



Tapered Barrel End Mills

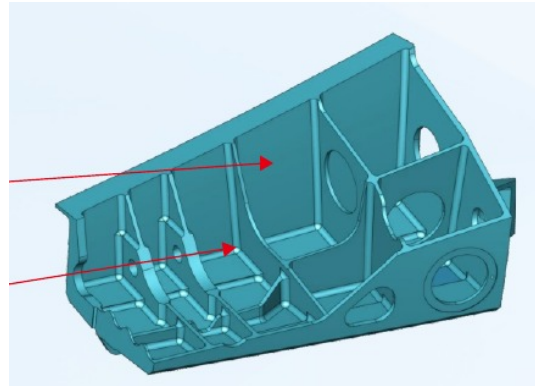
High-Efficiency Finishing for 5-Axis CNC Machining

Product Overview

KAI XUAN TENG tapered barrel end mills are designed for high-efficiency finishing of complex surfaces, steep walls, mold cavities, tangent planes and free-form profiles. The large barrel radius enables a much larger step-over than conventional ball nose tools while maintaining fine surface quality.

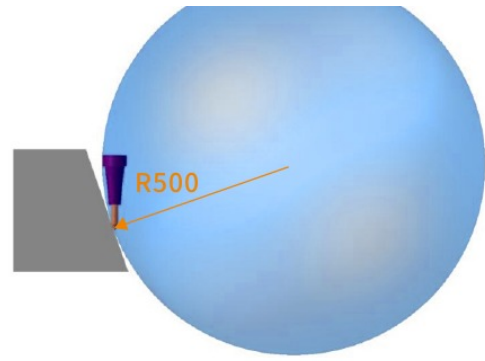
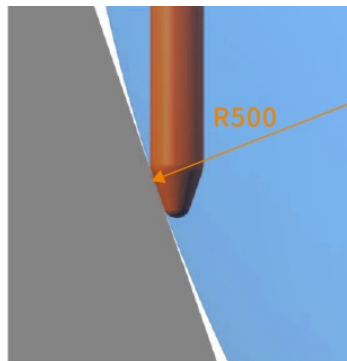
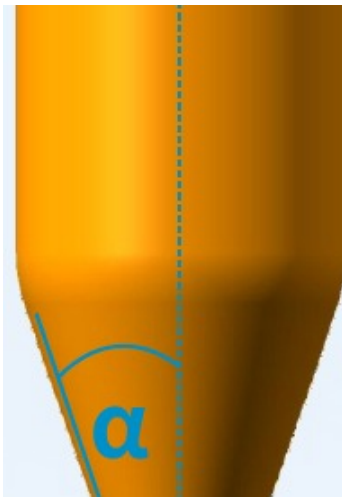
Typical machining challenges

- Inclined and free-form surfaces are difficult to finish efficiently.
- Ball nose end mills require very small step-over, creating long toolpaths and long cycle times.
- Conventional tools are less efficient around corner transitions and large-radius surfaces.



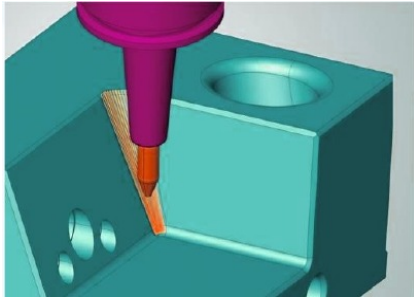
Design Principle

The barrel profile is based on a large tangential radius, commonly R350, R500, R750 or R1000. This geometry increases the effective cutting contact area and allows higher productivity in 5-axis finishing operations.

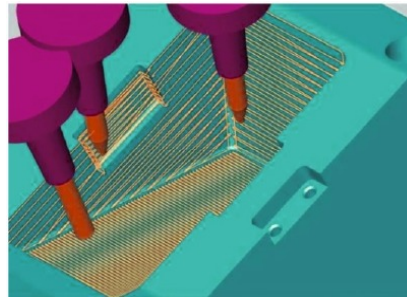


Application Range

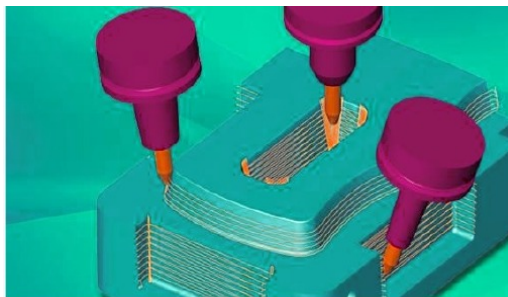
Suitable for prism corner radius finishing, tangent plane machining and free-form surface finishing.



Prism corner radius finishing



Tangent plane machining



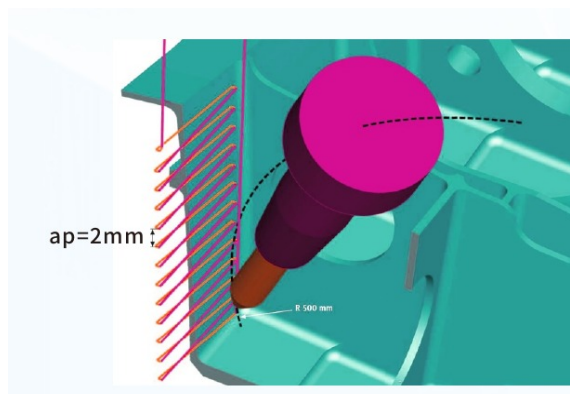
Free-form surface finishing

Faster finishing
The barrel radius allows a larger step-over and fewer passes, reducing finishing time by up to 90% in suitable applications.

Efficiency Advantage

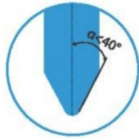
Ball nose end mill $\varnothing 10$
Step-over $a_p = 0.14$ mm
Theoretical roughness $R_{th} = 1$ μm
Area machining time: 55 s/cm²

Barrel end mill $\varnothing 16$
Step-over $a_p = 2.0$ mm
Theoretical roughness $R_{th} = 1$ μm
Area machining time: 3 s/cm²



Barrel End Mill Design

- A barrel end mill is a variation of a tapered ball nose end mill.
- A large tangential radius replaces the straight taper, typically from R50 mm to R1500 mm.



Barrel end mills with a taper angle below 40° are especially suitable for steep surfaces.

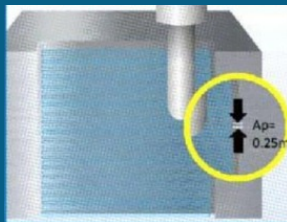
KAI XUAN TENG Barrel Tool Features

- Variable geometry suppresses vibration and extends tool life.
- KAI XUAN TENG geometry allows multiple regrinding cycles.
- Dedicated carbide substrate and coating improve tool life and wear resistance.
- 3-8 flute designs cover different materials and applications.
- Precise form tolerance ensures machining accuracy.
- Standard diameter range from 6 mm to 16 mm.
- Two tool families are available for ferrous metals and aluminum alloys.
- Custom non-standard tools are available.

Barrel End Mill Features and Advantages

- Larger axial step-over than conventional scan finishing.
- Shorter machining time and improved surface quality, increasing productivity.
- Up to 90% cutting time reduction in suitable finishing applications.
- Longer tool life while reducing the number of tools required.
- Larger arc radius compensation helps extend spindle life and maintain machine positioning accuracy.
- Lower tool-change cost.
- Good process reliability.
- Reduced or eliminated semi-finishing work, such as fine milling and polishing.
- Lower cutting heat and reduced risk of part deformation.
- Flexible capability for surface machining and profile milling.

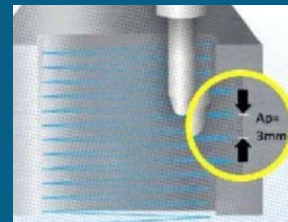
Machining Capability



Typical ball nose end mill
Small step-over

- Large number of passes
- Longer machining time

To use the cutting edge portion, a step-over of about 6.25 mm is often required.



Barrel end mill
Large step-over

- Fewer passes
- Shorter machining time

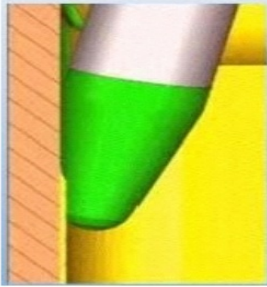
The barrel cutting section requires only about 3 mm step-over.

Cavity Machining

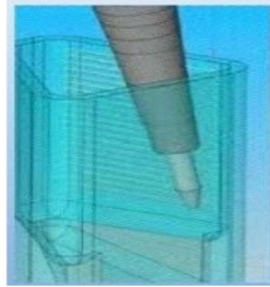
Ball Nose End Mill	VS	Barrel Tool
18 min 40 sec	Machining time	2 min 31 sec
0.25 mm	Step-over	3 mm
18,667 mm	Toolpath length	4,045 mm
1000 mm/min	Feed rate	1000 mm/min

Recommended Machining Methods

Correct toolpath strategy plays a key role in tool performance, tool life and surface finish.



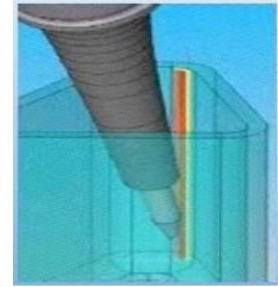
Use combined toolpaths to remove remaining stock on curved surfaces.



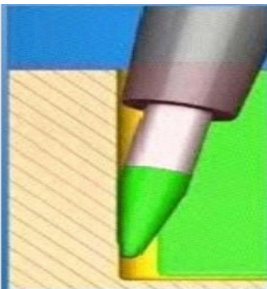
Prefer climb milling to improve tool life and surface finish.



Use the tip radius for small corner-cleaning operations.



Use the barrel radius section for larger corner radii.



Keep the tool and holder combination as short as possible.



Avoid the bottom tip area when chip space is limited.



Use upward machining paths whenever possible.

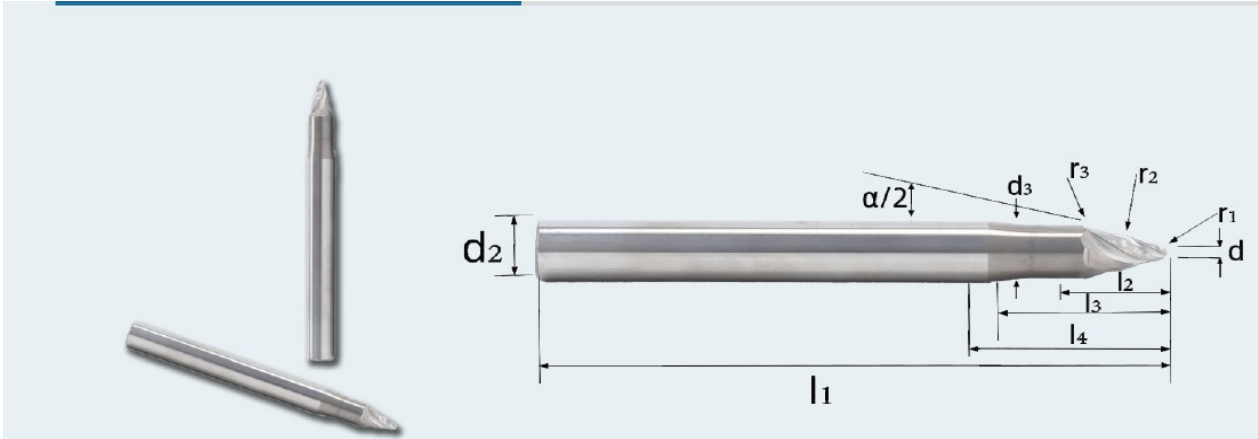


Avoid feeding downward with the tool tip.

- For large surfaces, use the barrel radius area as the main cutting section.
- Use the largest practical tool diameter to improve cutting speed and chip evacuation.
- Change the cutting contact point along the cutting edge to distribute wear.
- Use climb milling whenever possible for better tool life and surface quality.
- Keep overhang short; avoid using the very bottom tip area unless parameters are reduced.

V021 Aluminum Alloy Series

Customizable | Regrindable | Unit: mm



Optimized for high-speed aluminum alloy finishing with smooth cutting action and efficient chip evacuation.

Small-diameter tapered barrel models

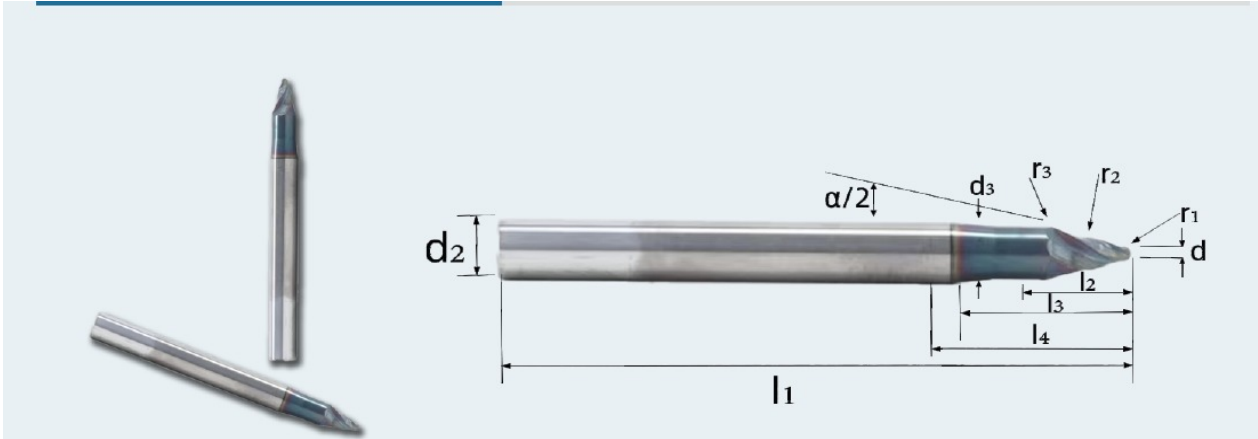
Model	D1	a/2	D2	D3	L1	L2	L3	L4	R1	R2	R3	Z
D6*A16*R0.5*R350*R1*75*4F	1	8°	6	5	75	16	17.5	22.5	0.5	350	1	4
D8*A30*R1*R350*R1*75*4F	2	15°	8	7	75	11.5	17.5	22.5	1	350	1	4
D8*A30*R1*R250*R1*75*4F	2	30°	8	-	75	8	-	-	1	250	1	4
D12*A28*R2*R350*R1*100*4F	4	14°	12	9	100	13.5	17.5	22.5	2	350	1	4

D16 large-radius models

Model	D1	a/2	D2	L1	L2	R1	R2	R3	Z
D16*A30°*R2*R750*3*108*4F	4	30°	16	100	14.5	2	750	3	4
D16*A30°*R2*R750*3*108*6F	4	30°	16	100	14.5	2	750	3	6
D16*A20°*R3*R1000*5*108*4F	6	20°	16	100	18.5	3	1000	5	4
D16*A20°*R3*R1000*5*108*8F	6	20°	16	100	18.5	3	1000	5	8
D16*A10°*R4*R1000*5*108*4F	8	10°	16	100	28.5	4	1000	5	4
D16*A10°*R4*R1000*5*108*8F	8	10°	16	100	25.5	4	1000	5	8
D16*A6°*R4*R1000*5*123*4F	8	6°	16	125	44	4	1000	5	4
D16*A6°*R4*R1000*5*123*8F	8	6°	16	125	44	4	1000	5	8

VXP02 Aluminum Alloy Series

Customizable | Regrindable | Unit: mm



Dedicated aluminum alloy finishing series for stable surface quality in mold and precision component machining.

Small-diameter tapered barrel models

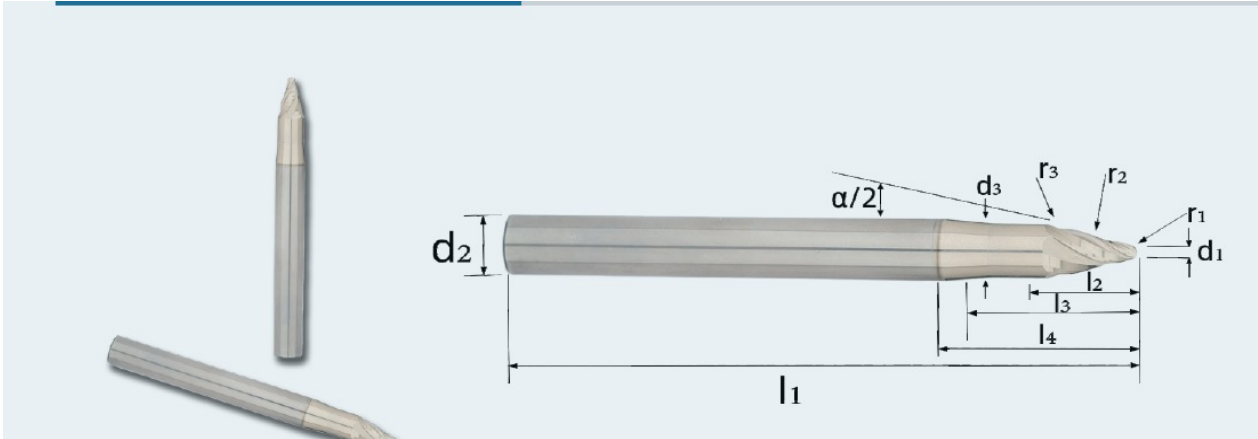
Model	D1	a/2	D2	D3	L1	L2	L3	L4	R1	R2	R3	Z
D6*A16*R0.5*R350*R1*75*4F	1	8°	6	5	75	16	17.5	22.5	0.5	350	1	4
D8*A30*R1*R350*R1*75*4F	2	15°	8	7	75	11.5	17.5	22.5	1	350	1	4
D8*A30*R1*R250*R1*75*4F	2	30°	8	-	75	8	-	-	1	250	1	4
D12*A28*R2*R350*R1*100*4F	4	14°	12	9	100	13.5	17.5	22.5	2	350	1	4

D16 large-radius models

Model	D1	a/2	D2	L1	L2	R1	R2	R3	Z
D16*A30*R2*R750*3*108*4F	4	30°	16	100	14.5	2	750	3	4
D16*A30*R2*R750*3*108*6F	4	30°	16	100	14.5	2	750	3	6
D16*A20*R3*R1000*5*108*4F	6	20°	16	100	18.5	3	1000	5	4
D16*A20*R3*R1000*5*108*8F	6	20°	16	100	18.5	3	1000	5	8
D16*A10*R4*R1000*5*108*4F	8	10°	16	100	28.5	4	1000	5	4
D16*A10*R4*R1000*5*108*8F	8	10°	16	100	25.5	4	1000	5	8
D16*A6*R4*R1000*5*123*4F	8	6°	16	125	44	4	1000	5	4
D16*A6*R4*R1000*5*123*8F	8	6°	16	125	44	4	1000	5	8

VXP02 Aluminum Alloy Series - Alternative Geometry

Customizable | Regrindable | Unit: mm



Alternative geometry within the aluminum alloy family. Custom dimensions and regrinding service are available.

Small-diameter tapered barrel models

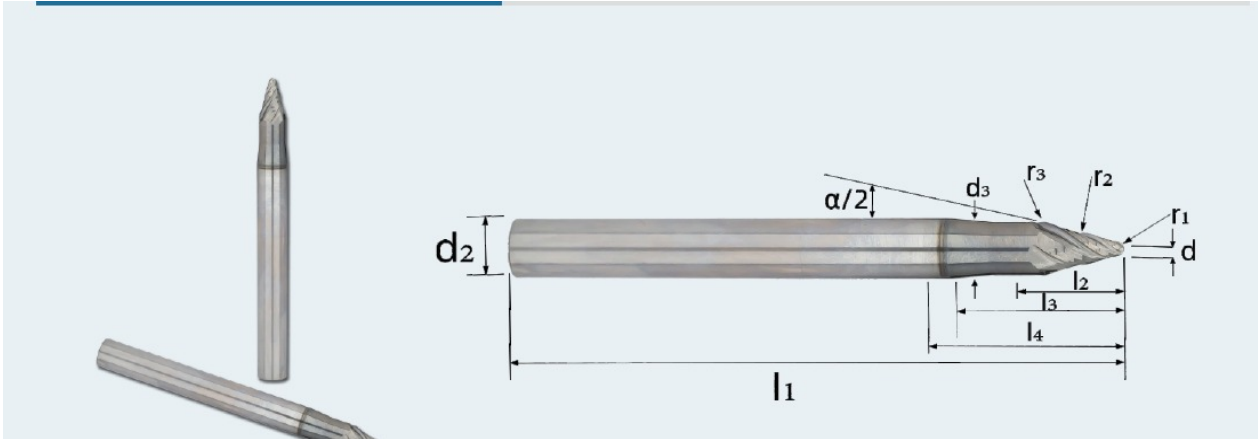
Model	D1	a/2	D2	D3	L1	L2	L3	L4	R1	R2	R3	Z
D6*A16*R0.5*R350*R1*75*4F	1	8°	6	5	75	16	17.5	22.5	0.5	350	1	4
D8*A30*R1*R350*R1*75*4F	2	15°	8	7	75	11.5	17.5	22.5	1	350	1	4
D8*A30*R1*R250*R1*75*4F	2	30°	8	-	75	8	-	-	1	250	1	4
D12*A28*R2*R350*R1*100*4F	4	14°	12	9	100	13.5	17.5	22.5	2	350	1	4

D16 large-radius models

Model	D1	a/2	D2	L1	L2	R1	R2	R3	Z
D16*A30*R2*R750*3*108*4F	4	30°	16	100	14.5	2	750	3	4
D16*A30*R2*R750*3*108*6F	4	30°	16	100	14.5	2	750	3	6
D16*A20*R3*R1000*5*108*4F	6	20°	16	100	18.5	3	1000	5	4
D16*A20*R3*R1000*5*108*8F	6	20°	16	100	18.5	3	1000	5	8
D16*A10*R4*R1000*5*108*4F	8	10°	16	100	28.5	4	1000	5	4
D16*A10*R4*R1000*5*108*8F	8	10°	16	100	25.5	4	1000	5	8
D16*A6*R4*R1000*5*123*4F	8	6°	16	125	44	4	1000	5	4
D16*A6*R4*R1000*5*123*8F	8	6°	16	125	44	4	1000	5	8

VT21 Stainless Steel Series

Customizable | Regrindable | Unit: mm



Designed for stainless steel finishing where edge strength, wear resistance and surface quality are important.

Small-diameter tapered barrel models

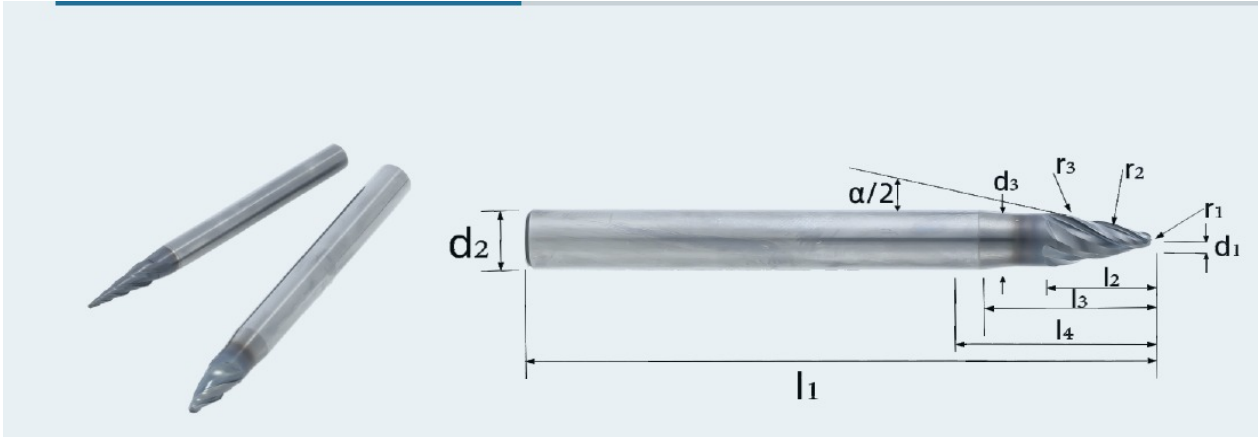
Model	D1	a/2	D2	D3	L1	L2	L3	L4	R1	R2	R3	Z
D6*A16*R0.5*R350*R1*75*4F	1	8°	6	5	75	16	17.5	22.5	0.5	350	1	4
D8*A30*R1*R350*R1*75*4F	2	15°	8	7	75	11.5	17.5	22.5	1	350	1	4
D8*A30*R1*R250*R1*75*4F	2	30°	8	-	75	8	-	-	1	250	1	4
D12*A28*R2*R350*R1*100*4F	4	14°	12	9	100	13.5	17.5	22.5	2	350	1	4

D16 large-radius models

Model	D1	a/2	D2	L1	L2	R1	R2	R3	Z
D16*A30°*R2*R750*3*108*4F	4	30°	16	100	14.5	2	750	3	4
D16*A30°*R2*R750*3*108*6F	4	30°	16	100	14.5	2	750	3	6
D16*A20°*R3*R1000*5*108*4F	6	20°	16	100	18.5	3	1000	5	4
D16*A20°*R3*R1000*5*108*8F	6	20°	16	100	18.5	3	1000	5	8
D16*A10°*R4*R1000*5*108*4F	8	10°	16	100	28.5	4	1000	5	4
D16*A10°*R4*R1000*5*108*8F	8	10°	16	100	25.5	4	1000	5	8
D16*A6°*R4*R1000*5*123*4F	8	6°	16	125	44	4	1000	5	4
D16*A6°*R4*R1000*5*123*8F	8	6°	16	125	44	4	1000	5	8

VO25 Steel Series

Customizable | Regrindable | Unit: mm



Developed for mold steel, pre-hardened steel and precision cavity finishing applications.

Small-diameter tapered barrel models

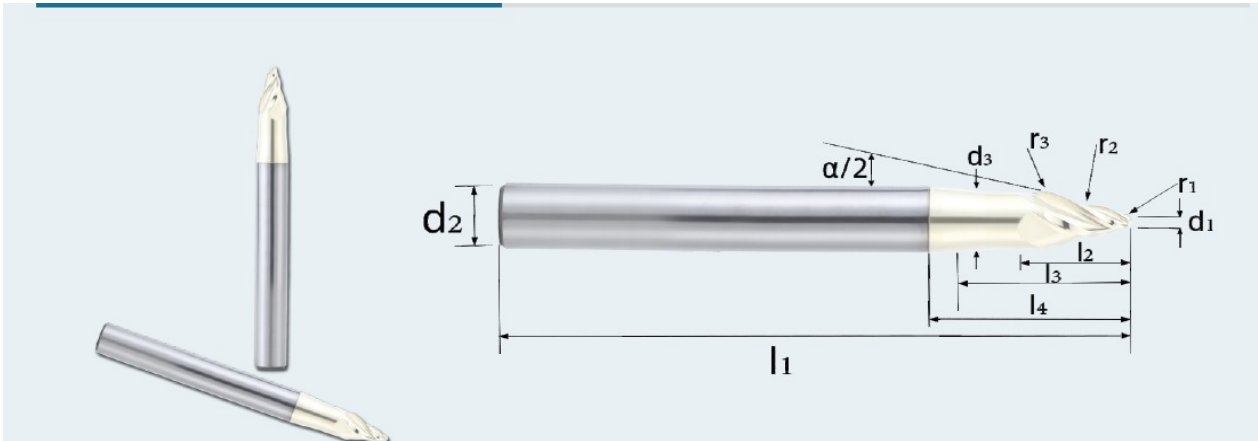
Model	D1	a/2	D2	D3	L1	L2	L3	L4	R1	R2	R3	Z
D6*A16*R0.5*R350*R1*75*4F	1	8°	6	5	75	16	17.5	22.5	0.5	350	1	4
D8*A30*R1*R350*R1*75*4F	2	15°	8	7	75	11.5	17.5	22.5	1	350	1	4
D8*A30*R1*R250*R1*75*4F	2	30°	8	-	75	8	-	-	1	250	1	4
D12*A28*R2*R350*R1*100*4F	4	14°	12	9	100	13.5	17.5	22.5	2	350	1	4

D16 large-radius models

Model	D1	a/2	D2	L1	L2	R1	R2	R3	Z
D16*A30°*R2*R750*3*108*4F	4	30°	16	100	14.5	2	750	3	4
D16*A30°*R2*R750*3*108*6F	4	30°	16	100	14.5	2	750	3	6
D16*A20°*R3*R1000*5*108*4F	6	20°	16	100	18.5	3	1000	5	4
D16*A20°*R3*R1000*5*108*8F	6	20°	16	100	18.5	3	1000	5	8
D16*A10°*R4*R1000*5*108*4F	8	10°	16	100	28.5	4	1000	5	4
D16*A10°*R4*R1000*5*108*8F	8	10°	16	100	25.5	4	1000	5	8
D16*A6°*R4*R1000*5*123*4F	8	6°	16	125	44	4	1000	5	4
D16*A6°*R4*R1000*5*123*8F	8	6°	16	125	44	4	1000	5	8

VX12 Titanium Alloy Series

Customizable | Regrindable | Unit: mm



Designed for titanium alloy finishing with controlled heat generation and stable cutting performance.

Small-diameter tapered barrel models

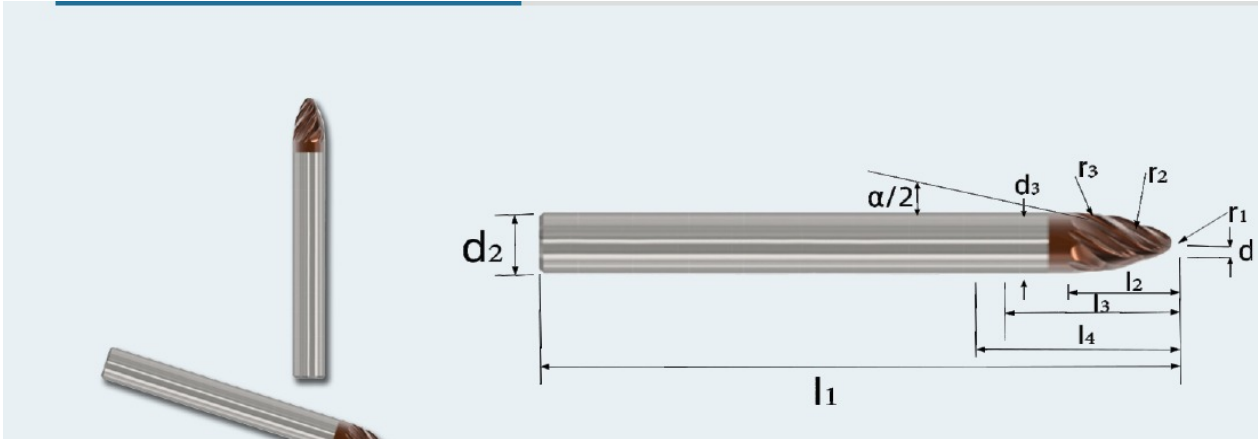
Model	D1	a/2	D2	D3	L1	L2	L3	L4	R1	R2	R3	Z
D6*A16*R0.5*R350*R1*75*4F	1	8°	6	5	75	16	17.5	22.5	0.5	350	1	4
D8*A30*R1*R350*R1*75*4F	2	15°	8	7	75	11.5	17.5	22.5	1	350	1	4
D8*A30*R1*R250*R1*75*4F	2	30°	8	-	75	8	-	-	1	250	1	4
D12*A28*R2*R350*R1*100*4F	4	14°	12	9	100	13.5	17.5	22.5	2	350	1	4

D16 large-radius models

Model	D1	a/2	D2	L1	L2	R1	R2	R3	Z
D16*A30*R2*R750*3*108*4F	4	30°	16	100	14.5	2	750	3	4
D16*A30*R2*R750*3*108*6F	4	30°	16	100	14.5	2	750	3	6
D16*A20*R3*R1000*5*108*4F	6	20°	16	100	18.5	3	1000	5	4
D16*A20*R3*R1000*5*108*8F	6	20°	16	100	18.5	3	1000	5	8
D16*A10*R4*R1000*5*108*4F	8	10°	16	100	28.5	4	1000	5	4
D16*A10*R4*R1000*5*108*8F	8	10°	16	100	25.5	4	1000	5	8
D16*A6*R4*R1000*5*123*4F	8	6°	16	125	44	4	1000	5	4
D16*A6*R4*R1000*5*123*8F	8	6°	16	125	44	4	1000	5	8

TN12 High-Temperature Alloy Series

Customizable | Regrindable | Unit: mm



Developed for difficult-to-machine heat-resistant alloys where wear resistance and process stability are critical.

Small-diameter tapered barrel models

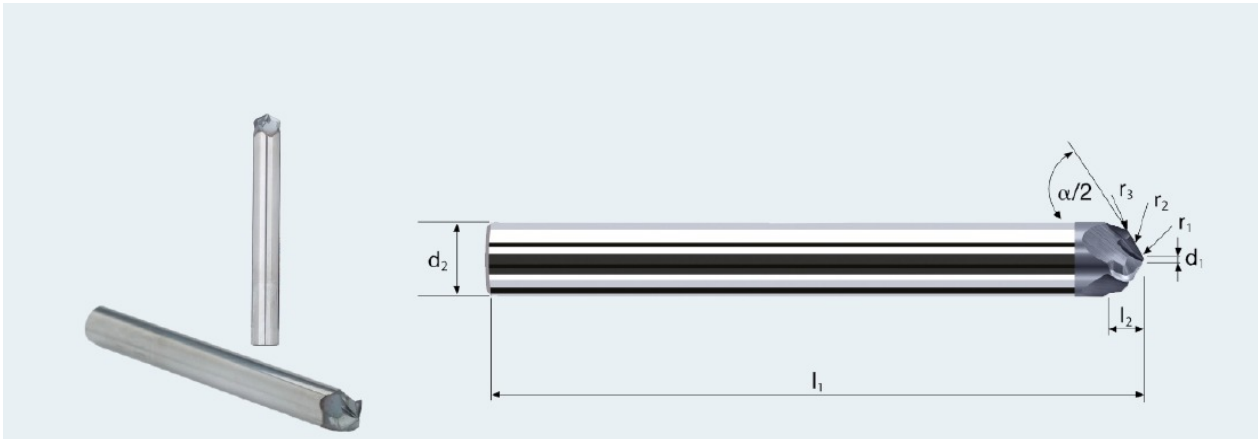
Model	D1	a/2	D2	D3	L1	L2	L3	L4	R1	R2	R3	Z
D6*A16*R0.5*R350*R1*75*4F	1	8°	6	5	75	16	17.5	22.5	0.5	350	1	4
D8*A30*R1*R350*R1*75*4F	2	15°	8	7	75	11.5	17.5	22.5	1	350	1	4
D8*A30*R1*R250*R1*75*4F	2	30°	8	-	75	8	-	-	1	250	1	4
D12*A28*R2*R350*R1*100*4F	4	14°	12	9	100	13.5	17.5	22.5	2	350	1	4

D16 large-radius models

Model	D1	a/2	D2	L1	L2	R1	R2	R3	Z
D16*A30°*R2*R750*3*108*4F	4	30°	16	100	14.5	2	750	3	4
D16*A30°*R2*R750*3*108*6F	4	30°	16	100	14.5	2	750	3	6
D16*A20°*R3*R1000*5*108*4F	6	20°	16	100	18.5	3	1000	5	4
D16*A20°*R3*R1000*5*108*8F	6	20°	16	100	18.5	3	1000	5	8
D16*A10°*R4*R1000*5*108*4F	8	10°	16	100	28.5	4	1000	5	4
D16*A10°*R4*R1000*5*108*8F	8	10°	16	100	25.5	4	1000	5	8
D16*A6°*R4*R1000*5*123*4F	8	6°	16	125	44	4	1000	5	4
D16*A6°*R4*R1000*5*123*8F	8	6°	16	125	44	4	1000	5	8

Lens Type Universal Finishing Series

Customizable | Regrindable | Unit: mm



Lens-type barrel geometry for efficient free-form surface finishing and 5-axis profile machining.

Lens-type standard models

Model	D1	$\alpha/2$	D2	L1	L2	R1	R2	R3	Z
D10*A65°*R1*R250*1.75*84*4F	2	65°	10	75	5	1	250	1.75	4
D20*A70°*R1*R250*1*104*8F	6	70°	20	100	5.5	1	250	1	8

Finishing Cutting Data Reference

The following values are catalog reference data for finishing. Adjust speed and feed according to workpiece hardness, effective diameter, actual cutting area, tool overhang, machine rigidity and required surface finish.

Dia.	P Steel HRC28-40 Vc/Fz	P Hardened Steel Vc/Fz	M Stainless Vc/Fz	S HRSA Vc/Fz	S Titanium Vc/Fz	N Non-ferrous Vc/Fz
6 mm	62-109 / 0.013-0.019	35-52 / 0.006-0.013	85-92 / 0.013-0.019	15-30 / 0.006-0.013	80-120 / 0.013-0.019	225-260 / 0.019-0.025
8 mm	62-109 / 0.019-0.025	35-52 / 0.013-0.019	85-92 / 0.019-0.025	15-30 / 0.013-0.019	80-120 / 0.019-0.025	225-260 / 0.025-0.031
10 mm	62-109 / 0.025-0.031	35-52 / 0.019-0.025	85-92 / 0.025-0.031	15-30 / 0.019-0.025	80-120 / 0.025-0.031	225-260 / 0.031-0.038
12 mm	62-109 / 0.031-0.038	35-52 / 0.025-0.031	85-92 / 0.031-0.038	15-30 / 0.025-0.031	80-120 / 0.031-0.038	225-260 / 0.038-0.050
16 mm	62-109 / 0.044-0.057	35-52 / 0.031-0.038	85-92 / 0.038-0.050	15-30 / 0.031-0.038	80-120 / 0.044-0.050	225-260 / 0.050-0.063

Calculation formulas

$$\text{RPM} = V_c \times 1000 / (D_c \times 3.1415)$$

$$\text{Feed} = F_z \times \text{number of flutes} \times \text{RPM}$$

For better surface finish, increase spindle speed appropriately and reduce feed per tooth, A_p and A_e . Avoid excessive A_e , especially when cutting with the bottom portion of the tool.

Application Case

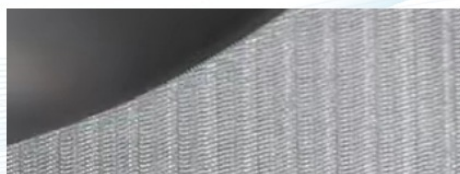
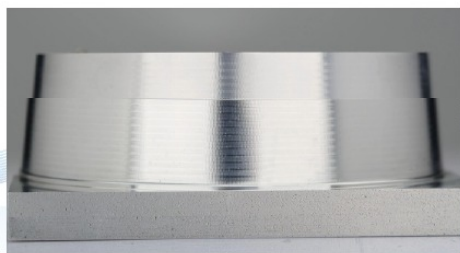
In the catalog case, a VXP02 D8 × R350 tapered barrel end mill was compared with a certain brand R3 ball nose end mill in a finishing application.



Tool	Operation	ap	ae	Spindle	Feed	Time	Surface roughness
VXP02 D8 × R350	Finishing	1.65 mm	0.1 mm	S20000	F3000	45 min	Ra 0.245
Brand R3 ball nose	Finishing	0.2 mm	0.2 mm	S18000	F2800	140 min	Ra 0.28

02系列D8*R350	精加工	ap1.65mm
某品牌r3球刀	精加工	ap0.2

nm	s20000	f3000	用时45分
2	s18000	进给2800	用时140分



Barrel end mill result: Ra 0.245

Ball nose end mill result: Ra 0.28

Result: the barrel end mill reduced machining time from 140 minutes to 45 minutes while achieving better surface roughness.

Technical Support and Services

KAI XUAN TENG provides application-driven support for customers using barrel end mills in mold, aerospace, medical, automotive and precision component machining.

Product development Custom geometry and non-standard dimensions for application-specific machining.	Application support Tool recommendation based on material, hardness, machine, holder and toolpath.
Technical support Cutting parameter guidance, process optimization and problem analysis.	Customer training On-site or remote guidance for tool use, toolpath strategy and maintenance.
Regrinding service Multiple regrinding cycles can help reduce tooling cost and extend tool value.	OEM/ODM support Private-label and customized solutions for distributors and industrial brands.

Company Information

Taizhou Degang Tools Co., Ltd. / Taizhou Tengli Tools Co., Ltd.

Address: Building 10, No. 318 Yongyuan Road, Lunan Street, Luqiao District, Taizhou, Zhejiang, China

Brand: KAI XUAN TENG

For quotations or sample testing, please provide workpiece material, hardness, tool diameter, required radius, tool overhang, machine type and target surface finish.