49	0
	R0.3	1°	30	10	5,100	660	0.015	0.525	0.011	5,100	580	0.011	0.49	0
			40	13.3	4,400	340	0.01	0.45	0.007	4,400	300	0.007	0.42	0
			50	16.7	3,900	270	0.008	0.3	0.006	3,900	240	0.006	0.28	0
			60	20	3,700	230	0.007	0.135	0.005	3,700	200	0.005	0.126	0
		3°	29.9	10	6,300	930	0.035	0.525	0.025	6,300	810	0.025	0.49	0
	R0.5	1°	30	10	5,100	660	0.015	0.525	0.011	5,100	580	0.011	0.49	0
			40	13.3	4,400	340	0.01	0.45	0.007	4,400	300	0.007	0.42	0
			50	16.7	3,900	270	0.008	0.3	0.006	3,900	240	0.006	0.28	0
			60	20	3,700	230	0.007	0.135	0.005	3,700	200	0.005	0.126	0
		3°	30.1	10	6,300	930	0.035	0.525	0.025	6,300	810	0.025	0.49	0

备 注 Notes

※1 切深量的 ap 表示为轴向切深量，ae 表示步距量。
※2 请根据机械刚性、被加工材料的夹持状态等调整切削条件。
※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 对于 Z 轴方向的切削进给方法，建议使用螺旋(Helical)及倾斜(Ramp)方式。
※6 当机床的最高主轴转速低于以上参考值时，请以相同比率调整主轴转速和进给速度。
※7 请尽量缩短刀具的伸出量。
※8 建议使用油雾冷却方式。
※9 在加工较深部位时，请特别注意冷却液的供应以及切屑的排出。
※10 加工的余量为参考值，请根据前一工序的加工状态和要求精度进行调整。
※11 清角加工的刀具选择参考：前一道工序(粗加工)使用的刀具直径约为清角加工刀具的 1.5 倍(如下例所示)
请根据前一道工序(粗加工)所留下的余量，调整切削深度与进给速度。
(例)前工序(粗加工)：φ3 × R0.5 ➡ 清角加工：φ2 × R0.2

※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 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
※5 Recommend to apply helical or ramping for approaching into axial direction.
※6 If the maximum spindle speed of the machine tool is lower than the reference value,please reduce the spindle speed and feed rate at the same rate.
※7 Length of tool overhang must be as short as possible.
※8 Oil mist coolant is recommended.
※9 Coolant supply and chip disposal in the deep portion are very important.
※10 The stock allowance for this tool is a guideline. Please adjust it according to the machining condition of the previous process and the required accuracy.
※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied.
Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
Example
Roughing: φ3 × R0.5 ➡ Stock removal (inner corner): φ2 × R0.2



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

1）拿取刀具使用时，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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MTNH430R_A1_202509_CN

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