

THE NEW VALUE FRONTIER



Solid End Mill | **3AFK**

For Aluminum Machining

3AFK



3-Flute End Mill for High Efficiency and Precision

High Efficiency with 3-Flutes. Excellent Precision Machining

Stable Machining due to sharp edge for Anti-chattering Performance

Wide Range of Applications Including Slotting, Shouldering, Ramping, and Plunging



For Aluminum Machining

3AFK

3-Flute End Mill for High Efficiency and Precision

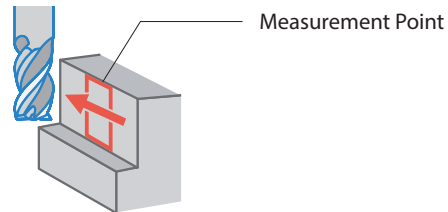
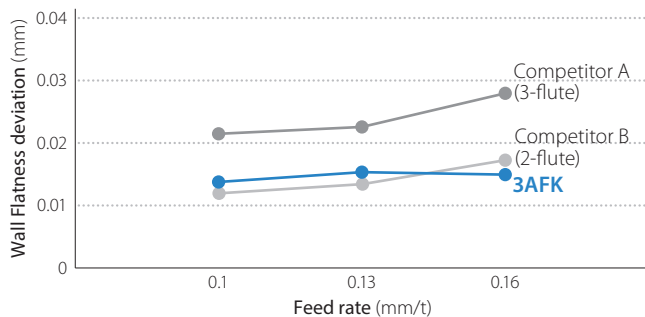
Sharp cutting edge and excellent Anti-Chattering Performance. Delivers High Stability in Diverse Machining Situations

1

High-performance and High-precision Machining

High Efficiency with 3-Flutes. Excellent Machining Precision

Comparison of wall flatness (In-house Evaluation)



Cutting Conditions: $n = 11,700 \text{ min}^{-1}$, $V_f = 3,500 - 5,600 \text{ mm/min}$, $a_p \times a_e = 15 \times 1 \text{ mm}$
Machining Diameter 10mm, Shouldering, Down Cut, Wet, HSK A63 Workpiece: A5052

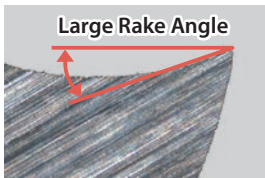
2

Burr reduction

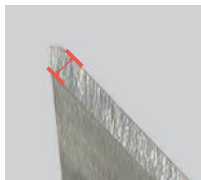
Excellent Sharpness with Large Rake Angle and small margin width

Comparison of the Rake Angle and Margin

3AFK



Competitor C

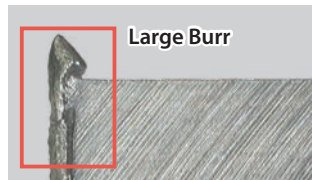


Burr Comparison after Machining (In-house Evaluation)

3AFK

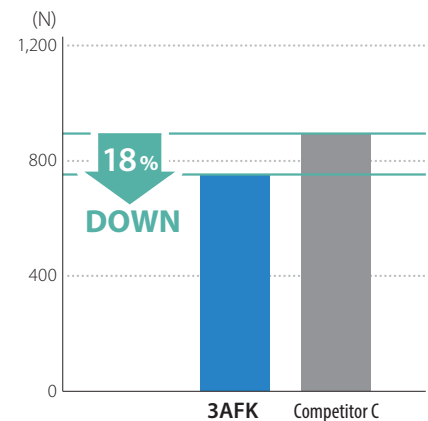


Competitor C



Burr Comparison after Machining Cutting Conditions: $n = 11,700 \text{ min}^{-1}$, $V_f = 4,600 \text{ mm/min}$, $a_p \times a_e = 10 \times 1 \text{ mm}$
Machining Diameter $\phi 10$, Shouldering, Down Cut, Wet, HSK A63 Workpiece: A7075

Cutting Force Comparison (In-house Evaluation)



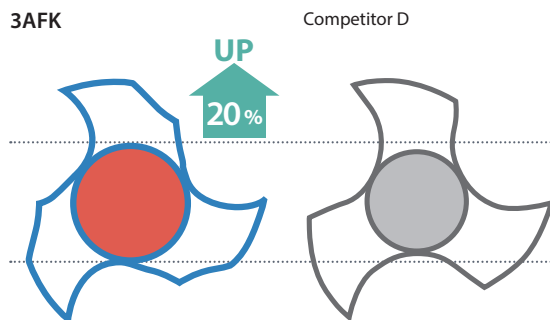
Cutting Conditions: $n = 11,700 \text{ min}^{-1}$, $V_f = 3,400 \text{ mm/min}$
 $a_p \times a_e = 10 \times 10 \text{ mm}$
Machining Diameter $\phi 10$, Slotting, Wet, BT50
Workpiece: A5052

3

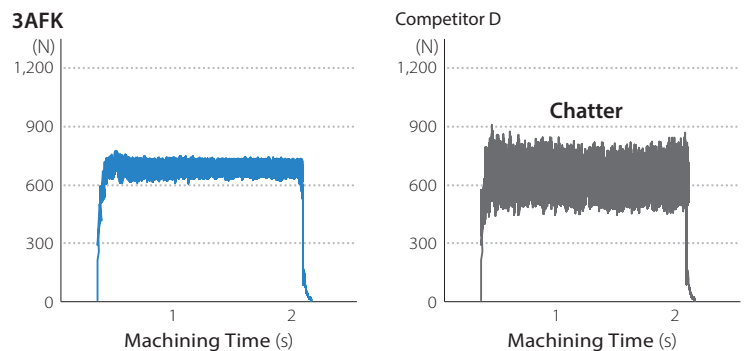
Chattering Resistance

Larger Core Thickness to Reduce Chattering

Core Thickness Comparison

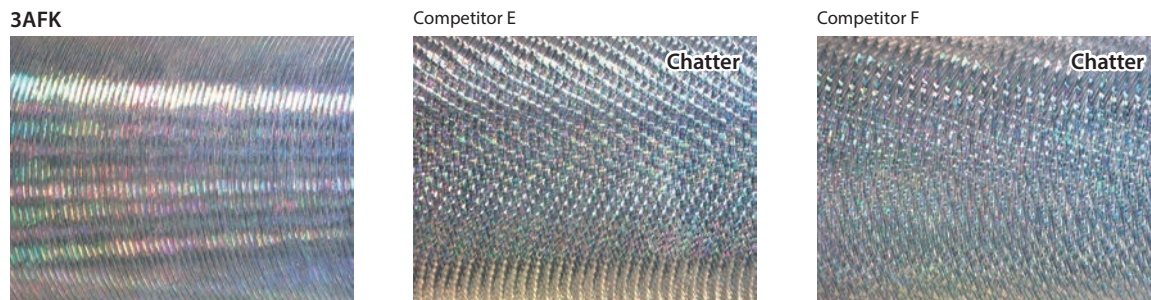


Cutting Force Comparison (In-house Evaluation)



Cutting Conditions: $n = 11,700 \text{ min}^{-1}$, $V_f = 3,400 \text{ mm/min}$, $a_p \times a_e = 10 \times 10 \text{ mm}$, Machining Diameter $\phi 10$, Slotting, Wet, BT50 Workpiece: A5052

Slotting and Bottom Surface Comparison (In-house Evaluation)

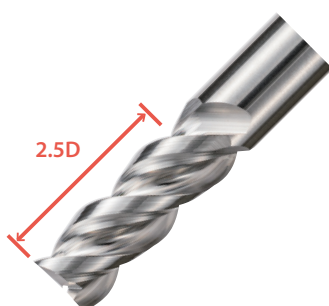


Cutting Conditions: $n = 11,100 \text{ min}^{-1}$, $V_f = 2,600 \text{ mm/min}$, $a_p = 10 \text{ mm}$, Wet Workpiece: A5052

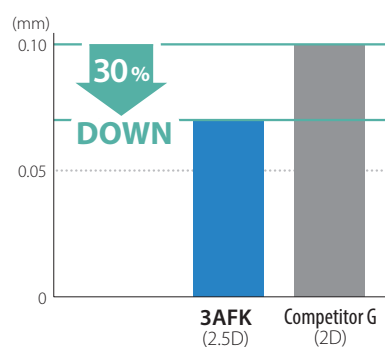
4

Flute Length 2.5 D (medium type) Added to the Lineup

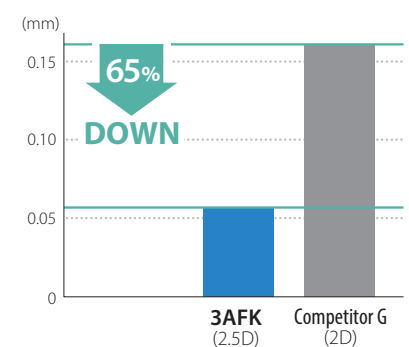
Stable Machining even while Deep Slotting



Comparison of wall flatness (In-house Evaluation)



Burr Height Comparison (In-house Evaluation)



Cutting Conditions: $n = 11,100 \text{ min}^{-1}$, $V_f = 3,800 \text{ mm/min}$, $a_p \times a_e = 20 \times 1 \text{ mm}$
Machining Diameter $\phi 10$, Shouldering, Down Cut, Wet, HSK A63 Workpiece: A7075

Cutting Conditions

Short Type 1.5D

Workpiece	Application	Hole Depth (mm)	Outer Diameter Dc (mm)	ø3	ø4	ø5	ø6	ø7	ø8	ø9	ø10	ø11	ø12	ø16
			RPM (min ⁻¹)	20,000	20,000	20,000	19,500	16,800	14,700	13,000	11,700	10,700	9,800	7,300
Aluminum Alloy A5052 A7075	Shouldering	$ap \times ae = 1.5Dc \times 0.3Dc$	Feed Rate (mm/min)	2,400	2,800	3,500	4,200	4,300	4,400	4,500	4,600	4,700	4,700	3,500
	Slotting	1Dc		1,600	2,000	2,500	3,000	3,100	3,200	3,300	3,400	3,500	3,500	2,200
	Plunging	1Dc		350	350	350	350	350	350	350	350	350	350	350
Workpiece	Application	Hole Depth (mm)	Outer Diameter Dc (mm)	ø3	ø4	ø5	ø6	ø7	ø8	ø9	ø10	ø11	ø12	ø16
			RPM (min ⁻¹)	20,000	19,900	15,900	13,200	11,300	9,900	8,800	7,900	7,200	6,600	4,900
Aluminum Alloy Cast AC, ADC	Shouldering	$ap \times ae = 1.5Dc \times 0.3Dc$	Feed Rate (mm/min)	2,400	2,500	2,500	2,500	2,500	2,600	2,600	2,600	2,600	2,600	1,900
	Slotting	1Dc		1,300	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,700	1,800	1,300
	Plunging	1Dc		300	250	200	200	190	150	150	100	100	80	60

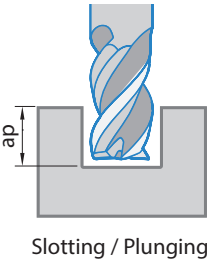
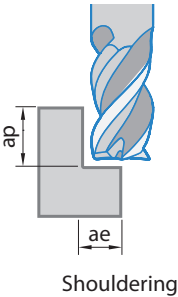
Medium Type 2.5D

Workpiece	Application	Hole Depth (mm)	Outer Diameter Dc (mm)	ø3	ø4	ø5	ø6	ø7	ø8	ø9	ø10	ø11	ø12	ø16
			RPM (min ⁻¹)	20,000	20,000	19,000	16,000	13,500	12,000	10,500	9,500	8,500	8,000	6,000
Aluminum Alloy A5052 A7075	Shouldering	$ap \times ae = 2.5Dc \times 0.3Dc$	Feed Rate (mm/min)	2,300	2,600	3,200	3,600	3,600	3,600	3,700	3,900	4,000	4,000	2,800
	Slotting	0.5Dc		1,500	1,900	2,300	2,600	2,600	2,700	2,700	2,800	2,900	2,900	1,600
	Plunging	0.5Dc		300	300	300	300	300	300	300	300	300	300	300
Workpiece	Application	Hole Depth (mm)	Outer Diameter Dc (mm)	ø3	ø4	ø5	ø6	ø7	ø8	ø9	ø10	ø11	ø12	ø16
			RPM (min ⁻¹)	20,000	15,900	12,700	10,600	9,100	7,900	7,000	6,300	5,800	5,300	3,950
Aluminum Alloy Cast AC, ADC	Shouldering	$ap \times ae = 2.5Dc \times 0.3Dc$	Feed Rate (mm/min)	2,300	2,200	2,000	2,000	2,000	2,000	2,000	2,000	2,100	2,100	1,500
	Slotting	0.5Dc		1,300	1,300	1,300	1,400	1,400	1,400	1,400	1,400	1,400	1,500	1,100
	Plunging	0.5Dc		300	200	150	160	160	120	120	80	80	60	50

Caution

- Water-soluble cutting oil should be used
- The cutting conditions should be adjusted based on the overhang of the tool and the machine or workpiece rigidity
- RPM and feed rate should be adjusted by the same percentage
- Pecking may be necessary if chips become clogged while plunging

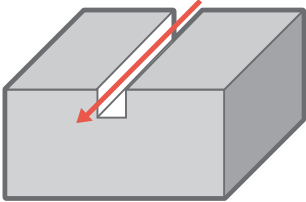
Application



Case Study

Device Part A5052

$n = 7,200 \text{ min}^{-1}$ ($V_c = 230 \text{ m/min}$)
 $V_f = 1,300 \text{ mm/min}$ ($f_z = 0.06 \text{ mm/t}$)
 $ap \times ae = 10 \times 10 \text{ mm}$ (Slotting)
Wet (Water-soluble)
3AFK100-250-500



Metal Removal

3AFK

130 cc/min

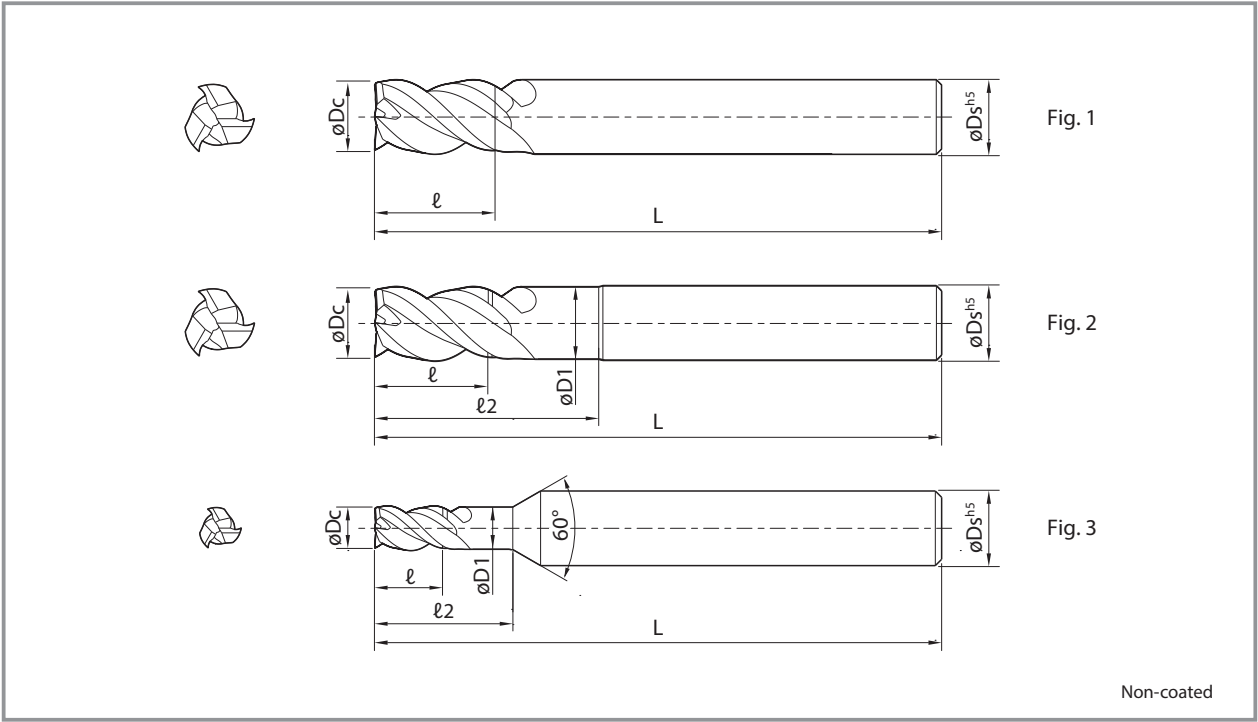
Competitor H

65 cc/min

Doubled the
Efficiency
2 Times

3AFK is capable of stable machining even with a slot depth of 10 mm and achieves twice the machining efficiency. Competitor H has high cutting forces with only a slot depth of 5 mm, and has machining difficulty.

(User Evaluation)



(Unit: mm)										
Description	Stock	Outer Diameter	Outer Diameter	Flute Length	Neck Diameter	Neck Length	Shank Diameter	Overall Length	Number of Flutes	Shape
		ø Dc	Tolerance	ℓ	ø D1	ℓ2	ø Ds	L		
3AFK030-045-090	●	3.0	0 -0.015	4.5	2.7	9	6	70	3	Fig. 3
3AFK040-060-120	●	4.0	0 -0.015	6	3.7	12	6	70	3	Fig. 3
3AFK050-075-150	●	5.0	0 -0.015	7.5	4.7	15	6	70	3	Fig. 3
3AFK060-090	●	6.0	0 -0.005	9	—	—	6	70	3	Fig. 1
3AFK060-090-180	●	6.0	0 -0.005	9	5.7	18	6	70	3	Fig. 2
3AFK070-105-210	●	7.0	0 -0.015	10.5	6.7	21	8	80	3	Fig. 3
3AFK080-120	●	8.0	0 -0.006	12	—	—	8	80	3	Fig. 1
3AFK080-120-240	●	8.0	0 -0.006	12	7.7	24	8	80	3	Fig. 2
3AFK090-135-270	●	9.0	0 -0.015	13.5	8.7	27	10	90	3	Fig. 3
3AFK100-150	●	10.0	0 -0.006	15	—	—	10	90	3	Fig. 1
3AFK100-150-300	●	10.0	0 -0.006	15	9.7	30	10	90	3	Fig. 2
3AFK110-165-330	●	11.0	0 -0.015	16.5	10.7	33	12	110	3	Fig. 3
3AFK120-180	●	12.0	0 -0.008	18	—	—	12	110	3	Fig. 1
3AFK120-180-360	●	12.0	0 -0.008	18	11.7	36	12	110	3	Fig. 2
3AFK160-240	●	16.0	0 -0.008	24	—	—	16	120	3	Fig. 1
3AFK160-240-480	●	16.0	0 -0.008	24	15.7	48	16	120	3	Fig. 2

● : Standard Stock

Lineup (medium type 2.5D)

(Unit: mm)

Description	Stock	Outer Diameter	Outer Diameter	Flute Length	Neck Diameter	Neck Length	Shank Diameter	Overall Length	Number of Flutes	Shape
		ø Dc	Tolerance	ℓ	ø D1	ℓ2	ø Ds	L		
3AFK030-075-150	●	3.0	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	7.5	2.7	15	6	70	3	Fig. 3
3AFK040-100-200	●	4.0	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	10	3.7	20	6	70	3	Fig. 3
3AFK050-125-250	●	5.0	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	12.5	4.7	25	6	70	3	Fig. 3
3AFK060-150	●	6.0	$\begin{smallmatrix} 0 \\ -0.005 \end{smallmatrix}$	15	—	—	6	70	3	Fig. 1
3AFK060-150-300	●	6.0	$\begin{smallmatrix} 0 \\ -0.005 \end{smallmatrix}$	15	5.7	30	6	70	3	Fig. 2
3AFK070-175-350	●	7.0	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	17.5	6.7	35	8	80	3	Fig. 3
3AFK080-200	●	8.0	$\begin{smallmatrix} 0 \\ -0.006 \end{smallmatrix}$	20	—	—	8	80	3	Fig. 1
3AFK080-200-400	●	8.0	$\begin{smallmatrix} 0 \\ -0.006 \end{smallmatrix}$	20	7.7	40	8	80	3	Fig. 2
3AFK090-225-450	●	9.0	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	22.5	8.7	45	10	90	3	Fig. 3
3AFK100-250	●	10.0	$\begin{smallmatrix} 0 \\ -0.006 \end{smallmatrix}$	25	—	—	10	90	3	Fig. 1
3AFK100-250-500	●	10.0	$\begin{smallmatrix} 0 \\ -0.006 \end{smallmatrix}$	25	9.7	50	10	90	3	Fig. 2
3AFK110-275-550	●	11.0	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	27.5	10.7	55	12	110	3	Fig. 3
3AFK120-300	●	12.0	$\begin{smallmatrix} 0 \\ -0.008 \end{smallmatrix}$	30	—	—	12	110	3	Fig. 1
3AFK120-300-600	●	12.0	$\begin{smallmatrix} 0 \\ -0.008 \end{smallmatrix}$	30	11.7	60	12	110	3	Fig. 2
3AFK160-400	●	16.0	$\begin{smallmatrix} 0 \\ -0.008 \end{smallmatrix}$	40	—	—	16	120	3	Fig. 1
3AFK160-400-800	●	16.0	$\begin{smallmatrix} 0 \\ -0.008 \end{smallmatrix}$	40	15.7	80	16	120	3	Fig. 2

●: Standard Stock