KYOCERA

整体式铣刀 Solid End Mill 6PFK型/8PFK型

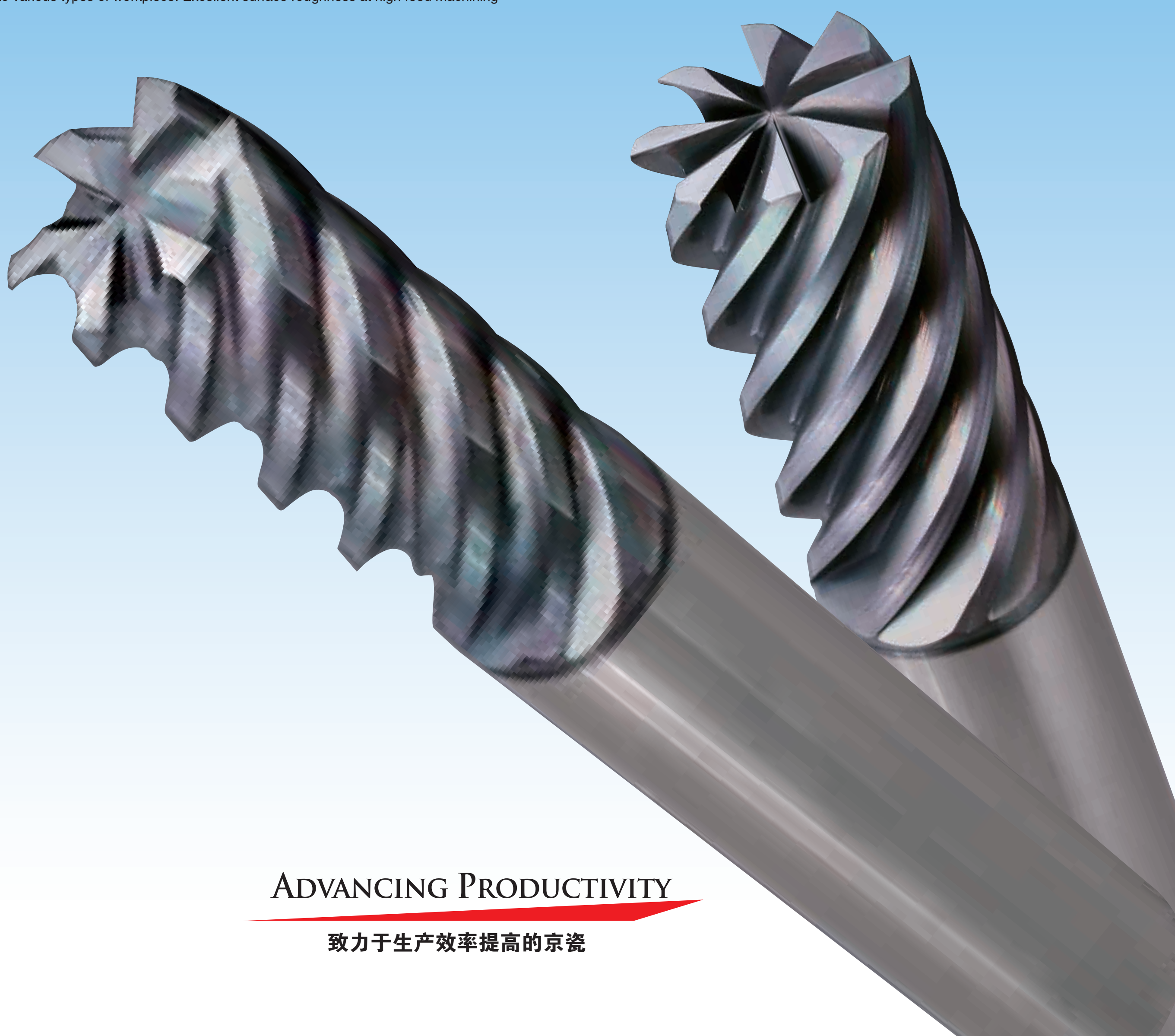
高效率多刀刃端铣刀

6PFK型/8PFK型

High Efficiency Multi-edge End Mill

- 6枚刀刃/8枚刀刃的多刃规格，实现台阶加工的高进给、高效率
  High feed and high efficiency shouldering with Multi-edge design (6 edges/8 edges)
- 独特设计的不等分割、不等导程可抑制振刀
  Kyocera's unique unequal spacing of teeth and variable lead to minimize chattering
- 新设想的特殊槽形，保证稳定的切屑排出
  Stable chip evacuation due to new special flute design
- 可对应广泛的被削材。即使高进给时也实现良好的加工面精度
  Applicable to various types of workpiece. Excellent surface roughness at high feed machining

MEGACOAT NANO实现
长寿命
Long Tool Life with "MEGACOAT NANO"



ADVANCING PRODUCTIVITY

致力于生产效率提高的京瓷

4个特长实现台阶加工的高进给、高效率

6PFK型 /8PFK型

4 advantages to realize high feed and high efficiency shouldering

1 独特设计的不等分割、不等导程抑制振刀。6枚刀刃/8枚刀刃的多刃规格，实现台阶加工的高进给、高效率。

Kyocera's unique unequal spacing of teeth and variable lead to minimize chattering
High feed and high efficiency shouldering with multi–edge design (6 edges/8 edges)

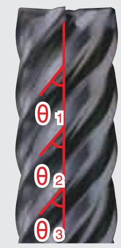
抑制振刀的2个要点 Two points for controlling chattering

POINT 01 不等分割 Unequal spacing of teeth

通过不等分割切刃、抑制切削时的周期振动
Cutting force varies due to varied flute width, which prevents periodical vibration during machining

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

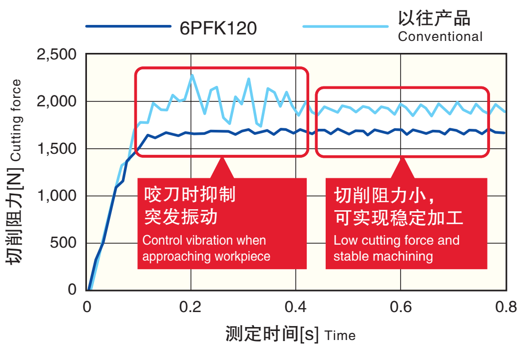
POINT 02 不等导程 Variable lead



螺旋角(导程角 θ)随刃而变化，发挥强抑制振动效果、加工面良好
Every flute has its optimum helix angle (lead angle θ), which enables excellent and anti vibration effect and good surface finish

$\theta_1 \neq \theta_2 \neq \theta_3$

不等分割、不等导程的效果抗振刀能力强
Unequal spacing of teeth and variable lead prevent vibration



加工条件：端铣刀径ϕ12、n=3,300min⁻¹ (Vc＝75m/rev)
Vf=2,000mm/min (fz＝0.17mm/t)
ap×ae=30×1.5mm
台阶加工、被削材：SCM440

Cutting conditions：End Mill Dia.ϕ12 n=3300min⁻¹(Vc＝75m/rev)
Vf=2000mm/min(fz＝0.17mm/t) ap×ae=30×1.5mm
Shouldering Workpiece：SCM440

2 新设想的特殊槽型，实现稳定的切屑排出

Stable chip evacuation by new special flute design

大刀片容屑槽保证良好的切屑排出、在高进给加工中发挥威力
Good chip evacuation with wide chip pocket
Good performance at high feed machining

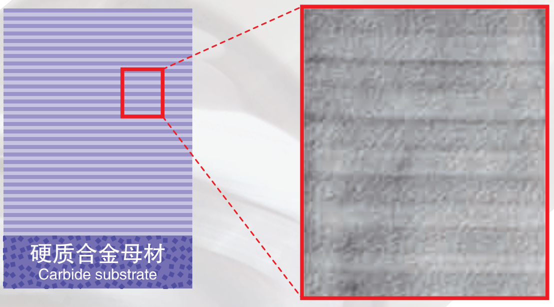
3 特殊纳米多涂层 MEGACOAT NANO实现长寿命

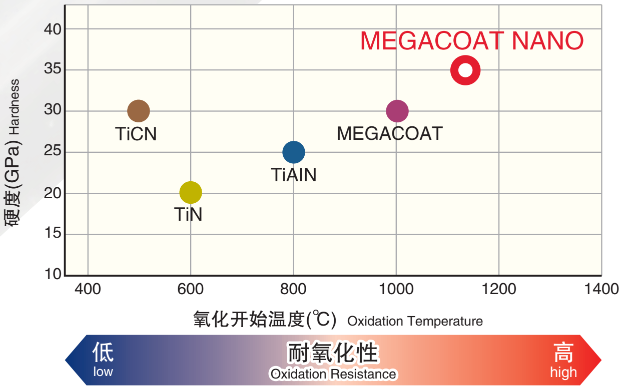
Long Tool Life with Special Multilayer Nano Coating MEGACOAT NANO

■ 特殊纳米多涂层的硬度高(35GPa)以及优良的耐氧化性(氧化开始温度：1,150℃)，抑制磨损、提高抗崩刃性能。

Prevents wear and chipping with high hardness (35GPa) and superior oxidation resistance (oxidation temperature: 1,150℃)

MEGACOAT基底多涂层构造
MEGACOAT base multi–layer structure

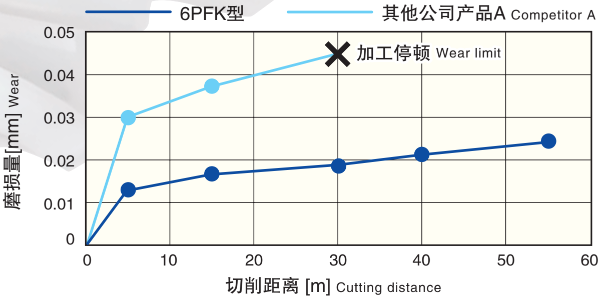




■ MEGACOAT NANO实现长寿命。与其他公司产品相比磨损量为1/2以下!

Long Tool Life with MEGACOAT NANO. Doubled Wear Resistance compared to the Competitor's!

● 磨损比较(外圆后角面) Wear comparison (peripheral relief)



30m切削后的切刃状态 Edge condition after machining 30m

6PFK型

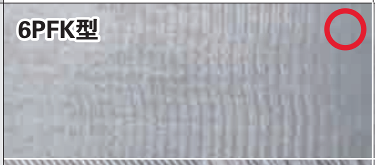
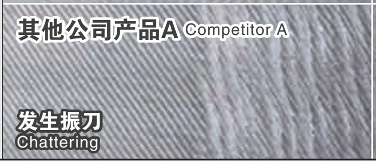
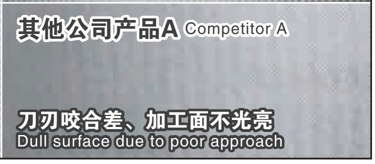
其他公司产品 A Competitor A

加工条件：n=7,000min^{-1} (Vc＝131m/rev)、Vf=1,300mm/min (fz＝0.03mm/t)、ap×ae=3.0×0.5mm、端铣刀径ϕ6、被削材SKD11(原材料)、台阶加工
Cutting conditions：n=7,000min^{-1}(Vc＝131m/rev) Vf=1,300mm/min(fz＝0.03mm/t) ap×ae=3.0×0.5mm End Mill Dia.ϕ6 Workpiece SKD11(Non–hardened) Shouldering

4 可对应广泛的被削材。高进给条件下也可实现出色的加工面精度

Applicable to various types of workpiece. Excellent surface roughness at high feed cutting

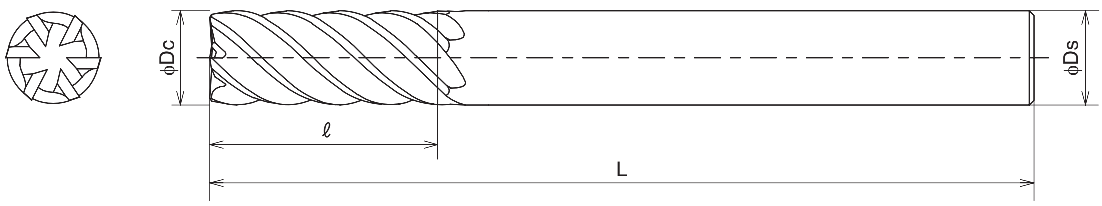
壁面状态比较 Surface finish comparison (side surface)　端铣刀径ϕ12 End Mill Dia ϕ12

被削材 Workpiece	SCM440	SUS304	Ti6Al–4V
切削条件 Cutting conditions	n=3,300min^{-1}(Vc=124m/rev) Vf=2,000mm/min(fz=0.1mm/t) ap×ae=30×1.5mm	n=2,500min^{-1}(Vc=94m/rev) Vf=1,130mm/min(fz=0.08mm/t) ap×ae=30×0.6mm	n=2,500min^{-1}(Vc=94m/rev) Vf=1,130mm/min(fz=0.08mm/t) ap×ae=30×0.6mm
结果 Results	6PFK型 	6PFK型 	6PFK型 
	其他公司产品A Competitor A  发生振刀 Chattering	其他公司产品A Competitor A  发生振刀 Chattering	其他公司产品A Competitor A  刀刃咬合差、加工面不光亮 Dull surface due to poor approach

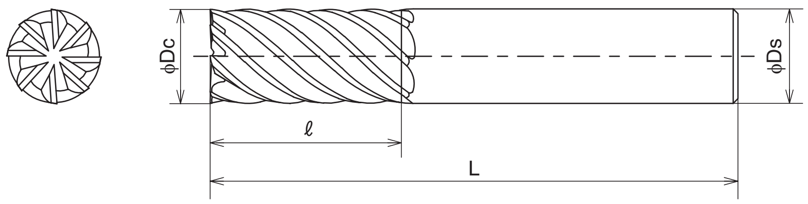
6PFK型 / 8PFK型

■ 系列化 Stock Items

■ 6PFK



■ 8PFK



6/8PFK型〔中等刃长型〕 Medium length of cut

型号 Description	库存 Stock	外径 Outside Dia.	外径公差 Outside Dia. Tolerance	刃长 Length of cut	刀杆径 Shank Dia.	全长 Overall length	刃数 Number of flutes
		ϕDc		ℓ	ϕDs	L	Z
6PFK060–150	●	6.0	0 –0.020	15	6	60	6
6PFK080–200	●	8.0	–0.005 –0.025	20	8	70	6
6PFK100–250	●	10.0	–0.005 –0.025	25	10	80	6
6PFK120–300	●	12.0	–0.010 –0.030	30	12	100	6
6PFK160–400	●	16.0	–0.010 –0.030	40	16	110	6
6PFK200–450	●	20.0	–0.010 –0.030	45	20	125	6
8PFK250–500	●	25.0	–0.010 –0.030	50	25	140	8

6/8PFK型〔长刃型〕 Long length of cut

型号 Description	库存 Stock	外径 Outside Dia.	外径公差 Outside Dia. Tolerance	刃长 Length of cut	刀杆径 Shank Dia.	全长 Overall length	刃数 Number of flutes
		ϕDc		ℓ	ϕDs	L	Z
6PFK060–250	●	6.0	0 –0.020	25	6	70	6
6PFK080–350	●	8.0	–0.005 –0.025	35	8	90	6
6PFK100–450	●	10.0	–0.005 –0.025	45	10	100	6
6PFK120–550	●	12.0	–0.010 –0.030	55	12	120	6
6PFK160–650	●	16.0	–0.010 –0.030	65	16	135	6
6PFK200–750	●	20.0	–0.010 –0.030	75	20	155	6
6PFK200–1000	●	20.0	–0.010 –0.030	100	20	180	6
8PFK250–1000	●	25.0	–0.010 –0.030	100	25	180	8

●：标准库存 Standard Stock

基准切削条件 Recommended Cutting Conditions

6/8PFK型〔台阶加工 中等刃长型 基准切削条件表〕Shouldering/Medium length of cut

被削材 Material	切深量(ap×ae)(mm) Depth of Cut	外径Dc(mm) Outside Dia.	ϕ6	ϕ8	ϕ10	ϕ12	ϕ16	ϕ20	ϕ25
一般构造钢、铸铁、碳素钢 SS400・FC・S45C Mild steel/Cast Iron/Carbon steel	Dc＜ϕ20 apxae=1.5Dcx0.2Dc Dc≥ϕ20 apxae=1.5Dcx0.1Dc	转数(min^{-1}) Spindle Revolution	7,400	5,600	4,500	3,700	2,800	2,200	1,800
		进给(mm/min) Feed Rate	2,650	2,640	2,410	2,250	2,010	1,700	1,500
合金钢、工具钢 SCM,SNCM Alloy steel/Tool steel	Dc＜ϕ20 apxae=1.5Dcx0.2Dc Dc≥ϕ20 apxae=1.5Dcx0.1Dc	转数(min^{-1}) Spindle Revolution	6,400	4,800	3,800	3,200	2,400	1,900	1,500
		进给(mm/min) Feed Rate	2,250	2,090	1,950	1,910	1,720	1,450	1,220
预硬塑胶模具钢 NAK，30～38HRC Pre–hardened steel	apxae=1.5Dcx0.1Dc	转数(min^{-1}) Spindle Revolution	5,600	4,200	3,300	2,800	2,100	1,700	1,300
		进给(mm/min) Feed Rate	1,780	1,710	1,520	1,400	1,220	1,120	980
不锈钢、钛合金钢 SUS304・Ti6Al–4V等 Stainless steel/Titanium Alloy	apxae=1.5Dcx0.05Dc	转数(min^{-1}) Spindle Revolution	5,000	3,800	3,000	2,500	1,900	1,500	1,200
		进给(mm/min) Feed Rate	1,350	1,320	1,200	1,130	970	850	720

6/8PFK型〔台阶加工 长刃型 基准切削条件表〕Shouldering/Long length of cut

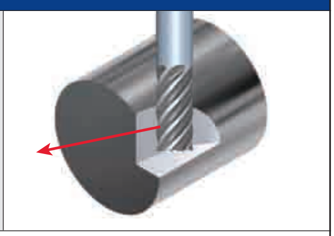
被削材 Material	切深量(ap×ae)(mm) Depth of Cut	外径Dc(mm) Outside Dia.	ϕ6	ϕ8	ϕ10	ϕ12	ϕ16	ϕ20	ϕ25
一般构造钢、铸铁、碳素钢 SS400・FC・S45C Mild steel/Cast Iron/Carbon steel	apxae=3.0Dcx0.01Dc	转数(min^{-1}) Spindle Revolution	4,600	3,500	2,800	2,300	1,700	1,400	1,100
		进给(mm/min) Feed Rate	1,830	1,730	1,530	1,380	1,120	880	660
合金钢、工具钢 SCM,SNCM Alloy steel/Tool steel	apxae=3.0Dcx0.01Dc	转数(min^{-1}) Spindle Revolution	3,700	2,800	2,200	1,800	1,400	1,100	900
		进给(mm/min) Feed Rate	1,490	1,340	1,220	1,120	940	720	540
预硬塑胶模具钢 NAK，30～38HRC Pre–hardened steel	apxae=3.0Dcx0.01Dc	转数(min^{-1}) Spindle Revolution	2,800	2,100	1,700	1,400	1,100	850	650
		进给(mm/min) Feed Rate	920	860	750	670	550	480	390
不锈钢、钛合金钢 SUS304・Ti6Al–4V等 Stainless steel/Titanium Alloy	apxae=3.0Dcx0.01Dc	转数(min^{-1}) Spindle Revolution	2,500	1,900	1,500	1,300	950	750	600
		进给(mm/min) Feed Rate	700	670	590	540	440	370	290

参 考 Notes	・不推荐用于槽加工。Slotting is not recommended ・推荐风压、并使用切削油。Machining with compressed air or coolant is recommended ・根据机械刚性来调整切深量。Adjust ap to suit each machine's rigidity ・请尽可能使用高刚性的设备及刀杆。Use a chuck and a machine with as high rigidity as possible

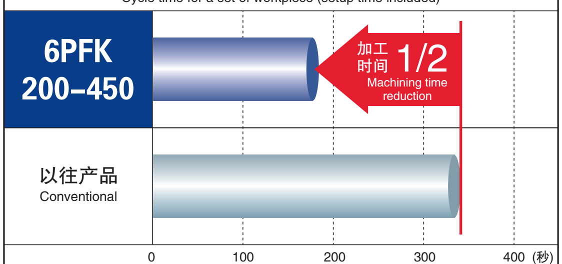
加工实例 Case Studies

SCM440

・机械零部件 Machine parts
・Vc=150m/min ($n=2,400min^{-1}$)
・fz＝0.12mm/t (Vf=1,710mm/min)
・ap=18mm，ae=1.0mm
・台阶加工 Shouldering



每套工件的周期时间(含刀具更换等准备时间)
Cycle time for a set of workpiece (setup time included)

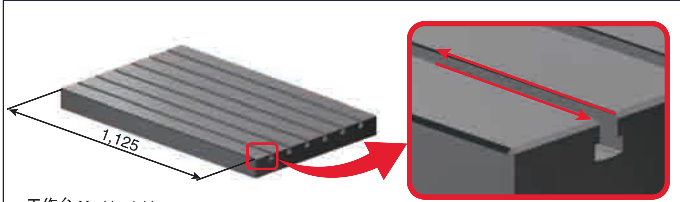


・与本公司以往产品相比周期时间大幅度缩短
Cycle time greatly reduced compared with the conventional tool

・加工100个工件后无大幅度磨损、可继续加工
No heavy wear after machining 100 workpieces and still possible to continue machining

(根据用户的评价) Evaluation by the user

FC250



・工作台 Machine table

6PFK200–450

● 精加工(1次走刀即可) Finishing (1 pass)
・$n=2,500min^{-1}$(Vc=157m/min)
・ap×ae=1.2×35mm
・Vf=3,500mm/min(fz=0.23mm/t)

加工时间 1/8 Machining time reduction

加工时间 10分(槽长：1,125mm×24根)
Machining time 10 min. (1,125mm×24 slots)

其他公司涂层产品 B Competitor B (coated)

● 半精加工 Semi finishing
・$n=2,500min^{-1}$ (Vc=157m/min)
・ap×ae=1.0×35mm
・Vf=1,500mm/min(fz=0.1mm/t)

● 精加工 Finishing
・$n=2,000min^{-1}$(Vc=125m/min)
・ap×ae=0.2×35mm
・Vf=1,000mm/min(fz=0.1mm/t)

加工时间 80分(槽长：1,125mm×24根)2次走刀加工
Machining time 80 min. (1,125mm×24 slots) 2 passes

・其他公司涂层产品B，因为发生振刀，不能提高切削条件，分2次走刀进行加工
Competitor A machined the workpiece with 2 passes due to chattering.

・6PFK提高切削条件一次走刀的条件下也不会发生振刀，可大幅提高生产效率
6PFK machined the workpiece with 1 pass without chattering.
Productivity has greatly improved by increasing cutting conditions.

(根据用户的评价) Evaluation by the user

不断扩大的产品系列 京瓷端铣刀系列
Kyocera Solid End Mill Series　Expanding Lineup

高进给、高效率加工端铣刀
High feed and high efficiency solid end mill

4MFK/4MFR

对应槽加工
For slotting

锪孔加工用工具
Tool for counterboring

2ZDK

加工革命
Machining innovation

各种APP应用程序，为客户生产效率提高做出贡献。

搜索"京瓷切削工具"或扫描二维码下载 APP 应用

iPhone　iPad　Android

还可在京瓷网站阅取最新信息。 京瓷 切削工具 检索 http://www.kyocera.com.cn/prdct/cuttingtool/index.html

KYOCERA

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