



Carbide End Mills for High Hardness Steels

AE-H SERIES

AE-MSS-H · AE-MS-H · AE-ML-H · AE-CRE-H · AE-HFE-H · AE-BM-H · AE-BD-H ·
AE-LNBD-H · AE-CPR4-H · PXSH

Volume 6



Multi-flute type

AE-MSS-H Multi-flute square type, 1,5 × D cutting length (Neck length 3 × D) PAGE 6

AE-MS-H Multi-flute square & radius type, 2.5 × D cutting length

AE-MSS-H Square Type PAGE 9

AE-MS-H Square Type PAGE 10

Radius Type PAGE 11



4 flutes



6 flutes



AE-ML-H Multi-flute square type, 4 x D cutting length PAGE 14

Square Type PAGE 18



Radius type

NEW

AE-CRE-H High efficiency type PAGE 20



4 flutes



5 flutes



AE-HFE-H High feed type PAGE 26



4 flutes



5 flutes



Ball Type

AE-BM-H 4-flute ball type for high efficiency processing PAGE 32



AE-BD-H 2-flute ball type for high precision finishing PAGE 38

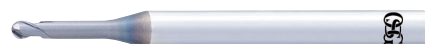


Long neck Type

AE-CPR4-H 4-flute radius type for high-efficiency and high precision finishing PAGE 42



AE-LNBD-H 2-flute long neck ball type for high precision finishing PAGE 58



PXM Exchangeable Head End Mill

PXSH Exchangeable Head End Mill PAGE 70
1xD cutting length

Square Type PAGE 72

PXMZ Straight Shank Holder for PXM PAGE 73

PXMC PXM Collet for PXM Exchangeable Head End Mill PAGE 75



6 flutes



8 flutes

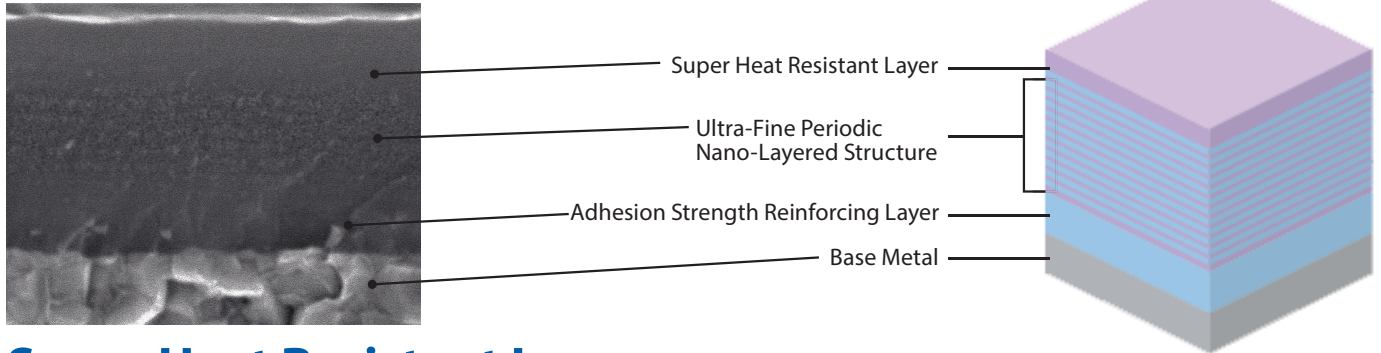


KEY FEATURES & BENEFITS

DUROREY Coating

Innovative coating that supports high-hardness steel machining

Coating Structure



Super Heat Resistant Layer

Smoothing of surface, high toughness and adhesion resistance due to the SiC containing ultra-heat-resistance material and crystal miniaturization

Ultra-Fine Periodic Nano-Layered Structure

Crystal miniaturization and improvement of mechanical properties due to the laminated structure of periodic nano-layer and wear-resistant layer

Super heat resistant layer and ultra-fine periodic nano-layered structure provide superior toughness while maintaining high heat resistance and abrasion resistance. Also suppresses chipping even in high hardness milling and achieves long tool life.

Coating Color	Coating Structure	Hardness (GPa)	Oxidation Temperature	Heat Resistance	Adhesion Strength	Surface Roughness	Wear Resistance	Welding Resistance	Toughness
Black Gray	Ultra-fine Periodic Nano-Layered	41	1.300	★	●	○	★	●	●

DUROREY is a registered trademark of OSG Corporation

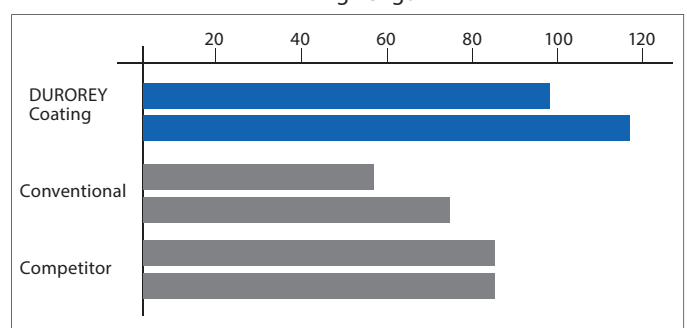
○ → ● → ★
Fair → Best

Coating Performance

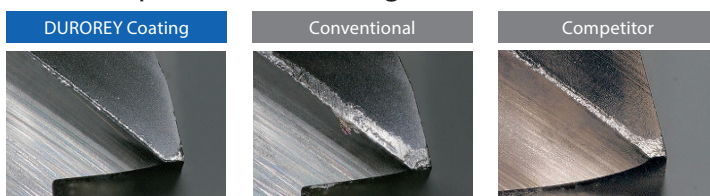
Cutting data of SKD11 60 HRC

Tool	6-flute square carbide end mill
Work Material	SKD11 (60HRC)
Milling method	Side Milling
Cutting Speed	250m/min (7.950 min ⁻¹)
Feed	4.800mm/min (0,1 mm/t)
Depth of Cut	ap = 10mm ae = 0,1mm
Coolant	Air Blow

Cutting length up to 0.1mm outer circumference wear width



Wear comparison after milling 84 m



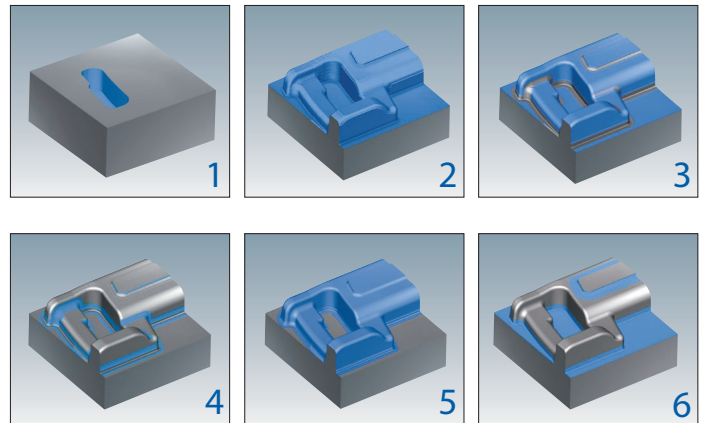
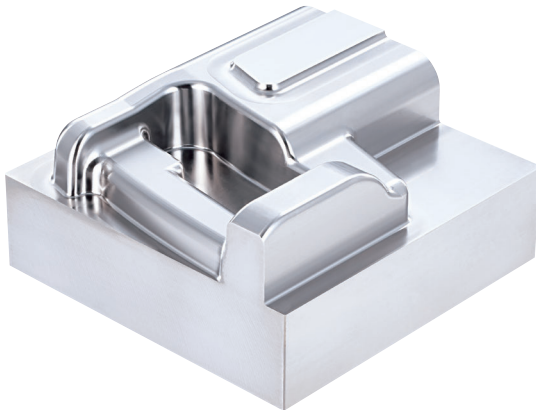
Approximately 60% improvement in performance compared to conventional coated products



VAST PRODUCT LINEUP WITH DUROREY COATING

High efficiency machining of high-hardness steel (60 HRC) with a maximum depth of cut of 22 mm

Work Material: SKD11(60HRC)
 Coolant: Air Blow
 Machine: Vertical Machining center
 Maximum RPM: 20.000 min⁻¹
 Holder: Shrink Fit
 Main Spindle: HSK-A63



Process	Milling part	Milling method	Milling process	Tool	Cutting Speed (m/min)	Feed (mm/min)	ap (mm)	ae (mm)
1	Pocket	Helical Milling	Roughing	AE-MS-H Ø10	120 (3.800min ⁻¹)	1.200 (0,05mm/t)	Helical Angle	Helical Radius
		Enlarging	Roughing		120 (3.800min ⁻¹)	6.000 (0,26mm/t)	22	0,1
2	Overall	Side Milling, High-efficiency Milling	Roughing	AE-MS-H Ø10XR1	120 (3.800min ⁻¹)	6.000 (0,26mm/t)	22	0,1
3	Overall	Contour Milling	Semi-finishing	AE-BM-H R5	270 (8.600min ⁻¹)	3.100 (0,09mm/t)	0,5	0,5
4	Corner R	Contour Milling	Leftover Milling	AE-BM-H R3	104 (5.500min ⁻¹)	1.800 (0,08mm/t)	0,5	0,5
5	Shape	Contour Milling	Finishing	AE-BD-H R3X18	305 (16.200min ⁻¹)	970 (0,03mm/t)	0,1	0,1
6	Bottom	Flat Surface Milling	PL Surface Finishing	AE-MS-H Ø6XR0,5	104 (5.500min ⁻¹)	990 (0,03mm/t)	0,04	0,25

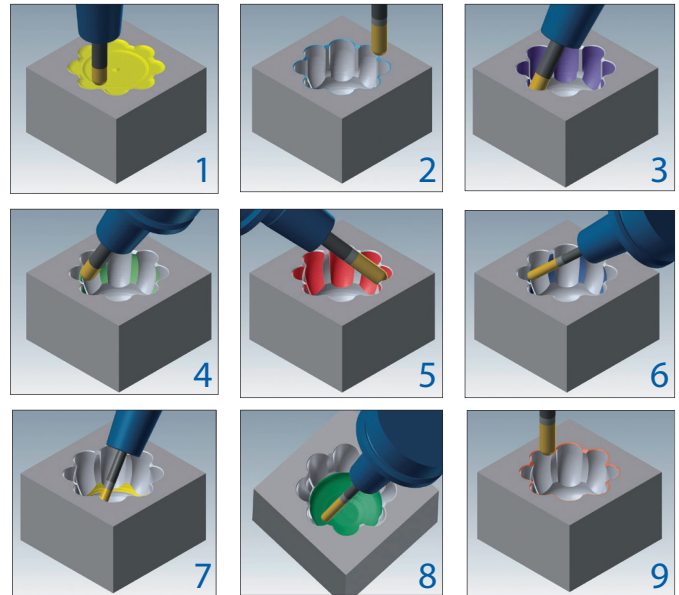
Milling | Solid carbide



TO ACCOMMODATE A WIDE VARIETY OF APPLICATIONS

High efficiency direct engraving with a large depth of cut even in high-hardness steel(60 HRC)

Work Material: YXR3(60HRC)
 Coolant: MQL
 Machine: 5-axis Machining center
 Main Spindle: HSK-A63
 Maximum RPM: 25.000 min⁻¹
 Holder: Shrink Fit

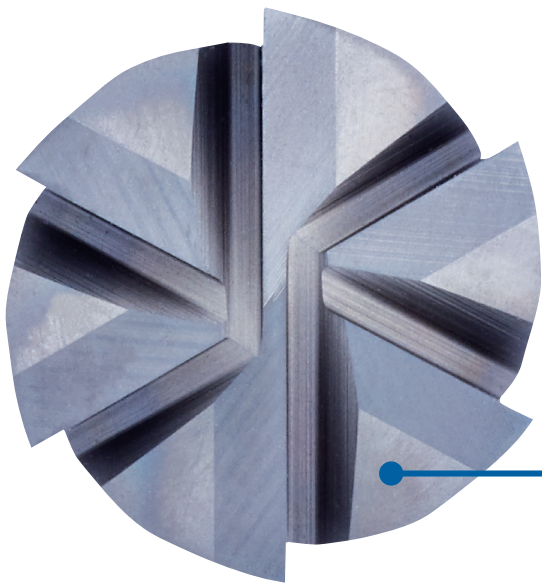


Process	Milling part	Milling method	Milling process	Tool	Cutting Speed (m/min)	Feed (mm/min)	ap (mm)	ae (mm)
1	Overall	3-axis contouring line	High-efficiency roughing	AE-BM-H R5	150 (4.800min ⁻¹)	1.920 (0,1mm/t)	0,7	1,5
2	Chamfer	3-axis contouring line	Semi-roughing					
3	Groove	5-axis profiling	Semi-roughing					
4	Ridge	5-axis turn milling	Roughing Semi-roughing					
5	Groove	5-axis profiling	High-precision finishing	AE-BD-H R5X30	150 (4.800min ⁻¹)	480 (0,05mm/t)	0,04	1
6	Ridge	5-axis profiling	High-precision finishing	AE-LNBD-H R3X40X6	55 (2.900min ⁻¹)	174 (0,03mm/t)	0,03	0,2
7	Middle bottom	5-axis turn milling	High-precision finishing					
8	Bottom	5-axis turn milling	High-precision finishing				0,02	0,2
9	Chamfer	3-axis contouring line	High-precision finishing	AE-BD-H R5X30	150 (4.800min ⁻¹)	480 (0,05mm/t)	0,04	1

Milling | Solid carbide



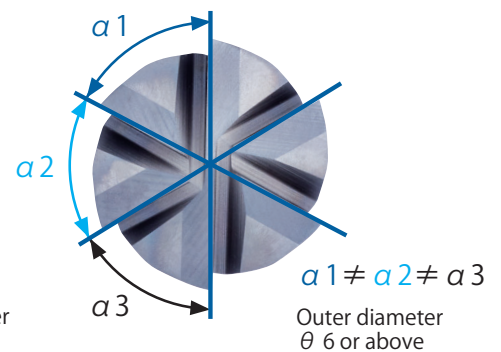
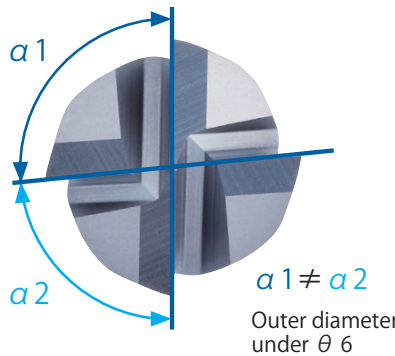
KEY FEATURES & BENEFITS



AE-MSS-H Multi-flute square and radius type end mills for high-hardness steels
Stub

AE-MS-H
Short

Unequal spacing teeth suppresses chattering



Optimal cutting edge specifications to enable stable machining of high hardness steels

Tool	AE-MS-H Ø4
Work Material	STAVAX (52HRC)
Milling method	Side Milling
Cutting Speed	100m/min (7.950 min ⁻¹)
Feed	1.250mm/min (0,039 mm/t)
Depth of Cut	ap = 6mm ae = 0,2mm
Coolant	Air Blow
Machine	Vertical Machining Center (BT40)

Wear condition of the cutting edge

AE-MS-H	Conventional
350,9m Milling Length	179,3m Milling Length

DUROREY Coating

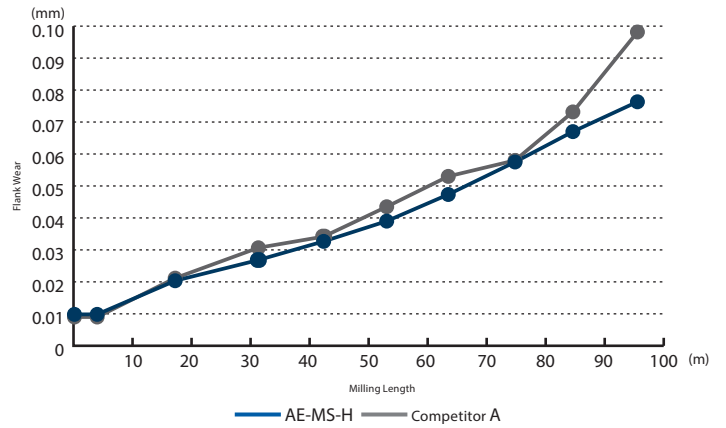
Exhibits outstanding performance in high-hardness steels due to its excellent toughness, high heat resistance and abrasion resistance characteristics.

Milling | Solid carbide

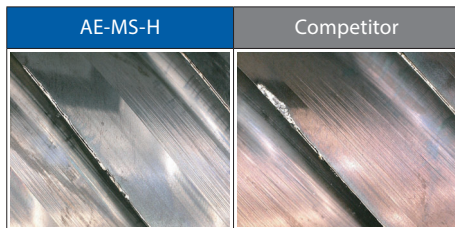
Long tool life

Achieves stable durability in high-hardness steel machining

Tool	AE-MS-H Ø10
Work Material	SKD11 (60HRC)
Milling method	Side milling
Cutting Speed	75,4m/min (2.400 min ⁻¹)
Feed	1000mm/min (0,069 mm/t)
Depth of Cut	ap = 15mm ae = 0,3mm
Coolant	Air Blow
Machine	Vertical Machining Center (BT40)



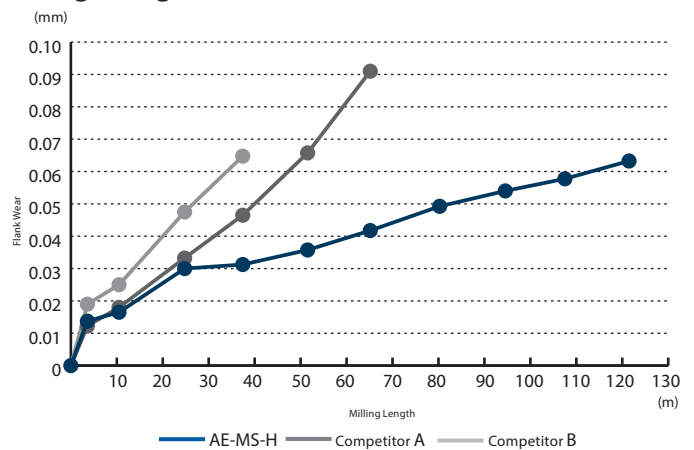
Wear condition of outer peripheral cutting edge after milling 95,2 m



High speed milling

Demonstrates excellent durability in high-speed machining of high-hardness steel

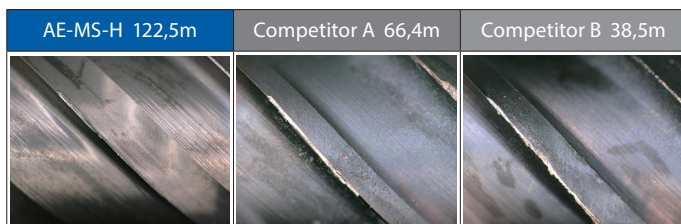
Tool	AE-MS-H Ø4
Work Material	SKD11 (60HRC)
Milling method	Side milling
Cutting Speed	125m/min (9.950 min ⁻¹)
Feed	1.200mm/min (0,03 mm/t)
Depth of Cut	ap = 4mm ae = 0,08mm
Coolant	Air Blow
Machine	Vertical Machining Center (BT40)



Milling | Solid carbide



Wear comparison for peripheral cutting edge

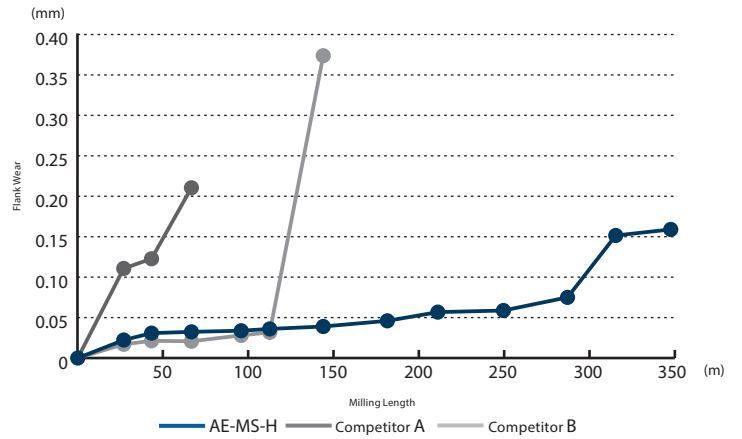


CUTTING DATA

Stable Performance

Stable performance even in pre-hardened steel STAVAX (52 HRC)

Tool	AE-MS-H Ø4
Work Material	STAVAX (52HRC)
Milling method	Side milling
Cutting Speed	100m/min (7.950 min ⁻¹)
Feed	1.250mm/min (0,039 mm/t)
Depth of Cut	ap = 6mm ae = 0,2mm
Coolant	Air Blow
Machine	Vertical Machining Center (BT40)



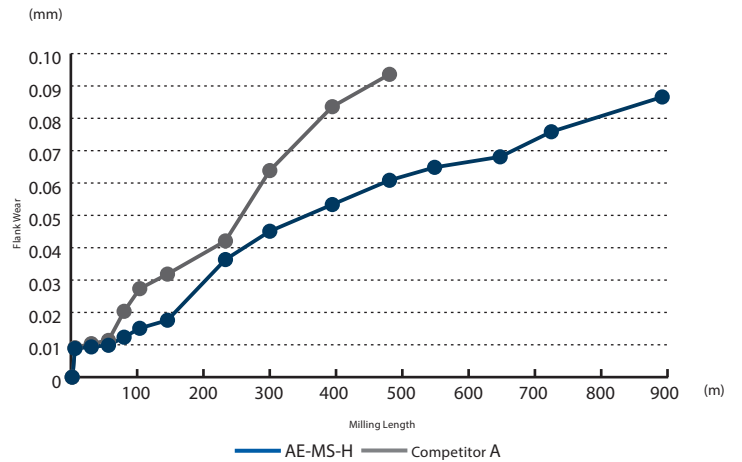
Wear comparison for peripheral cutting edge



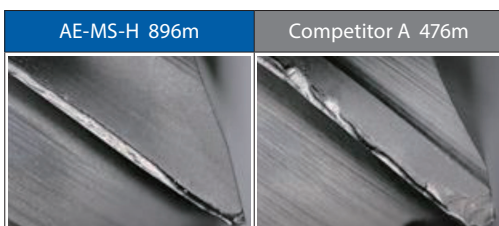
Long tool life

Demonstrates good cutting performance even in pre-hardened steel NAK80 (40 HRC)

Tool	AE-MS-H Ø3
Work Material	NAK80 (40HRC)
Milling method	Side milling
Cutting Speed	102m/min (10.823 min ⁻¹)
Feed	866mm/min (0,02 mm/t)
Depth of Cut	ap = 4,5mm ae = 0,2mm
Coolant	Air Blow
Machine	HORIZONTAL Machining Center (HSK63)

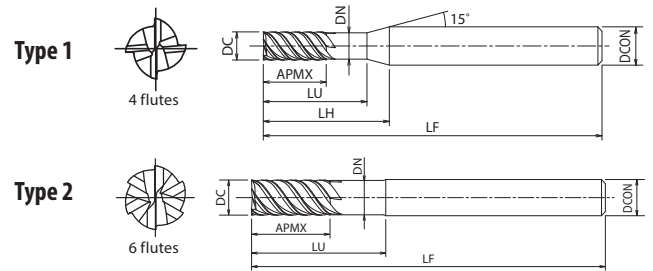


Wear comparison for peripheral cutting edge



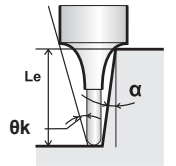
AE-MSS-H

Milling | Solid carbide



- First choice in quality and performance
- Carbide end mill with DUOREY coating
- For hardened material up to 70HRC
- Multi flute, variable helix and unequal spacing
- 1.5XD length of cut, long neck up to 3XD

Material compatibility icons: P (~45 HRC), P (~55 HRC), M (~35 HRC), K (~350 HB), S, H (~60 HRC), H (~65 HRC), H (~70 HRC).



Product features: A, CARBIDE, DUOREY, 43°, SHRINK FIT, 0--0,02.

page 12

EDP	ZEFP	DC	LH	LU	LF	APMX	DCON	DN	θk	Effective length by inclined angles Le (α)*					Type	Price
										0,5°	1°	1,5°	2°	3°		
48364199	4	1	12,3	3	45	1,5	6	0,95	11,46°	3,10	3,21	3,33	3,45	3,73	1	
48364299	4	2	13,9	6	45	3	6	1,95	8,19°	6,65	6,88	7,13	7,39	7,99	1	
8549830	4	3	14,8	9	45	4,5	6	2,85	5,78°	9,46	9,87	10,23	10,62	11,48	1	
8549831	4	4	16	12	50	6	6	3,85	3,59°	12,60	13,09	13,56	14,07	15,21	1	
8549832	4	5	17,1	15	60	7,5	6	4,85	1,68°	15,72	16,3	16,88	-	-	1	
8549833	6	6	-	18	80	9	6	5,85	-	-	-	-	-	-	2	
8549834	6	8	-	24	90	12	8	7,85	-	-	-	-	-	-	2	
8549835	6	10	-	30	100	15	10	9,85	-	-	-	-	-	-	2	
8549836	6	12	-	36	110	18	12	11,8	-	-	-	-	-	-	2	

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.

Milling | Solid carbide

AE-MS-H

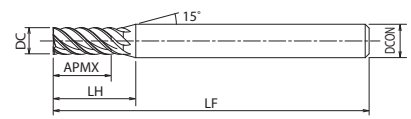
Milling | Solid carbide



Type 1



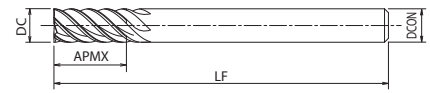
4 flutes



Type 2



6 flutes



- First choice in quality and performance
- Square Type
- 2,5 × D cutting length
- 4-6 flutes

Material compatibility and hardness icons: P (blue) ~45 HRC, P (light blue) ~55 HRC, M (yellow) ~35 HRC, K (red) ~350 HB, S (orange) ~60 HRC, H (dark grey) ~65 HRC, H (light grey) ~70 HRC.

Material and geometry icons: A (red), CARBIDE, DUREY, 43° angle, SHRINK FIT, 0 - -0,02 tolerance.

EDP	ZEFP	DC	LH	LF	APMX	DCON	Type	Price
8549710	4	1	12,7	60	2,5	6	1	
8549715	4	1,5	13	60	3,8	6	1	
8549720	4	2	13,9	60	5	6	1	
8549725	4	2,5	14,5	60	6,3	6	1	
8549730	4	3	15,4	60	7,5	6	1	
8549735	4	3,5	15,6	60	8,8	6	1	
8549740	4	4	16,1	60	10	6	1	
8549745	4	4,5	16,4	60	11,3	6	1	
8549750	4	5	16,7	60	12,5	6	1	
8549755	4	5,5	17,1	60	13,8	6	1	
8549760	6	6	-	60	15	6	2	
8549780	6	8	-	70	20	8	2	
8549810	6	10	-	80	25	10	2	
8549812	6	12	-	90	30	12	2	
8549816	6	16	-	105	40	16	2	
8549820	6	20	-	120	50	20	2	

Milling | Solid carbide

AE-MS-H

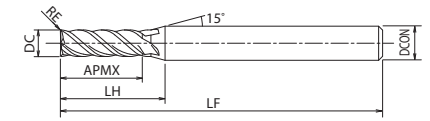
Milling | Solid carbide



Type 1



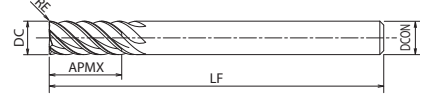
4 flutes



Type 2



6 flutes



- First choice in quality and performance
- Radius Type
- 2,5 × D cutting length
- 4-6 flutes



EDP	ZEFP	DC	RE	LH	LF	APMX	DCON	Type	Price
8549842	4	3	0,2	15,4	60	7,5	6	1	
8549845	4	3	0,5	15,4	60	7,5	6	1	
8549852	4	4	0,2	16,1	60	10	6	1	
8549855	4	4	0,5	16,1	60	10	6	1	
8549856	4	4	1	16,1	60	10	6	1	
8549862	4	5	0,2	16,7	60	12,5	6	1	
8549865	4	5	0,5	16,7	60	12,5	6	1	
8549866	4	5	1	16,7	60	12,5	6	1	
8549873	6	6	0,3	-	60	15	6	2	
8549875	6	6	0,5	-	60	15	6	2	
8549876	6	6	1	-	60	15	6	2	
8549883	6	8	0,3	-	70	20	8	2	
8549885	6	8	0,5	-	70	20	8	2	
8549886	6	8	1	-	70	20	8	2	
8549887	6	8	1,5	-	70	20	8	2	
8549888	6	8	2	-	70	20	8	2	
8549893	6	10	0,3	-	80	25	10	2	
8549895	6	10	0,5	-	80	25	10	2	
8549896	6	10	1	-	80	25	10	2	
8549897	6	10	1,5	-	80	25	10	2	
8549898	6	10	2	-	80	25	10	2	
8549899	6	10	3	-	80	25	10	2	
8549903	6	12	0,3	-	90	30	12	2	
8549905	6	12	0,5	-	90	30	12	2	
8549906	6	12	1	-	90	30	12	2	
8549907	6	12	1,5	-	90	30	12	2	
8549908	6	12	2	-	90	30	12	2	
8549909	6	12	3	-	90	30	12	2	




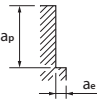
CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-MSS-H

Square Type


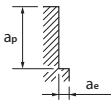
Side Milling

	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80		Hardened Steel																			
			~ 55HRC		~ 62HRC		~ 66HRC		~ 70HRC													
Vc (m/min)	110 ~ 130		80 ~ 100		60 ~ 80		50 ~ 70		40 ~ 60													
DC X LU	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)												
1 X 3	38.220	1.220	28.660	860	22.290	530	19.110	400	15.920	250												
2 X 6	19.110	1.220	14.330	860	11.150	530	9.550	400	7.960	250												
3 X 9	12.740	1.220	9.550	880	7.430	530	6.370	400	5.310	250												
4 X 12	9.550	1.220	7.170	890	5.570	530	4.780	400	3.980	250												
5 X 15	7.640	1.220	5.730	920	4.460	540	3.820	400	3.180	250												
6 X 18	6.370	1.830	4.780	1.350	3.720	800	3.180	600	2.650	380												
8 X 24	4.780	1.840	3.580	1.350	2.790	800	2.390	600	1.990	380												
10 X 30	3.820	1.830	2.870	1.340	2.230	800	1.910	600	1.590	380												
12 X 36	3.180	1.830	2.390	1.330	1.860	800	1.590	600	1.330	380												
Depth of cut	 <table border="1"> <tr><th>ap</th><th>ae</th></tr> <tr><td>≤1,5D</td><td>≤0,1D</td></tr> </table> <p>ae Max = 1mm</p>		ap	ae	≤1,5D	≤0,1D	<table border="1"> <tr><th>ap</th><th>ae</th></tr> <tr><td>≤1,5D</td><td>≤0,05D</td></tr> </table> <p>ae Max = 0,5mm</p>				ap	ae	≤1,5D	≤0,05D	<table border="1"> <tr><th>ap</th><th>ae</th></tr> <tr><td>≤1,5D</td><td>≤0,03D</td></tr> </table> <p>ae Max = 0,3mm</p>				ap	ae	≤1,5D	≤0,03D
ap	ae																					
≤1,5D	≤0,1D																					
ap	ae																					
≤1,5D	≤0,05D																					
ap	ae																					
≤1,5D	≤0,03D																					
<p>1. Use a rigid and precise machine and holder. 2. When chattering occurs, reduce the speed and feed simultaneously. 3. Use an air blow or a suitable cutting fluid with high smoke retardant properties.</p>																						

AE-MSS-H

Square Type

High-Speed Side Milling

	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80		Hardened Steel															
			~ 55HRC		~ 62HRC		~ 66HRC		~ 70HRC									
Vc (m/min)	290 ~ 310		240 ~ 260		150 ~ 170		130 ~ 150		90 ~ 110									
DC X LU	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)								
1 X 3	50.000	1.800	50.000	1.800	50.000	1.500	44.590	1.160	31.850	700								
2 X 6	47.770	3.440	39.810	2.870	25.480	1.530	22.290	1.160	15.920	700								
3 X 9	31.850	3.440	26.540	2.870	16.990	1.530	14.860	1.190	10.620	720								
4 X 12	23.890	3.440	19.900	2.870	12.740	1.530	11.150	1.190	7.960	720								
5 X 15	19.110	3.440	15.920	2.870	10.190	1.530	8.920	1.190	6.370	720								
6 X 18	15.920	5.160	13.270	4.300	8.490	2.290	7.430	1.780	5.310	1.080								
8 X 24	11.940	5.160	9.950	4.300	6.370	2.290	5.570	1.770	3.980	1.080								
10 X 30	9.550	5.160	7.960	4.300	5.100	2.300	4.460	1.770	3.180	1.080								
12 X 36	7.960	5.160	6.630	4.300	4.250	2.300	3.720	1.770	2.650	1.080								
Depth of cut	 <table border="1"> <tr><th>ap</th><th>ae</th></tr> <tr><td>≤1,5D</td><td>≤0,02D</td></tr> </table> <p>ae Max = 0,2mm</p>		ap	ae	≤1,5D	≤0,02D	<table border="1"> <tr><th>ap</th><th>ae</th></tr> <tr><td>≤1,5D</td><td>≤0,01D</td></tr> </table> <p>ae Max = 0,01mm</p>				ap	ae	≤1,5D	≤0,01D				
ap	ae																	
≤1,5D	≤0,02D																	
ap	ae																	
≤1,5D	≤0,01D																	
<p>1. Tools can cause sparks. Do not use flammable fluids. 2. Use an air blow or a suitable cutting fluid with high smoke retardant properties. Caution: Sparks generated during operation or heat caused by tool breakage can cause fire. Be sure to use all proper fire - prevention measures. The conditions are for high speed / high precision machining centers.</p>																		

Milling | Solid carbide




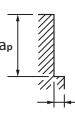
CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-MS-H

Square Type / Radius Type


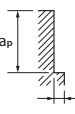
Side Milling

	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80		Hardened Steel																											
			~ 55HRC		~ 62HRC		~ 66HRC		~ 70HRC																					
Vc (m/min)	110 ~ 130		80 ~ 100		60 ~ 80		50 ~ 70		40 ~ 60																					
Mil.Dia (mm)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)																				
1	38.220	1.530	28.660	1.150	22.290	620	19.110	460	15.920	330																				
1,5	25.480	1.530	19.110	1.150	14.860	620	12.740	460	10.620	330																				
2	19.110	1.530	14.330	1.150	11.150	620	9.550	460	7.960	330																				
2,5	15.290	1.530	11.460	1.150	8.920	620	7.640	460	6.370	330																				
3	12.740	1.530	9.550	1.150	7.430	620	6.370	460	5.310	340																				
3,5	10.910	1.220	8.190	890	6.370	540	5.460	400	4.550	250																				
4	9.550	1.530	7.170	1.150	5.570	620	4.780	460	3.980	340																				
4,5	8.490	1.220	6.370	890	4.950	530	4.240	400	3.540	250																				
5	7.640	1.530	5.730	1.150	4.460	620	3.820	460	3.180	360																				
5,5	6.940	1.220	5.210	890	4.050	530	3.470	400	2.890	250																				
6	6.370	2.290	4.780	1.720	3.720	940	3.180	690	2.650	510																				
8	4.780	2.290	3.580	1.720	2.790	940	2.390	690	1.990	510																				
10	3.820	2.290	2.870	1.720	2.230	940	1.910	690	1.590	510																				
12	3.180	2.290	2.390	1.720	1.860	950	1.590	690	1.330	510																				
16	2.390	1.840	1.790	1.340	1.390	800	1.190	590	990	380																				
20	1.910	1.830	1.430	1.340	1.110	800	950	590	800	380																				
Depth of cut			<table border="1"><tr><th>ap</th><th>ae</th></tr><tr><td>DC ≤ Ø1,5</td><td>1,5D 0,02D</td></tr><tr><td>Ø1,5 < DC ≤ Ø2,5</td><td>1,5D 0,05D</td></tr><tr><td>Ø2,5 < DC</td><td>1,5D 0,1D</td></tr></table> ae Max = 1mm		ap	ae	DC ≤ Ø1,5	1,5D 0,02D	Ø1,5 < DC ≤ Ø2,5	1,5D 0,05D	Ø2,5 < DC	1,5D 0,1D	<table border="1"><tr><th>ap</th><th>ae</th></tr><tr><td>1,5D</td><td>0,05D</td></tr></table> ae Max = 1mm		ap	ae	1,5D	0,05D	<table border="1"><tr><th>ap</th><th>ae</th></tr><tr><td>1,5D</td><td>0,03D</td></tr></table> ae Max = 0,5mm		ap	ae	1,5D	0,03D	<table border="1"><tr><th>ap</th><th>ae</th></tr><tr><td>1D</td><td>0,02D</td></tr></table> ae Max = 0,5mm		ap	ae	1D	0,02D
	ap	ae																												
DC ≤ Ø1,5	1,5D 0,02D																													
Ø1,5 < DC ≤ Ø2,5	1,5D 0,05D																													
Ø2,5 < DC	1,5D 0,1D																													
ap	ae																													
1,5D	0,05D																													
ap	ae																													
1,5D	0,03D																													
ap	ae																													
1D	0,02D																													
<ol style="list-style-type: none"> Use a rigid and precise machine and holder. When chattering occurs, reduce the speed and feed simultaneously. Use an air blow or a suitable cutting fluid with high smoke retardant properties. 																														

AE-MS-H

Square Type / Radius Type

High-Speed Side Milling

	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80		Hardened Steel																							
			~ 55HRC		~ 62HRC		~ 66HRC		~ 70HRC																	
Vc (m/min)	290 ~ 310		240 ~ 260		150 ~ 170		130 ~ 150		90 ~ 110																	
Mil.Dia (mm)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)																
1	50.000	2.000	50.000	2.000	50.000	1.600	44.590	1.250	31.850	700																
1,5	50.000	3.000	50.000	3.000	33.970	1.630	29.720	1.250	21.230	760																
2	47.770	3.820	39.810	3.180	25.480	1.630	22.290	1.250	15.920	800																
2,5	38.220	3.820	31.850	3.190	20.380	1.630	17.830	1.250	12.740	800																
3	31.850	3.820	26.540	3.180	16.990	1.630	14.860	1.250	10.620	810																
3,5	27.280	3.440	22.740	2.870	14.550	1.530	12.730	1.180	9.090	730																
4	23.890	3.820	19.900	3.180	12.740	1.630	11.150	1.250	7.960	810																
4,5	21.220	3.440	17.680	2.860	11.320	1.530	9.900	1.180	7.070	730																
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16	5.970	5.160	4.970	4.290	3.180	2.290	2.790	1.770	1.990	1.090																
20	4.770	5.150	3.980	4.300	2.550	2.300	2.230	1.770	1.590	1.090																
Depth of cut			<table border="1"><tr><th>ap</th><th>ae</th></tr><tr><td>1D</td><td>0,05D</td></tr></table> ae Max = 0,5mm		ap	ae	1D	0,05D	<table border="1"><tr><th>ap</th><th>ae</th></tr><tr><td>1D</td><td>0,03D</td></tr></table> ae Max = 0,5mm		ap	ae	1D	0,03D	<table border="1"><tr><th>ap</th><th>ae</th></tr><tr><td>1D</td><td>0,02D</td></tr></table> ae Max = 0,2mm		ap	ae	1D	0,02D	<table border="1"><tr><th>ap</th><th>ae</th></tr><tr><td>1D</td><td>0,01D</td></tr></table> ae Max = 0,2mm		ap	ae	1D	0,01D
	ap	ae																								
1D	0,05D																									
ap	ae																									
1D	0,03D																									
ap	ae																									
1D	0,02D																									
ap	ae																									
1D	0,01D																									
<ol style="list-style-type: none"> Tools can cause sparks. Do not use flammable fluids. Use an air blow or a suitable cutting fluid with high smoke retardant properties. <p>Caution: Sparks generated during operation or heat caused by tool breakage can cause fire. Be sure to use all proper fire - prevention measures. The conditions are for high speed / high precision machining centers.</p>																										

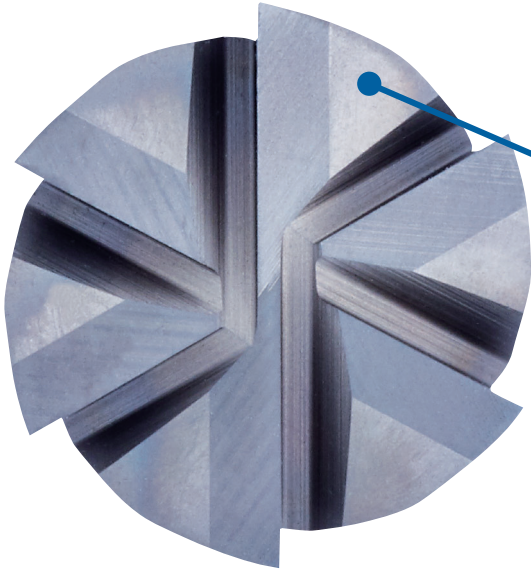
Milling | Solid carbide



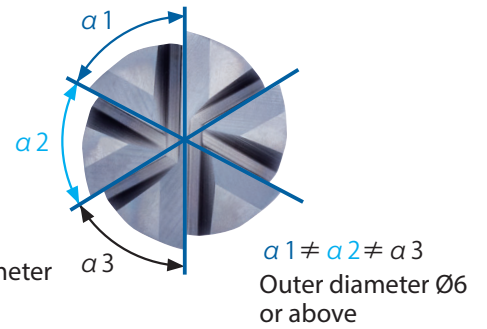
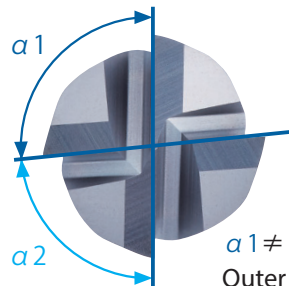
KEY FEATURES & BENEFITS

AE-ML-H

Multi-flute square type end mills for high-hardness steels



Unequal spacing teeth suppresses chattering



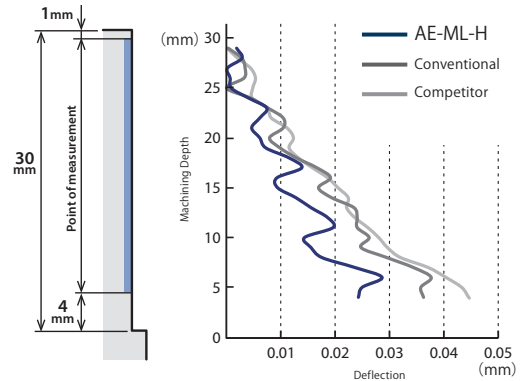
Improved tool rigidity by web taper geometry

The web taper geometry, where the thickness of core changes from the cutting edge to the shank, greatly improves tool rigidity, thereby prevents the machining surface from tilting



Tool	AE-ML-H $\text{Ø}10$ 6 flutes
Work Material	STAVAX(51~52HRC)
Milling method	Side milling
Cutting Speed	50m/min (1.590 min^{-1})
Feed Rate	668mm/min (0,07 mm/t)
Depth of Cut	$a_p = 30\text{mm}$ $a_e = 0,1\text{mm}$
Coolant	Air Blow
Machine	Horizontal Machining Center (HSK63)

The amount of deflection of the machined surface at cutting length of 3,5m



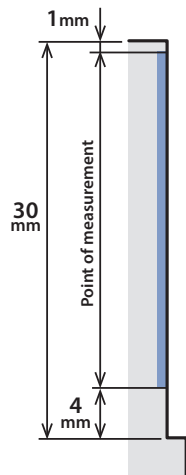
DUREY Coating

Exhibits outstanding performance in high-hardness steels due to its excellent toughness, high heat resistance and abrasion resistance characteristics.

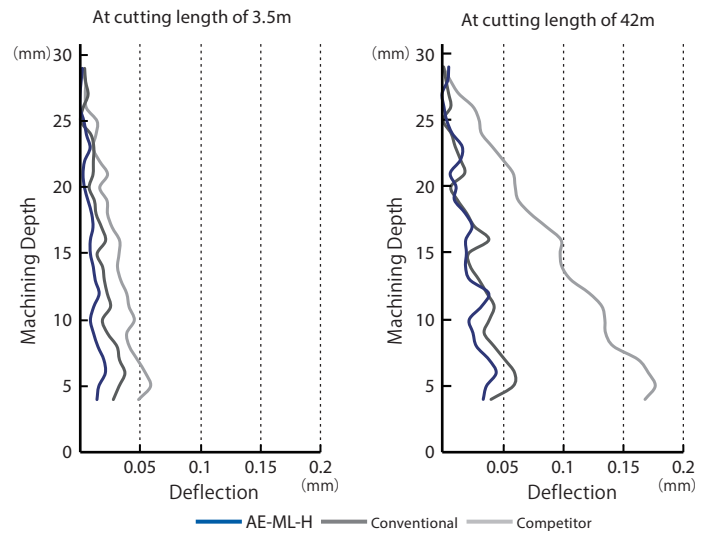
High precision milling

Achieves stable milling accuracy in high-hardness steel machining

Tool	AE-ML-H Ø10 6flutes
Work Material	SKD11 (60HRC)
Milling method	Side milling
Cutting Speed	30m/min (955 min ⁻¹)
Feed Rate	260mm/min (0,045 mm/t)
Depth of Cut	ap = 30mm ae = 0,05mm
Coolant	Air Blow
Machine	Horizontal Machining Center (HSK63)



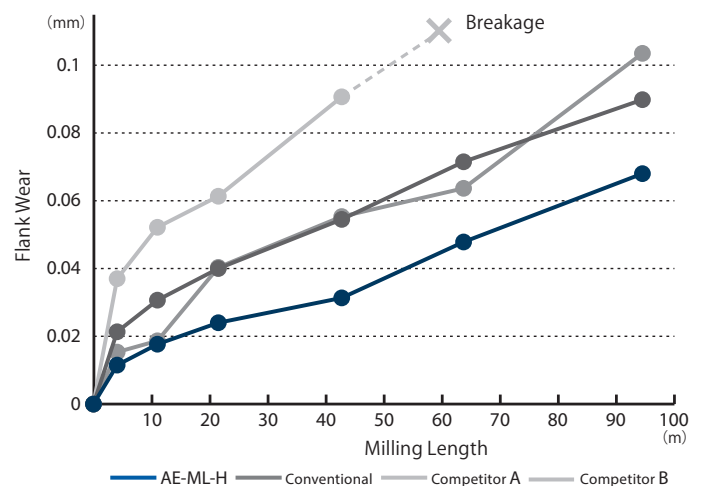
Comparison of the amount of deflection of the machined surface



Long tool life

Achieves stable durability in high-hardness steel machining

Tool	AE-ML-H Ø10 6flutes
Work Material	SKD11 (60HRC)
Milling method	Side milling
Cutting Speed	30m/min (955 min ⁻¹)
Feed Rate	260mm/min (0,045 mm/t)
Depth of Cut	ap = 30mm ae = 0,05mm
Coolant	Air Blow
Machine	Horizontal Machining Center (HSK63)



Milling | Solid carbide

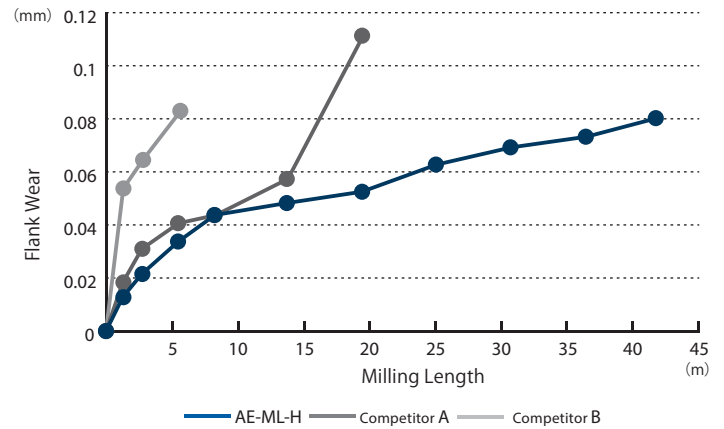


CUTTING DATA

Stable Performance

Achieves stable durability in high-hardness steel machining

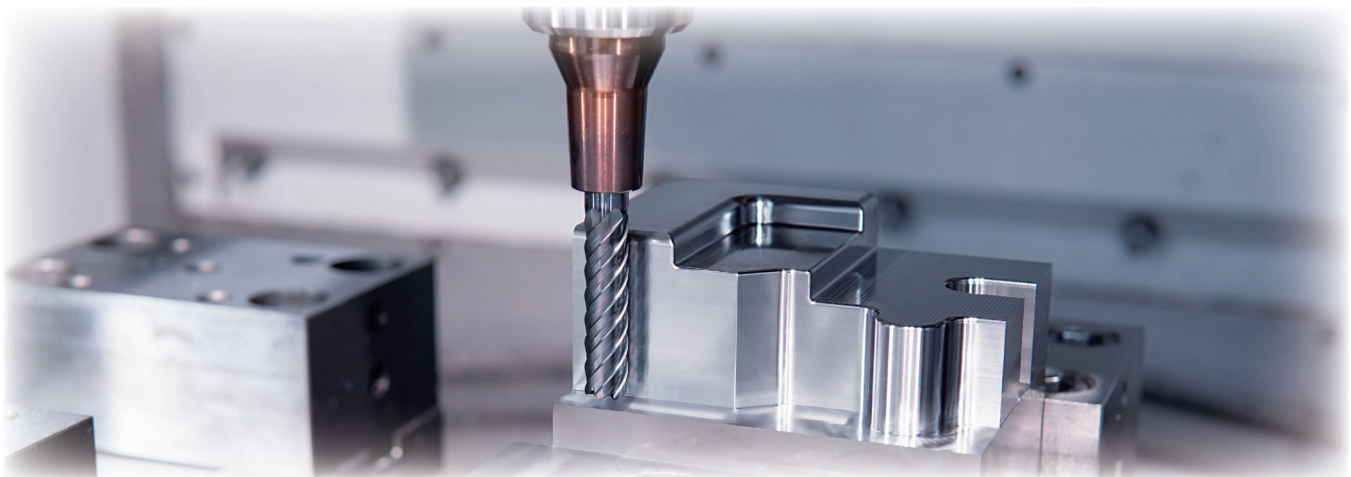
Tool	AE-ML-H Ø3 4 flutes	Competitor A 4 flutes	Competitor B 3 flutes
Work Material	SKD (60HRC)		
Milling method	Side milling		
Cutting Speed	40m/min (4.250 min ⁻¹)		
Feed	460mm/min (0,027 mm/t)	345mm/min (0,027 mm/t)	
Depth of Cut	ap = 9mm ae = 0,03mm		
Coolant	Air Blow		
Machine	Vertical Machining Center (BT40)		



Wear condition of outer peripheral cutting edge and corner edge

Milling Length	Cutting edge			Corner edge		
	AE-ML-H	Competitor A	Competitor B	AE-ML-H	Competitor A	Competitor B
5.6m						
19.6m						
42m						

Milling | Solid carbide



High efficiency

Highly efficient machining of hot working die steel DH31-S, which requires superior tool performance

Work Material: DH31-S (50HRC)

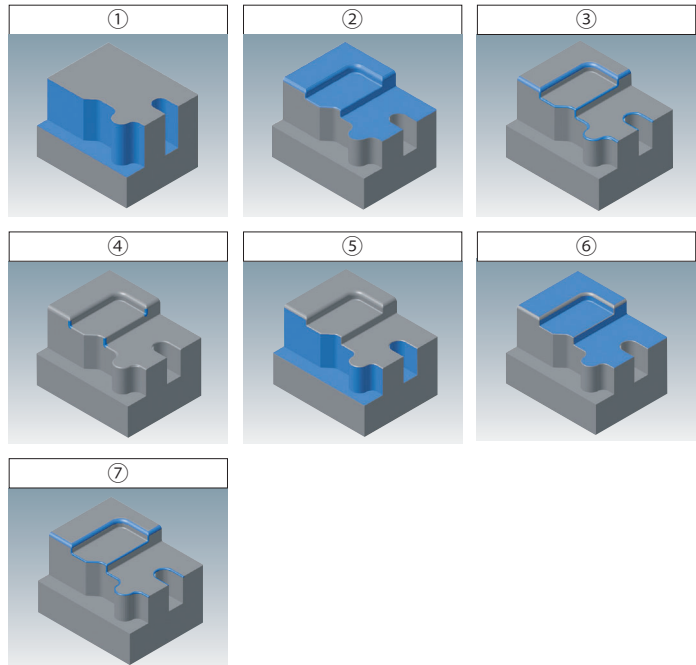
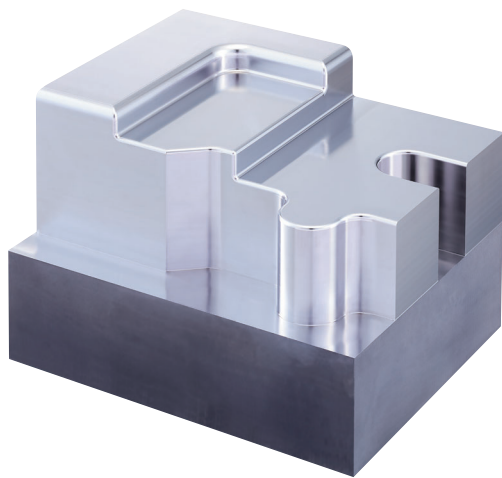
Machine: Vertical Machining Center

Main Spindle : HSK-A63

Maximum RPM: 20.000 min⁻¹

Coolant : Air Blow

Holder: Shrink Fit



Process	Milling part	Milling method	Milling process	Tool	Cutting Speed (m/min)	Feed (mm/min)	ap (mm)	ae (mm)
1	Side	Side Milling, High-efficiency Milling	Roughing	AE-ML-H Ø 10X40	80 (2.550min ⁻¹)	1.070 (0,07mm/t)	40	0,5
2	Top	Side Milling, High-efficiency Milling		AE-MS-H Ø 10XR1	120 (3.800min ⁻¹)	2.750 (0,12mm/t)	15	0,5
3	Corner R	Contour Milling	Semi-finishing	AE-MS-H Ø 10XR1	200 (6.370min ⁻¹)	1.900 (0,05mm/t)	0,1	0,1
4	Corner R	Copy Milling	Leftover Milling	AE-LNBD-H R1X10X6	50 (8.000min ⁻¹)	480 (0,03mm/t)	0,1	0,1
5	Bottom Side	Face Milling Side Milling	Finishing	AE-ML-H Ø 10X40	120 (3.800min ⁻¹)	1.150 (0,05mm/t)	0,2	1
							40	
6	Top	Face Milling Side Milling	Finishing	AE-MS-H Ø 10XR1	120 (3.800min ⁻¹)	1.150 (0,05mm/t)	0,2	1
							15	
7	Corner R	Contour Milling	Corner R Finishing	AE-LNBD-H R1X10X6	80 (12.700min ⁻¹)	760 (0,03mm/t)	0,1	0,1




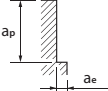
CUTTING CONDITIONS

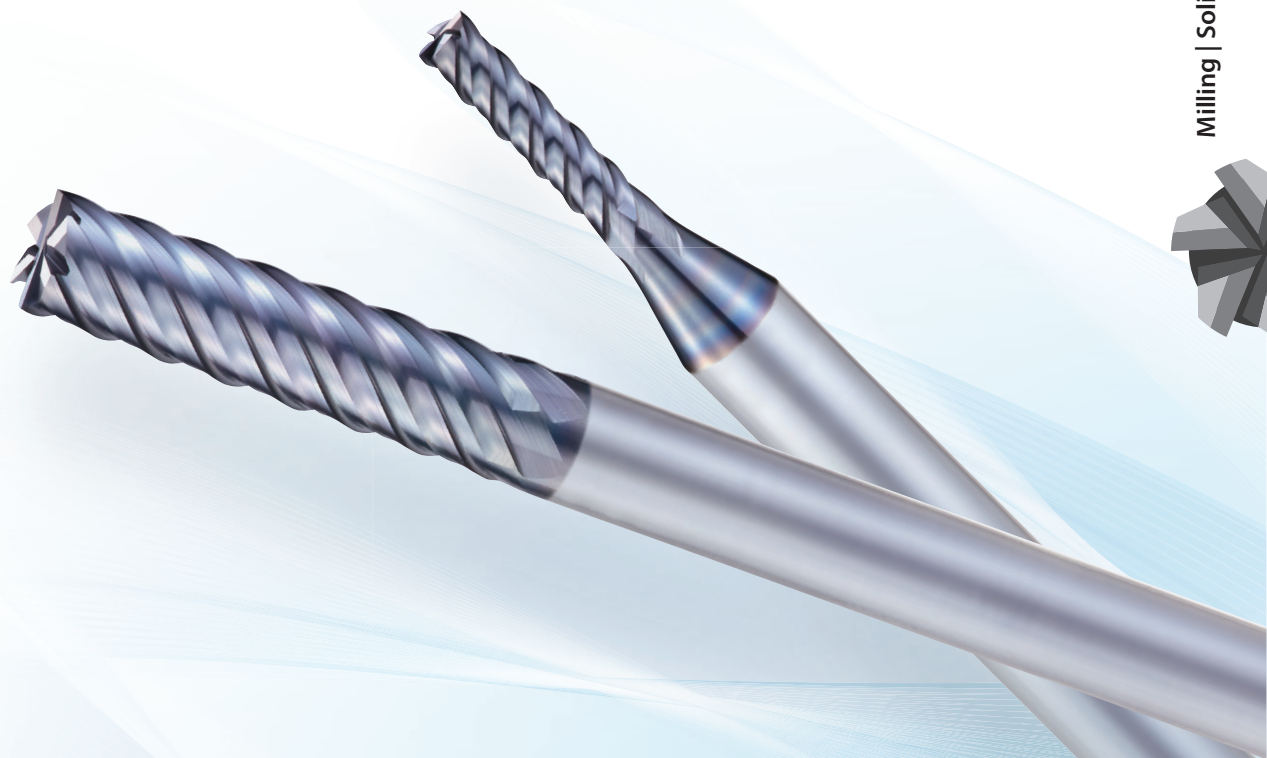
Milling | Endmills | Cutting conditions

AE-ML-H

Square Type

Side Milling

	Hardened Steel • Prehardened Steel SCM • SKD61 • NAK80		Hardened Steel															
			~ 55HRC		~ 62HRC		~ 66HRC		~ 70HRC									
Vc (m/min)	60		45		30		20		15									
Mil.Dia (mm)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)								
3	6.370	650	4.780	370	3.180	170	2.120	100	1.590	60								
4	4.780	650	3.580	370	2.390	170	1.590	100	1.190	60								
5	3.820	650	2.870	370	1.910	170	1.270	100	960	60								
6	3.180	970	2.390	560	1.590	260	1.060	150	800	90								
8	2.390	970	1.790	560	1.190	260	800	150	600	90								
10	1.910	970	1.430	560	960	260	640	150	480	90								
12	1.590	970	1.190	560	800	260	530	150	400	90								
16	1.190	970	900	560	600	260	400	150	300	90								
20	960	970	720	560	480	260	320	150	240	90								
Depth of cut			<table border="1"> <tr> <td>ap</td> <td>ae</td> </tr> <tr> <td>3D</td> <td>0,01D</td> </tr> </table> <p>ae Max = 0,2mm</p>		ap	ae	3D	0,01D	<table border="1"> <tr> <td>ap</td> <td>ae</td> </tr> <tr> <td>3D</td> <td>0,005D</td> </tr> </table> <p>ae Max = 0,1mm</p>		ap	ae	3D	0,005D				
	ap	ae																
3D	0,01D																	
ap	ae																	
3D	0,005D																	
<p>1. Use a rigid and precise machine and holder. 2. When chattering occurs, reduce the speed and feed simultaneously. 3. Use an air blow or a suitable cutting fluid with high smoke retardant properties.</p>																		

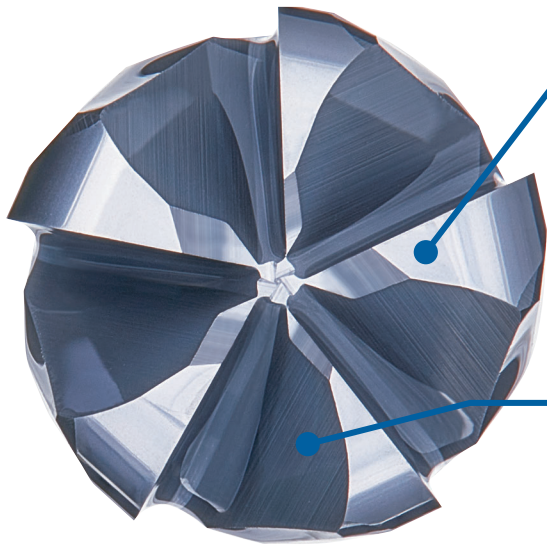


Milling | Solid carbide

KEY FEATURES & BENEFITS

AE-CRE-H

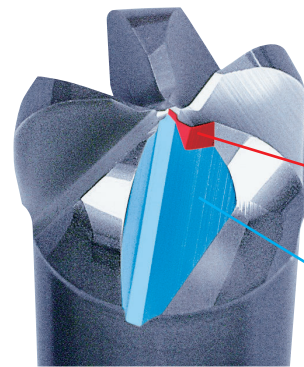
High efficiency radius type carbide end mill for high-hardness steels



Multi-flute and unequal spacing teeth specifications for high efficiency

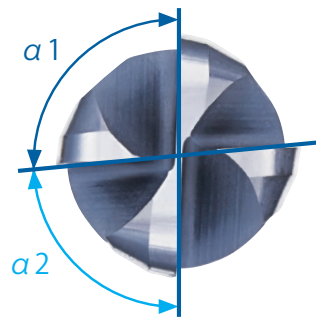
- Achieves high-efficiency milling with multi-flute specification
- Unequal spacing teeth suppresses chattering to enable stable machining

2-stage gash shape



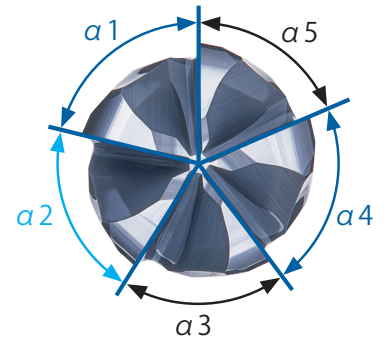
Prevents chipping of center cutting edge

Large chip pocket
Improved chip evacuation



$$\alpha 1 \neq \alpha 2$$

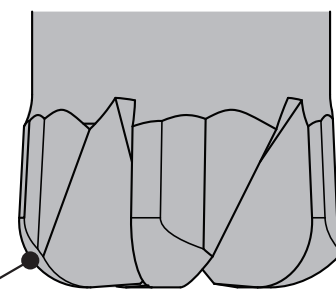
Outer diameter up to $\phi 2$



$$\alpha 1 = \alpha 4 \neq \alpha 2 \neq \alpha 3 = \alpha 5$$

Outer diameter $\phi 3$ or above

Cutting edge specifications that enable highly efficient direct engraving



Large positive R shape

Enables both large depth of cut and high-feed milling

Short flute length
High tool rigidity

KEY FEATURES & BENEFITS

Direct engraving of hardened steel

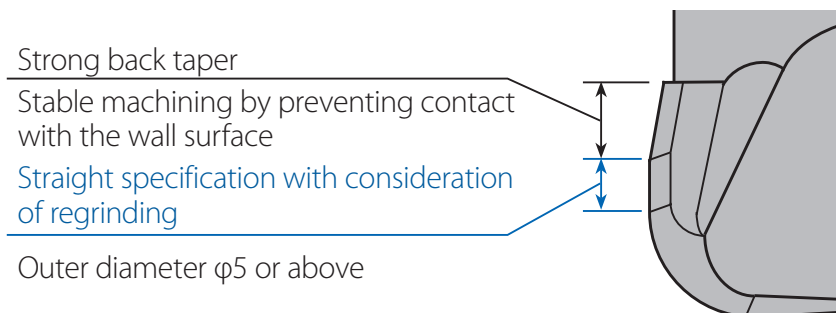
Tool	AE-CRE-H Ø10 X R2
Work Material	SKH51 (65HRC)
Milling method	Contour milling
Cutting Speed	80m/min (2.550 min ⁻¹)
Feed Rate	2,230mm/min (0,17 mm/t)
Depth of Cut	ap = 0,1mm ae = 3mm
Coolant	Air Blow
Machine	Vertical Machining Center (HSK-A63)



*Please refer to page 23 for cutting condition details

Realization of resource circulation and a sustainable manufacturing environment by regrinding

Cutting edge specification that minimizes shape change after regrinding



Regrinding, recoating, and cemented carbide recycling contribute to resource circulation and a sustainable manufacturing environment.

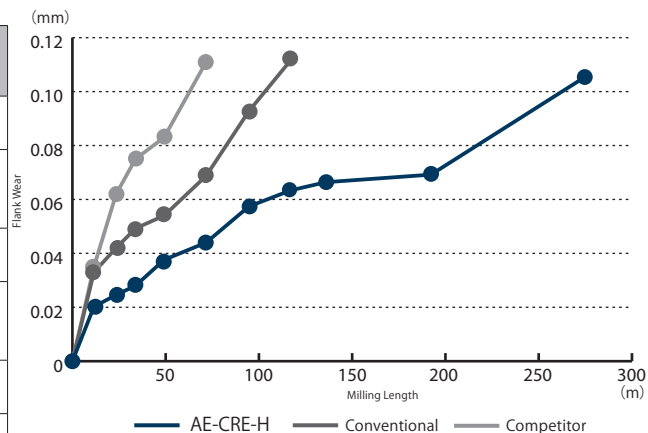


CUTTING DATA

Stable Performance

Stable wear transition in 60 HRC high-hardness steel machining

Tool	AE-CRE-H Ø10 X R2	Conventional 4 flute	Competitor 4 flute
Work Material	SKD11 (60HRC)		
Milling method	Frontal milling		
Cutting Speed	100m/min (3.180 min ⁻¹)		
Feed Rate	3.820mm/min (0,24 mm/t)	3.820mm/min (0,3 mm/t)	
Depth of Cut	ap = 0,1mm ae = 3mm		
Overhang Length	30mm (L/D=3)		
Coolant	Air Blow		
Machine	Horizontal Machining Center (HSK-A63)		



Wear comparison of the cutting edge

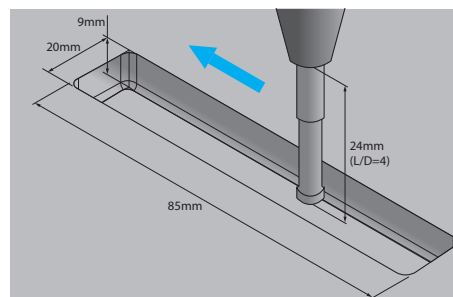


Long Tool Life

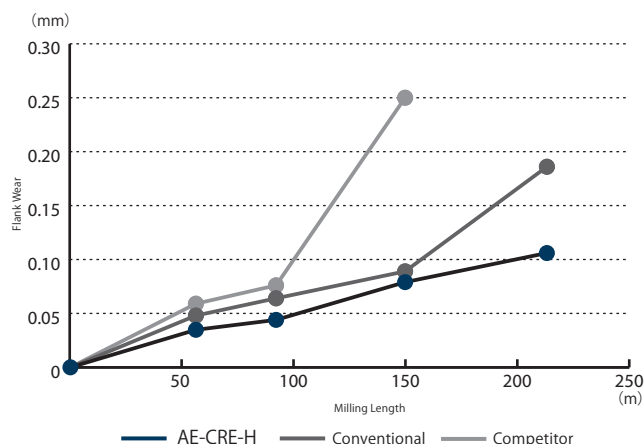
Exhibits excellent durability even in die-cast mold steel

Tool	AE-CRE-H Ø6 X R1,5	Conventional 4 flute	Competitor 4 flute
Work Material	DAC-MAGIC (45HRC)		
Milling method	Pocket milling		
Pocket Shape	85mm x 20mm x 9mm Depth		
Cutting Speed	130m/min (6.900 min ⁻¹)		
Feed Rate	1.700mm/min (0,049 mm/t)	1.700mm/min (0,062 mm/t)	
Depth of Cut	ap = 0,18mm ae = 2,4mm		
Overhang Length	24mm (L/D=4)		
Coolant	Air Blow		
Machine	Vertical Machining Center (BT40)		

Processing Shape



Machining distance per pocket : 30m



Wear comparison of the cutting edge



Direct engraving of forging dies out of right-hardness steel (65 HRC)

Work Material: SKH51 (65HRC)

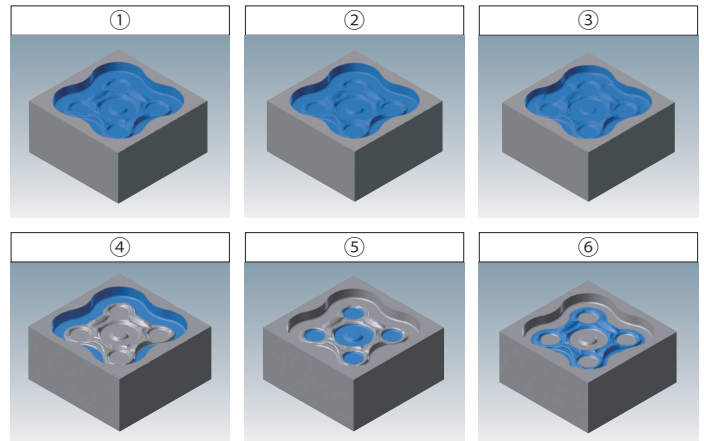
Machine: Vertical Machining Center

Main Spindle : HSK-A63

Maximum RPM: 20.000 min⁻¹

Coolant : Air Blow

Holder: Shrink Fit

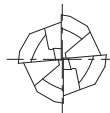


Process	Milling part	Milling method	Milling process	Tool	Cutting Speed (m/min)	Feed (mm/min)	ap (mm)	ae (mm)
1	Overall	Contour Milling	Roughing	AE-CRE-H Ø 10XR2	80 (2.550min ⁻¹)	2.230 (0,17mm/t)	0,1	3
2	Overall	Contour Milling	Roughing	AE-CRE-H Ø 6XR1,5	80 (4.250min ⁻¹)	2.230 (0,1mm/t)	0,075	1,8
3	Overall	Contour Milling	Semi-finishing	AE-CRE-H Ø 3XR0,75	80 (8.500min ⁻¹)	2.010 (0,05mm/t)	0,05	0,1
4	Peripheral	Contour Milling	Finishing	AE-CRE-H Ø 6XR1,5	80 (4.250min ⁻¹)	635 (0,03mm/t)	0,1	0,6
5	Product Shape	Flat Surface Milling	Finishing	AE-CRE-H Ø 3XR0,75	80 (8.500min ⁻¹)	635 (0,015mm/t)	0,1	0,05
6	Product Shape	Copy Milling	Finishing	AE-CRE-H Ø 3XR0,75	80 (8.500min ⁻¹)	635 (0,015mm/t)	0,1	0,05



AE-CRE-H NEW

Milling | Solid carbide



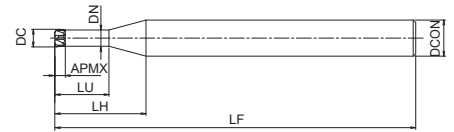
4 flutes



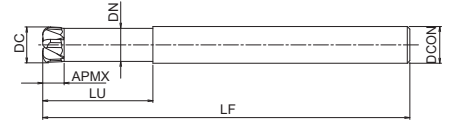
5 flutes

- First choice in quality and performance
- Radius Type
- High efficiency type
- 4-5 flutes

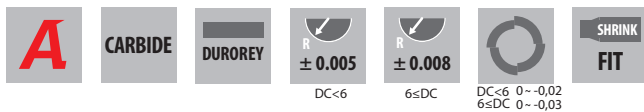
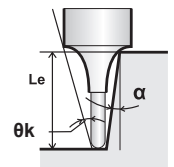
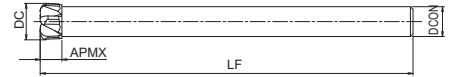
Type 1



Type 2



Type 3



EDP	ZEFP	DC	RE	LH	LU	LF	APMX	DCON	DN	θk	Effective length by inclined angles Le (α)*					Type	Price
											0,5°	1°	1,5°	2°	3°		
8550028	4	1	0,2	12,6	3	50	0,4	6	0,85	11,24°	3,37	3,54	3,71	3,88	4,22	1	
8550029	4	2	0,5	13,6	6	60	0,8	6	1,8	8,51°	6,48	6,75	7	7,25	7,8	1	
8550030	5	3	0,75	14,7	9	60	1,3	6	2,7	6,05°	9,55	9,88	10,21	10,56	11,36	1	
8550031	5	4	1	15,8	12	70	1,6	6	3,6	3,82°	12,61	13,01	13,45	13,92	14,97	1	
8550032	5	5	1,2	16,9	15	80	2	6	4,5	1,81°	15,68	16,18	16,72	-	-	1	
8550033	5	6	1,5	-	18	90	2,5	6	5,4	-	-	-	-	-	-	2	
8550034	5	7	1,5	-	-	90	3	6	-	-	-	-	-	-	-	3	
8550035	5	8	2	-	24	100	3,5	8	7,2	-	-	-	-	-	-	2	
8550036	5	9	2	-	-	100	4	8	-	-	-	-	-	-	-	3	
8550037	5	10	2	-	30	100	5	10	9	-	-	-	-	-	-	2	
8550038	5	11	2	-	-	100	5	10	-	-	-	-	-	-	-	3	
8550039	5	12	3	-	36	110	5	12	11	-	-	-	-	-	-	2	
8550040	5	13	3	-	-	110	6	12	-	-	-	-	-	-	-	3	

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.

CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-CRE-H

Frontal Milling

DC x RE	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80		Hardened Steel							
	~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
(m/min)	140~160		140~160		90~110		70~90		50~70	
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)
1 xR0,2	48.000	7.250	48.000	6.800	32.000	2.900	25.500	1.650	19.500	950
2 xR0,5	24.000	7.250	24.000	6.800	16.000	2.900	13.000	1.700	9.550	950
3 xR0,75	16.000	8.600	16.000	8.050	10.700	3.450	8.450	1.950	6.350	1.100
4 xR1	12.000	9.550	12.000	8.950	7.950	3.800	6.350	2.200	4.750	1.200
5 xR1,2	9.550	9.500	9.550	8.950	6.350	3.800	5.050	2.200	3.800	1.200
6 xR1,5	7.950	9.500	7.950	8.900	5.300	3.800	4.200	2.200	3.150	1.200
7 xR1,5	6.800	8.550	6.800	8.000	4.500	3.400	3.600	1.950	2.700	1.100
8 xR2	5.950	9.500	5.950	8.900	3.950	3.750	3.150	2.200	2.350	1.200
9 xR2	5.300	8.550	5.300	8.000	3.500	3.400	2.800	1.950	2.100	1.100
10 xR2	4.750	9.450	4.750	8.900	3.150	3.750	2.500	2.150	1.900	1.200
11 xR2	4.300	8.500	4.300	7.950	2.850	3.350	2.300	1.950	1.700	1.100
12 xR3	3.950	9.450	3.950	8.850	2.650	3.800	2.100	2.200	1.550	1.200
13 xR3	3.650	8.500	3.650	8.000	2.400	3.350	1.950	1.950	1.450	1.100

Depth of cut	ap ae		ap ae		ap ae	
	0,1RE	0,3D	0,1RE	0,3D	0,05RE	0,3D
	ap Max = 0,2mm		ap Max = 0,2mm		ap Max = 0,1mm	

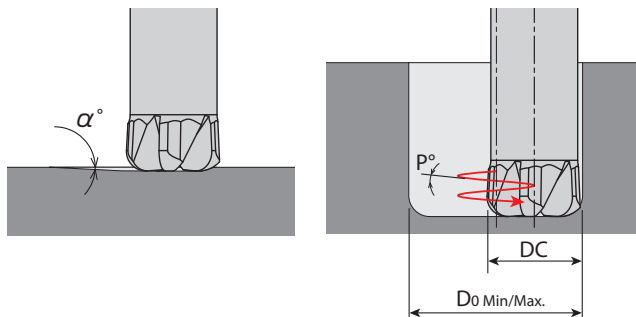
1. Use a rigid and precise machine and holder.
 2. These milling conditions are based on milling with circular interpolation at corners. For milling without circular interpolation (such as right angle corners), reduce the speed to 50-70% and the cutting depth to 50-80% of the above conditions.
 3. We suggest using air blow or MQL (mist).
 4. Please adjust the speed, feed and cutting depth according to actual cutting conditions.
 5. These milling conditions are for overhang length of less than 4 x D.
 For longer overhang length, reduce the speed, feed rate, and the cutting depth in accordance to the respective coefficients to prevent chattering. It can also be used by lowering the cutting speed and adjusting the ae.

Cutting Condition Guide for Changes in Overhang Length

L/D	Hardened Steel • Prehardened Steel SCM • SKD61 • NAK80			Hardened Steel											
	~45HRC			~55HRC			~62HRC			~66HRC			~70HRC		
	S (min ⁻¹)	F (mm/min)	ap (mm)	S (min ⁻¹)	F (mm/min)	ap (mm)	S (min ⁻¹)	F (mm/min)	ap (mm)	S (min ⁻¹)	F (mm/min)	ap (mm)	S (min ⁻¹)	F (mm/min)	ap (mm)
L/D ≤ 4	100%			100%			100%			100%			100%		
4 < L/D < 6	70%			70%			70%			60%			60%		
L/D = 6	50%			50%			50%			40%			40%		

Maximum Ramping Angle (E°)

DC x RE	Ramping Angle E°	Helical Milling (mm)		Helical Angle P°
		D0 Min.	D0 Max.	
1 xR0,2	3°	1,25	1,75	1,5°
2 xR0,5		2,5	3,5	
3 xR0,75		4,5	5,5	
4 xR1		6	7	
5 xR1,2		7,5	9	
6 xR1,5		9	11	
7 xR1,5		10,5	13	
8 xR2		12	15	
9 xR2		13,5	17	
10 xR2		15	19	
11 xR2		16,5	21	
12 xR3		18	23	
13 xR3		19,5	25	



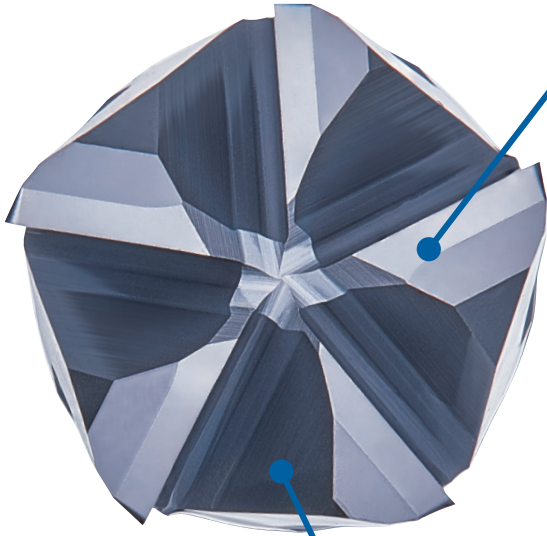
When ramping or helical milling, after adjusting the cutting condition by changing the overhang length, set the feed rate to 50% or less.



KEY FEATURES & BENEFITS

AE-HFE-H

High feed radius type carbide end mill for high-hardness steels

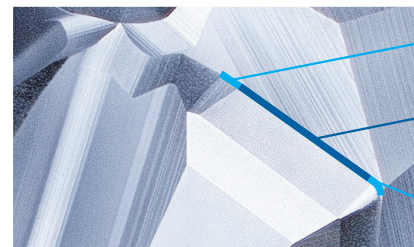


Composite radius shape capable of high feed

Unique radius shape reduces cutting resistance
High-feed machining possible even at overhang length of $L/D = 7$

Unequal spacing teeth suppresses chattering

Achieves stable and highly efficient machining



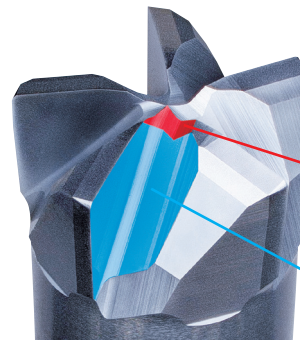
Bottom edge R

Incline cutting edge

Corner R

2-stage gash shape

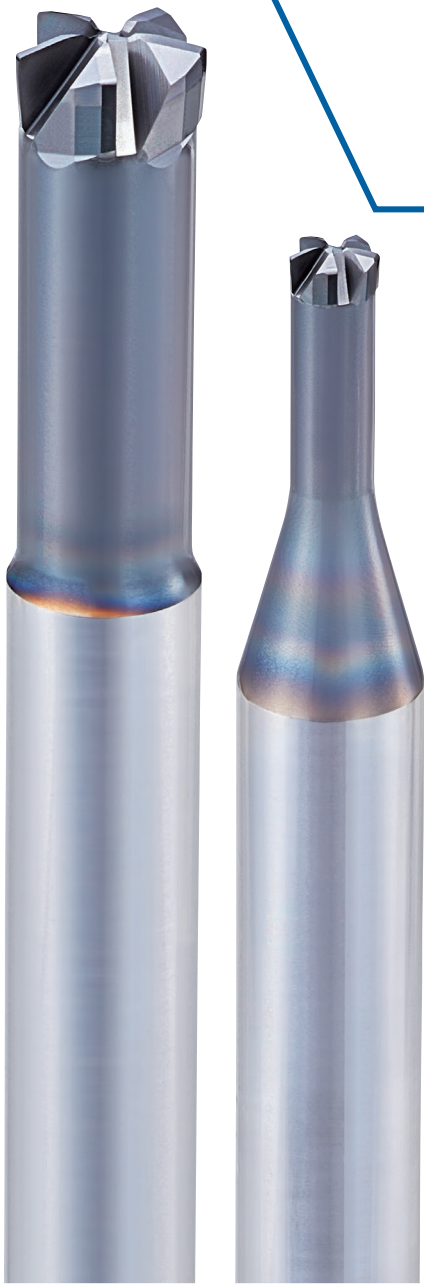
Achieves both cutting edge strength and good chip evacuation



Prevents chipping of center cutting edge

Large chip pocket

Improved chip evacuation



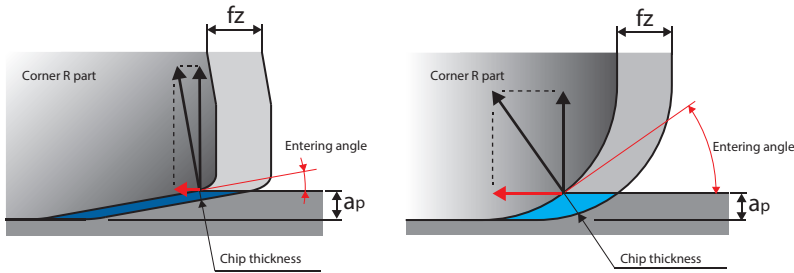
Milling | Solid carbide

KEY FEATURES & BENEFITS

High-speed, high-feed machining at overhang length of $L/D = 7$

Unique radius shape reduces cutting resistance

- Cutting resistance in the feed direction is reduced due to the small cutting angle, suppressing vibration and deflection of the tool.
- By reducing the chip thickness, cutting heat is easily transferred to the chip, making it more difficult for heat to remain on the tool cutting edge and work material.

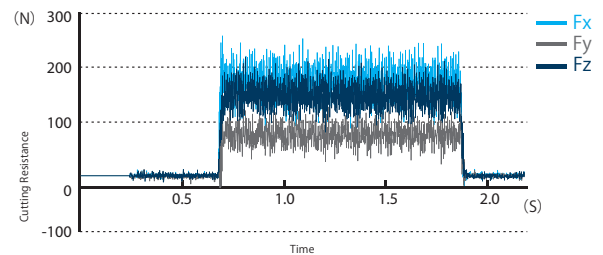


Composite radius shape

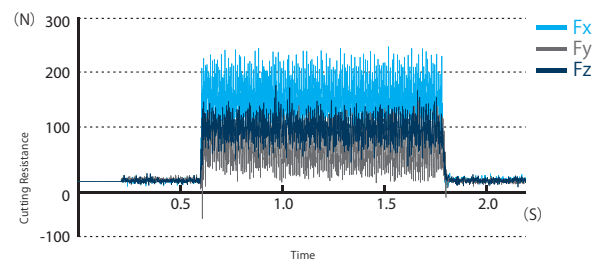
Conventional radius shape

Stable machining made possible by reducing cutting resistance

Tool	AE-HFE-H Ø6 X R0,45	Conventional radius shape Ø6 X R1,5
Work Material	STAVAX (53HRC)	
Milling method	Frontal milling	
Cutting Speed	75m/min (3.980 min ⁻¹)	
Feed Rate	3.580mm/min (0,18 mm/t)	
Depth of Cut	ap = 0,12mm ae = 2,4mm	
Overhang Length	42mm (L/D=7)	
Coolant	Air Blow	
Machine	Vertical Machining Center (HSK63)	



AE-HFE-H



Conventional radius shape

Realization of resource circulation and a sustainable manufacturing environment by regrinding

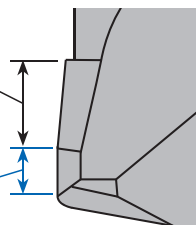
Cutting edge specification that minimizes shape change after regrinding

Strong back taper

Stable machining by preventing contact with the wall surface

Straight specification with consideration of regrinding

Outer diameter $\phi 5$ or above



Regrinding, recoating, and cemented carbide recycling contribute to resource circulation and a sustainable manufacturing environment.



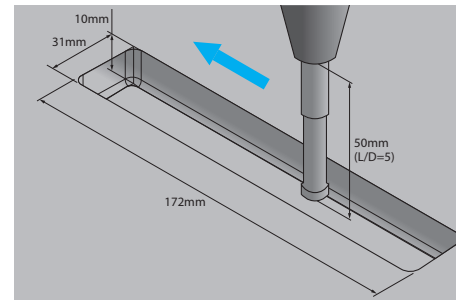
CUTTING DATA

Stable Performance

Achieves stable machining in STAVAX (53HRC)

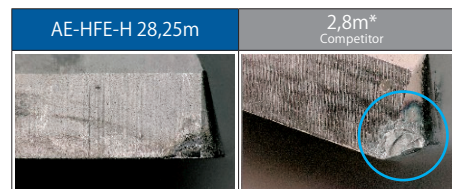
Tool	AE-HFE-H Ø10 X R0,7	Competitor 6 flute
Work Material	STAVAX (53HRC)	
Milling method	Pocket milling	
Pocket Shape	172mm x 31mm x 10mm Depth	
Cutting Speed	100m/min (3.180 min ⁻¹)	
Feed Rate	3.180mm/min (0,2 mm/t)	3.180mm/min (0,17 mm/t)
Depth of Cut	ap = 0,2mm ae = 4mm	
Overhang Length	50mm (L/D=5)	
Coolant	Air Blow	
Machine	Horizontal Machining Center (HSK-A63)	

Processing Shape



Machining distance per pocket : 28,25m

Wear comparison of the cutting edge



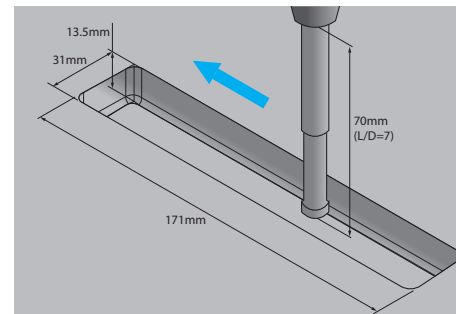
*Number of pockets processed: equivalent to 0.1 pocket

Long Tool Life

High-feed machining with excellent durability in SKD61 (50 HRC) at L/D = 7

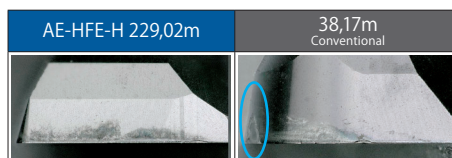
Tool	AE-HFE-H Ø10 X R0,7	Conventional 4 flute
Work Material	SKD61 (50HRC)	
Milling method	Pocket milling	
Pocket Shape	171mm x 31mm x 13,5mm Depth	
Cutting Speed	75m/min (2.390 min ⁻¹)	
Feed Rate	3.590mm/min (0,3 mm/t)	3.590mm/min (0,38 mm/t)
Depth of Cut	ap = 0,2mm ae = 4mm	
Overhang Length	70mm (L/D=7)	
Coolant	Air Blow	
Machine	Horizontal Machining Center (HSK-A63)	

Processing Shape



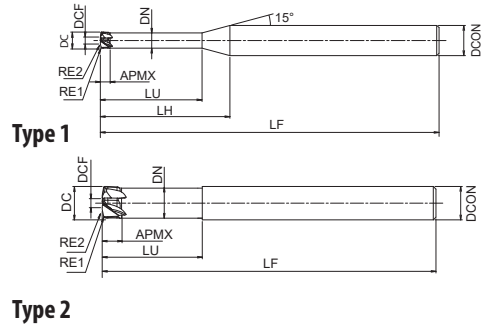
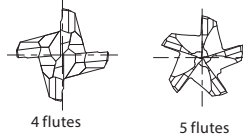
Machining distance per pocket : 38,17m

Wear comparison of the cutting edge

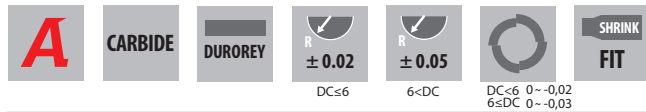
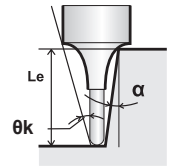


AE-HFE-H NEW

Milling | Solid carbide



- First choice in quality and performance
- Radius Type
- High Feed type
- 4-5 flutes



EDP	ZEFP	DC	rt	DCF	RE1	RE2	LH	LU	LF	APMX	DCON	DN	θk	Effective length by inclined angles Le (α)*					Type	Price
														0,5°	1°	1,5°	2°	3°		
8550019	4	1	0,1	0,36	0,1	0,488	12,6	3	60	0,4	6	0,85	11,33°	3,16	3,33	3,5	3,66	4	1	
8550020	4	2	0,2	0,73	0,15	0,975	13,6	6	60	0,8	6	1,8	8,46°	6,29	6,56	6,82	7,07	7,63	1	
8550021	5	3	0,3	1,1	0,2	1,463	14,7	9	60	1,3	6	2,7	5,95°	9,36	9,7	10,04	10,4	11,22	1	
8550022	5	4	0,35	1,5	0,2	1,95	15,8	12	70	1,6	6	3,6	3,71°	12,42	12,85	13,3	13,78	14,87	1	
8550023	5	5	0,4	1,87	0,2	2,438	16,9	15	80	2	6	4,5	1,74°	15,5	16,02	16,59	-	-	1	
8550024	5	6	0,45	2,24	0,2	2,925	-	18	90	2,5	6	5,4	-	-	-	-	-	-	2	
8550025	5	8	0,65	2,99	0,3	3,9	-	24	100	3,5	8	7,2	-	-	-	-	-	-	2	
8550026	5	10	0,7	3,83	0,3	4,875	-	30	110	4,5	10	9	-	-	-	-	-	-	2	
8550027	5	12	0,8	4,59	0,3	5,85	-	36	135	5	12	11	-	-	-	-	-	-	2	

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.



CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-HFE-H

Frontal Milling $L/D \leq 4$

	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80		Hardened Steel													
	~45HRC		~ 55HRC		~ 62HRC		~ 66HRC		~ 70HRC							
(m/min)	120~140		100~120		80~100		70~90		60~80							
DC X rt	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)						
1 xR0,1	41.000	7.400	35.000	5.300	28.500	3.200	25.000	1.650	22.000	1.250						
2 xR0,2	20.500	7.400	17.500	5.300	14.000	3.150	12.500	1.650	11.000	1.250						
3 xR0,3	13.500	9.100	11.500	6.550	9.550	4.050	8.450	2.100	7.400	1.550						
4 xR0,35	10.000	9.450	8.750	6.950	7.150	4.250	6.350	2.200	5.550	1.650						
5 xR0,4	8.250	9.750	7.000	6.950	5.700	4.250	5.050	2.200	4.450	1.650						
6 xR0,45	6.900	9.800	5.800	6.950	4.750	4.250	4.200	2.200	3.700	1.650						
8 xR0,65	5.150	9.750	4.350	6.950	3.550	4.250	3.150	2.200	2.750	1.600						
10 xR0,7	4.100	9.700	3.500	6.950	2.850	4.250	2.500	2.150	2.200	1.600						
12 xR0,8	3.450	9.800	2.900	6.950	2.350	4.200	2.100	2.200	1.850	1.650						
Depth of cut																
			<table border="1"> <tr> <th>ap</th> <th>ae</th> </tr> <tr> <td>0,04D</td> <td>0,6D</td> </tr> </table>		ap	ae	0,04D	0,6D								
ap	ae															
0,04D	0,6D															

Frontal Milling $4 < L/D \leq 6$

	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80		Hardened Steel													
	~45HRC		~ 55HRC		~ 62HRC		~ 66HRC		~ 70HRC							
(m/min)	110~130		90~110		70~90		60~80		40~60							
DC X rt	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)						
1 xR0,1	38.000	5.750	31.500	3.550	25.000	2.800	22.000	1.450	15.500	850						
2 xR0,2	19.000	5.750	15.500	3.500	12.500	2.800	11.000	1.450	7.950	900						
3 xR0,3	12.500	7.100	10.500	4.450	8.450	3.600	7.400	1.800	5.300	1.100						
4 xR0,35	9.550	7.600	7.950	4.750	6.350	3.800	5.550	1.900	3.950	1.150						
5 xR0,4	7.600	7.550	6.350	4.750	5.050	3.750	4.450	1.900	3.150	1.150						
6 xR0,45	6.350	7.600	5.300	4.750	4.200	3.750	3.700	1.900	2.650	1.150						
8 xR0,65	4.750	7.550	3.950	4.700	3.150	3.750	2.750	1.900	1.950	1.150						
10 xR0,7	3.800	7.550	3.150	4.700	2.500	3.700	2.200	1.900	1.550	1.150						
12 xR0,8	3.150	7.550	2.650	4.750	2.100	3.750	1.850	1.900	1.300	1.150						
Depth of cut																
			<table border="1"> <tr> <th>ap</th> <th>ae</th> </tr> <tr> <td>0,03D</td> <td>0,5D</td> </tr> </table>		ap	ae	0,03D	0,5D								
ap	ae															
0,03D	0,5D															

1. Use a rigid and precise machine and holder.
2. The values listed above are for reference. Please set the cutting condition in accordance with the actual machining environment.
3. When the depth of cut a_p exceeds the table above, set it so that it does not exceed the maximum depth of cut $a_{p\ Max}$. Please adjust the cutting condition according to the actual machining environment.
4. Please reduce the feed rate when the depth of cut is greater than specified.
5. We suggest using air blow or MQL (mist).
6. Please adjust the speed, feed and cutting depth according to actual cutting conditions.
7. If the pick amount is DCF or more, cusp may occur on the machined surface.



CUTTING CONDITIONS

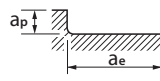
Milling | Endmills | Cutting conditions

AE-HFE-H

Frontal Milling $6 < L/D \leq 7$

DC X rt	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80		Hardened Steel							
	~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
(m/min)	90~110		65~85		50~70		45~65		30~50	
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)
1 xR0,1	31.500	4.150	23.500	2.650	19.000	1.400	17.500	950	12.500	550
2 xR0,2	15.500	4.100	11.500	2.600	9.550	1.450	8.750	950	6.000	550
3 xR0,3	10.500	5.200	7.950	3.350	6.350	1.800	5.800	1.200	4.200	700
4 xR0,35	7.950	5.550	5.950	3.550	4.750	1.850	4.350	1.300	3.150	750
5 xR0,4	6.350	5.550	4.750	3.550	3.800	1.850	3.500	1.300	2.500	750
6 xR0,45	5.300	5.550	3.950	3.550	3.150	1.850	2.900	1.300	2.100	750
8 xR0,65	3.950	5.500	2.950	3.500	2.350	1.850	2.150	1.250	1.550	750
10 xR0,7	3.150	5.500	2.350	3.500	1.900	1.850	1.750	1.300	1.250	750
12 xR0,8	2.650	5.550	1.950	3.500	1.550	1.850	1.450	1.300	1.050	750

Depth of cut



ap	ae
0,02D	0,4D

Maximum Ramping Angle (E°)

DC X rt	Ramping Angle E°	Helical Milling (mm)		Helical Angle P°
		D0 Min.	D0 Max.	
1 xR0,1	3°	1,25	1,75	1,5°
2 xR0,2		2,5	3,5	
3 xR0,3		4,5	5,5	
4 xR0,35		6	7	
5 xR0,4		7,5	9	
6 xR0,45		9	11	
8 xR0,65		12	15	
10 xR0,7		15	19	
12 xR0,8		18	23	

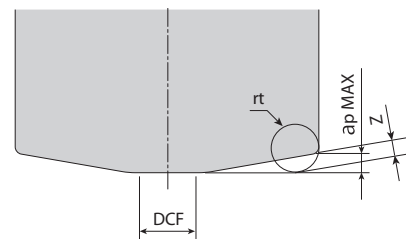
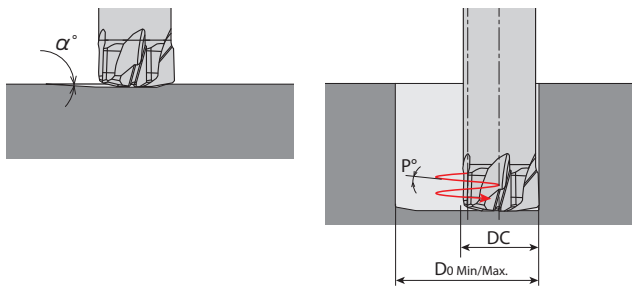
* For ramping and helical milling, set the feed rate to 50%.

Edge shape definitions for the purpose of creating a program

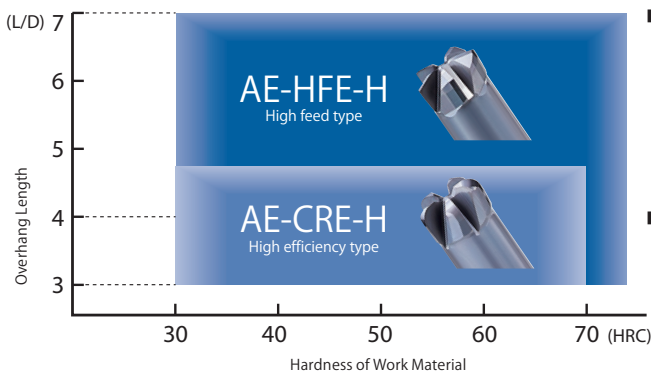
DC	rt	ap Max
1	R0,1	0,04
2	R0,2	0,073
3	R0,3	0,11
4	R0,35	0,143
5	R0,4	0,185
6	R0,45	0,227
8	R0,65	0,294
10	R0,7	0,351
12	R0,8	0,428

Maximum depth of cut

DC	ap Max
1	0,04
2	0,08
3	0,12
4	0,16
5	0,2
6	0,24
8	0,32
10	0,4
12	0,48



Two types of corner radius end mills that can be selected based on application needs

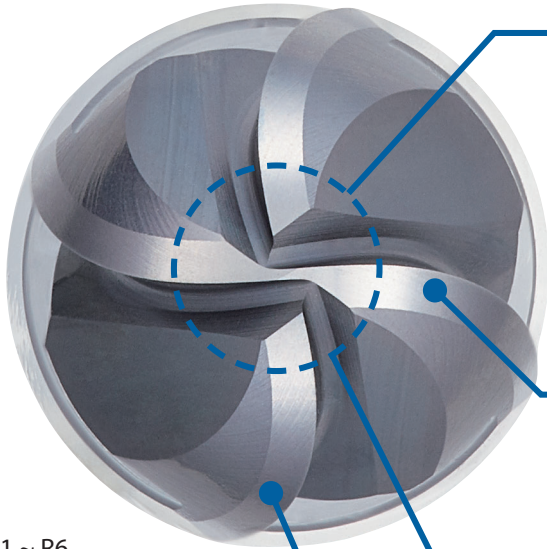


- AE-HFE-H**
 High feed type
 - Composite radius shape reduces cutting resistance
 - High feed machining possible at L/D = 7
 - Corner R specification: pseudo-R shape
- AE-CRE-H**
 High efficiency type
 - Large corner radius that enables high-efficiency machining
 - Corner R specification: regular R shape

KEY FEATURES & BENEFITS

AE-BM-H

4 flutes high efficiency Carbide ball end mill for high-hardness steel



Center 2 flute specification

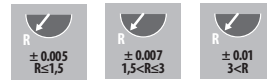
Controls tear when milling flat areas to improve surface accuracy.
Secures chip pockets with the center 2-flute specification to control the clogging of chips.

Sharp spiral curve

Reduces cutting resistance and enables stable performance with extended tool life.

Superior ball R precision

Suitable for a wide range of processes, from roughing to semi-roughing.



Unequal flute spacing

Controls harmonic vibration commonly generated during milling with multiple flutes to enable high-efficiency milling.

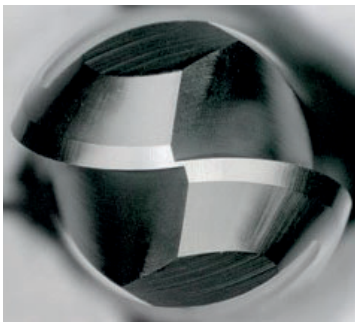
R1 ~ R6
total 8 items



Milling | Solid carbide

KEY FEATURES & BENEFITS

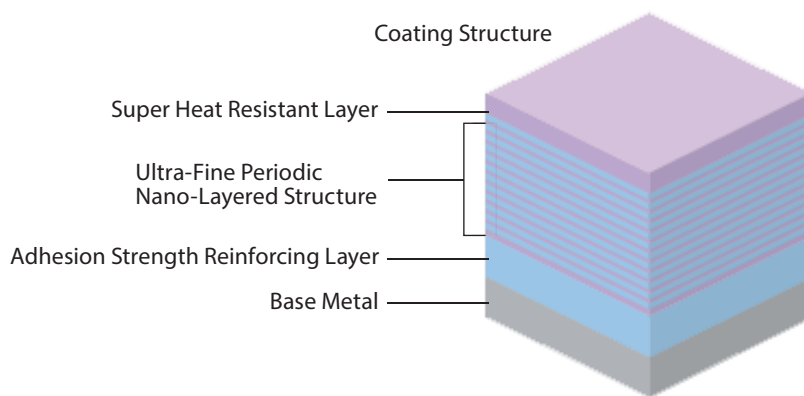
Main Features

AE-BD-H	AE-BM-H
 <p>High accuracy finishing, 2 flutes R0,5 ~ R6 total 17 items</p> <ul style="list-style-type: none"> • Variable negative spiral gash Strong negative point to suppress chipping & negative outer cutting edge angle for excellent surface finish • Core thickness Improved core thickness suppresses cracks and chipping • Excellent radius accuracy Wide variety of finishing applications • Also available as short shank type for shrink fit holders • DUROREY coating Excellent wear resistance for machining high hardness materials • Smooth surface High coating surface smoothness for improved work material surface 	 <p>High performance 4 flutes type R1 ~ R6 total 8 items</p> <ul style="list-style-type: none"> • Unequal spacing Multiflute type to suppress vibrations • Strong spiral geometry Low cutting resistance, high efficiency machining • 2 flutes center cut - large chip pocket for improved chip evacuation - improved surface quality even on flat surfaces • Excellent radius accuracy High versatility from roughing to semi-finishing • DUROREY coating Excellent wear resistance for machining high hardness materials

DUROREY Coating

Newly developed DUROREY coating enables superior heat resistance and high toughness optimized for high-hardness steel milling!

Super heat resistant layer and ultra-fine periodic nano-layered structure provide superior toughness while maintaining high heat resistance and abrasion resistance. Also suppresses chipping even in high hardness milling and achieves long tool life.



Coating Color	Coating Structure	Hardness (GPa)	Oxidation Temperature	Heat Resistance	Adhesion Strength	Surface Roughness	Wear Resistance	Welding Resistance	Toughness
Black Gray	Ultra-fine Periodic Nano-Layered	41	1.300	★	●	○	★	●	●

DUROREY is a registered trademark of OSG Corporation

○ → ● → ★
Fair Best

Milling | Solid carbide



AE-BM-H

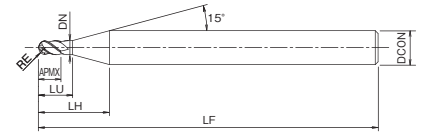
Milling | Solid carbide



Type 1

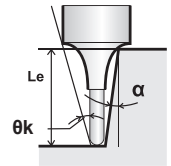


Type 2



- First choice in quality and performance
- For high hardness materials
- 4 flutes, ball nose

P ~45 HRC	P ~55 HRC	M ~35 HRC	K ~350 HB	S	H ~60 HRC	H ~65 HRC	H ~70 HRC
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A	CARBIDE	DUROREY	40°	SHRINK FIT	$R \pm 0,005$ $R \leq 1,5$	$R \pm 0,007$ $1,5 < R \leq 3$	$R \pm 0,01$ $3 < R$
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EDP	ZEFP	DC	RE	LU	LF	APMX	LH	DCON	DN	θ_k	Effective length by inclined angles $Le(\alpha)^*$					Type	Price
											0,5°	1°	1,5°	2°	3°		
8549602	4	2	1	4	50	2	11,9	6	1,95	10,32°	4,22	4,44	4,65	4,85	5,25	1	
8549603	4	3	1,5	6	50	3	11,8	6	2,85	8,18°	6,25	6,49	6,72	6,94	7,36	1	
8549604	4	4	2	8	60	4	12	6	3,85	5,68°	8,32	8,62	8,9	9,15	9,71	1	
8549605	4	5	2,5	10	60	5	12,1	6	4,85	2,97°	10,39	10,75	11,07	11,37	-	1	
8549606	4	6	3	-	60	9	-	6	-	-	-	-	-	-	-	2	
8549608	4	8	4	-	70	12	-	8	-	-	-	-	-	-	-	2	
8549610	4	10	5	-	80	15	-	10	-	-	-	-	-	-	-	2	
8549612	4	12	6	-	90	18	-	12	-	-	-	-	-	-	-	2	

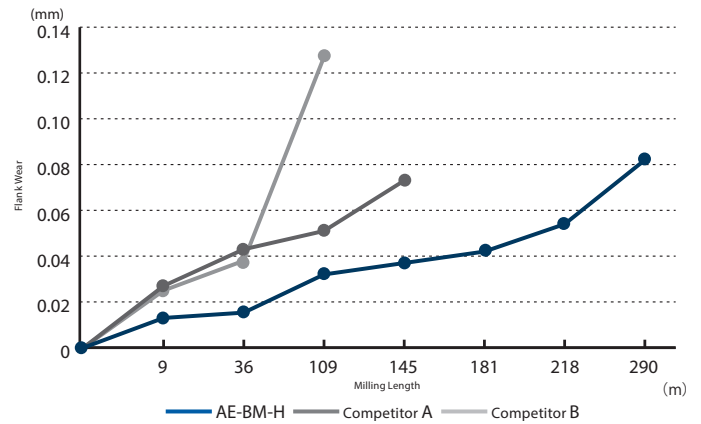
* If there is no value in the actual effective length (Le column) for the work gradient angle α , it indicates no interference.

Milling | Solid carbide

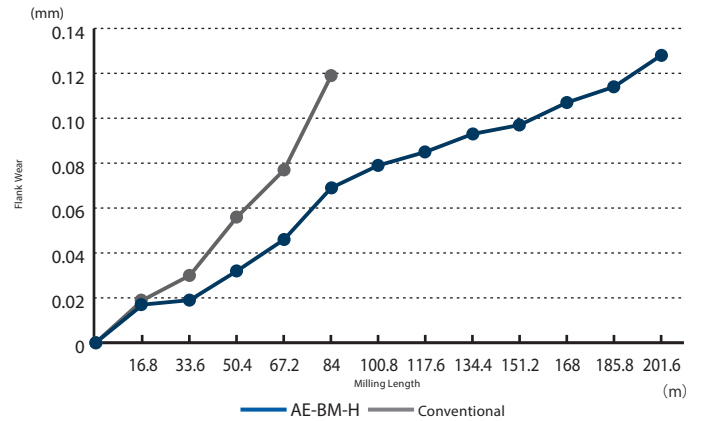
Long tool life

Exhibits superior endurance in high-hardness steel milling.

Tool	AE-BM-H R5	Competitor
Work Material	SKD11 (60HRC)	
Milling method	Pocket milling	
Cutting Speed	55m/min (1.750 min ⁻¹)	
Feed Rate	875mm/min (0,125 mm/t)	
Depth of Cut	ap = 0,75mm Pf = 2,25mm	
Coolant	Air Blow	
Machine	Vertical Machining Center (BT40)	



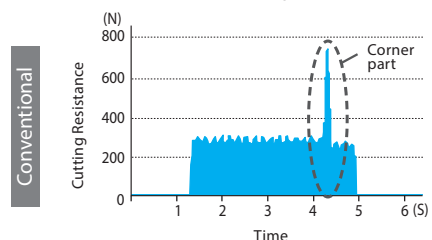
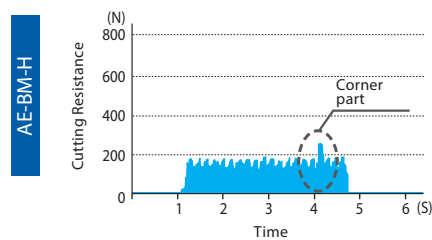
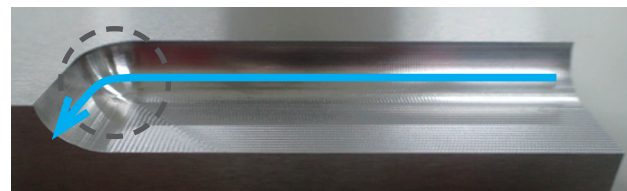
Tool	AE-BM-H R5	Conventional
Work Material	SKH51 (65HRC)	
Milling method	Pocket milling	
Cutting Speed	125m/min (4.000 min ⁻¹)	
Feed Rate	2.000mm/min (0,125 mm/t)	
Depth of Cut	ap = 0,3mm Pf = 1,2mm	
Coolant	Air Blow	
Machine	Horizontal Machining Center (HSK63)	



Low cutting force

Effects of sharp spiral curve and unequal flute spacing enable stable milling with low resistance.

Tool	AE-BM-H R5	Conventional
Work Material	SKD11 (60HRC)	
Milling method	Corner R milling	
Cutting Speed	80m/min (2.550 min ⁻¹)	
Feed Rate	2.000mm/min (0,196 mm/t)	
Depth of Cut	ap = 5mm Pf = 0,1mm	
Coolant	Air Blow	
Machine	Vertical Machining Center (BT40)	



CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-BM-H

Roughing

The machining path is on condition of contouring line operation.

R	~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)
R1	20.700	3.310	18.300	1.830	15.900	1.590	14.300	1.140	9.600	770
R1,5	13.800	2.760	12.200	1.710	10.600	1.480	9.600	1.150	6.400	770
R2	10.400	2.500	9.200	1.660	8.000	1.440	7.200	1.150	4.800	770
R2,5	8.300	2.660	7.300	1.900	6.400	1.660	5.700	1.370	3.800	910
R3	6.900	2.760	6.100	1.950	5.300	1.700	4.800	1.340	3.200	900
R4	5.200	2.500	4.600	1.840	4.000	1.600	3.600	1.300	2.400	860
R5	4.500	2.340	4.000	1.760	3.500	1.540	3.200	1.280	2.200	850
R6	4.000	2.240	3.600	1.730	3.200	1.540	2.900	1.160	2.100	840

ap	Pf
RE<R3	0,1D
R3≤RE	0,15D

ap	Pf
RE<R3	0,07D
R3≤RE	0,12D

ap	Pf
0,05D	0,15D

1. Use a rigid and precise machine and holder.
 2. We suggest using air blow or MQL (mist).
 3. These milling conditions are for an end mill where the tool extension length is 4 times the diameter of the end mill. When length of the tool extension from the machine is long, reduce the speed and feed and milling depth.
 4. The above condition shows an approximate standard for contouring operation (side milling) with a low machining load. If abnormal cutting sounds, vibration or chattering occur depending on the machining shape, cutting amount, rigidity of the machine or work holding condition, etc., please adjust the speed, feed and the depth of cut.
 5. When the radius of curvature is less than 1.5 times the tool diameter, please reduce the speed to 50-80%, the feed rate to 50-80%, and the pick feed to 20-60% of the above shown cutting conditions.
 6. When the machining incline angle (β) is more than 15°, please reduce the speed to 40-60%, the feed 30-50%, and the axial cutting depth to 30-60% of the above shown cutting conditions.
 7. If the cutting depth is small, it is possible to further increase the speed and feed.

AE-BM-H

Finishing

The machining path is on condition of contouring line operation.

R	~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)
R1	27.100	4.340	24.700	2.470	22.300	1.780	18.300	1.460	13.500	1.080
R1,5	18.000	3.600	16.500	2.310	14.900	1.780	12.200	1.460	9.000	1.080
R2	13.500	3.240	12.300	2.210	11.100	1.780	9.200	1.470	6.800	1.090
R2,5	10.800	3.460	9.900	2.570	8.900	2.140	7.300	1.750	5.400	1.300
R3	9.000	3.600	8.200	2.620	7.400	2.070	6.100	1.710	4.500	1.260
R4	6.800	3.260	6.200	2.480	5.600	1.790	4.600	1.470	3.400	1.090
R5	5.700	2.960	5.300	2.330	4.800	1.730	4.000	1.440	3.000	1.080
R6	5.000	2.800	4.600	2.210	4.200	1.680	3.500	1.400	2.800	1.120

ap	Pf
0,02D	0,05D

Milling | Solid carbide

CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-BM-H

High Speed Roughing

The machining path is on condition of contouring line operation.

R	~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)
R1	37.300	5.970	33.000	3.300	28.700	2.870	25.800	2.060	17.200	1.380
R1,5	24.800	4.960	22.000	3.080	19.100	2.670	17.200	2.060	11.500	1.380
R2	20.700	4.970	18.300	3.290	15.900	2.860	14.300	2.290	9.600	1.540
R2,5	16.600	5.310	14.600	3.800	12.700	3.300	11.500	2.760	7.600	1.820
R3	13.800	5.520	12.200	3.900	10.600	3.390	9.600	2.690	6.400	1.790
R4	10.400	4.990	9.200	3.680	8.000	3.200	7.200	2.590	4.800	1.730
R5	8.900	4.630	8.000	3.520	7.000	3.080	6.400	2.560	4.500	1.800
R6	8.000	4.480	7.200	3.460	6.400	3.070	5.800	2.320	4.200	1.680

Depth of cut	~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
	ap	Pf	ap	Pf	ap	Pf	ap	Pf	ap	Pf
	0,1D	0,2D	0,08D	0,2D			0,05D	0,1D		

1. Use a rigid and precise machine and holder.
2. We suggest using air blow or MQL (mist).
3. These milling conditions are for an end mill where the tool extension length is 4 times the diameter of the end mill. When length of the tool extension from the machine is long, reduce the speed and feed and milling depth.
4. The above condition shows an approximate standard for contouring operation (side milling) with a low machining load. If abnormal cutting sounds, vibration or chattering occur depending on the machining shape, cutting amount, rigidity of the machine or work holding condition, etc., please adjust the speed, feed and the depth of cut.
5. When the radius of curvature is less than 1.5 times the tool diameter, please reduce the speed to 50-80%, the feed rate to 50-80%, and the pick feed to 20-60% of the above shown cutting conditions.
6. When the machining incline angle (β) is more than 15° please reduce the speed to 40-60%, the feed 30-50%, and the axial cutting depth to 30-60% of the above shown cutting conditions.
7. If the cutting depth is small, it is possible to further increase the speed and feed.

AE-BM-H

High Speed Finishing

The machining path is on condition of contouring line operation.

R	~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)
R1	40.610	6.500	37.020	3.700	33.440	2.680	27.470	2.200	20.300	1.620
R1,5	27.070	5.410	24.680	3.460	22.290	2.670	18.310	2.200	13.540	1.620
R2	24.360	5.850	22.210	4.000	20.060	3.210	16.480	2.640	12.180	1.950
R2,5	19.490	6.240	17.770	4.620	16.050	3.850	13.180	3.160	9.750	2.340
R3	16.240	6.500	14.810	4.740	13.380	3.750	10.990	3.080	8.120	2.270
R4	12.180	5.850	11.110	4.440	10.030	3.210	8.240	2.640	6.090	1.950
R5	10.320	5.370	9.460	4.160	8.600	3.100	7.170	2.580	5.450	1.960
R6	9.080	5.080	8.360	4.010	7.640	3.060	6.210	2.480	5.020	2.010

Depth of cut	~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
	ap	Pf	ap	Pf	ap	Pf	ap	Pf	ap	Pf
							0,02D	0,05D		

1. Use a rigid and precise machine and holder.
2. We suggest using air blow or MQL (mist).
3. These milling conditions are for an end mill where the tool extension length is 4 times the diameter of the end mill. When length of the tool extension from the machine is long, reduce the speed and feed and milling depth.
4. The above condition shows an approximate standard for contouring operation (side milling) with a low machining load. If abnormal cutting sounds, vibration or chattering occur depending on the machining shape, cutting amount, rigidity of the machine or work holding condition, etc., please adjust the speed, feed and the depth of cut.
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6. When the machining incline angle (β) is more than 15° please reduce the speed to 40-60%, the feed 30-50%, and the axial cutting depth to 30-60% of the above shown cutting conditions.
7. If the cutting depth is small, it is possible to further increase the speed and feed.

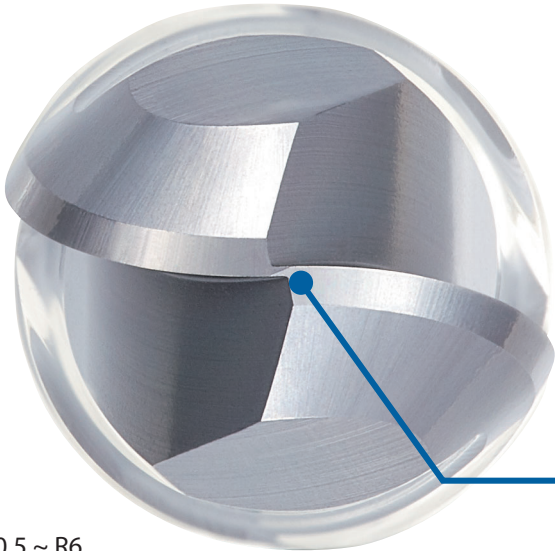
Milling | Solid carbide



KEY FEATURES & BENEFITS

AE-BD-H

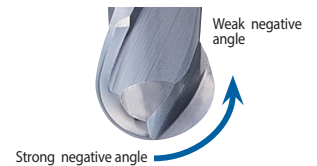
2-flute high-precision finishing Carbide ball end mill for high hardness steel



R0,5 ~ R6
total 17 items

Variable negative spiral gash

Controls chipping with larger negative angle at tip of cutting edge. While securing cutting quality by making the negative angle weaker near the outer periphery, chipping resistance is enhanced in combination with the weaker helix angle specification.

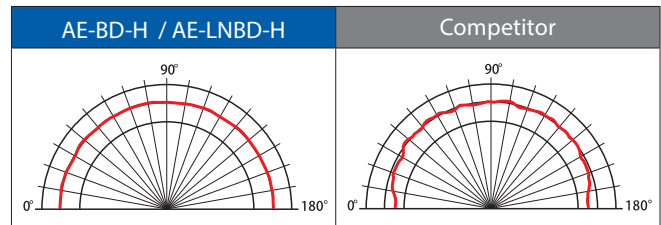


Thickness at the center

Thickening of the center core to prevent deformation of the ball tip and improve control of chipping.

Superior ball R precision

Secures stable R accuracy across 180°



Superior shank accuracy

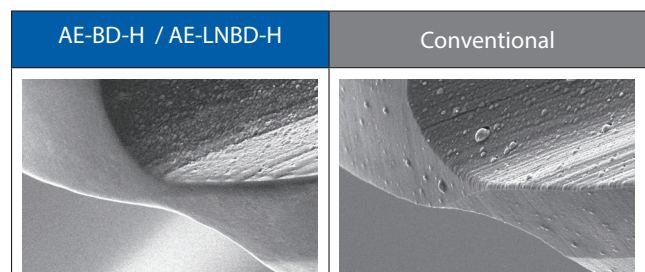
Supports h4 tolerance (0/-0.004)

Ideal for shrink fit holders

Lineup of short-shank type suitable for shrink fit holders are also available.

Smooth Surface Treatment

Improves surface accuracy by smoothing the coating surface.

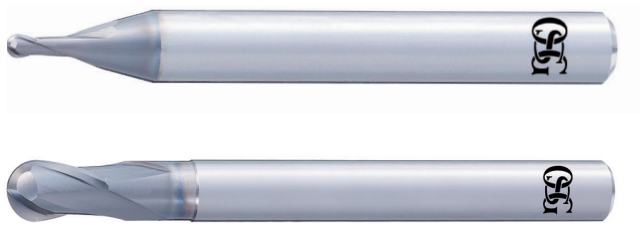


Milling | Solid carbide

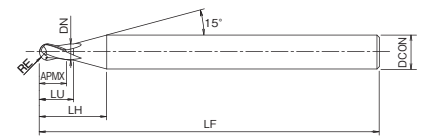


AE-BD-H

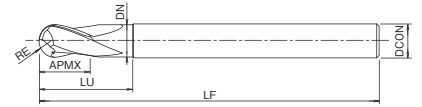
Milling | Solid carbide



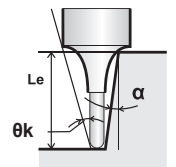
Type 1



Type 2



- First choice in quality and performance
- For high hardness materials
- 2 flutes, ball nose



EDP	Short Shank	ZEFP	DC	RE	LU	LF	APMX	LH	DCON	DN	θk	Effective length by inclined angles Le (α)*					Type	Price
												0,5°	1°	1,5°	2°	3°		
3042001	-	2	1	0,5	2	50	0,8	7,6	4	0,95	11,71°	2,05°	2,1°	2,16°	2,22°	2,35°	1	
3042002	-	2	1,5	0,75	3	50	1,2	7,8	4	1,45	10,03°	3,13°	3,25°	3,35°	3,44°	3,65°	1	
3042003	-	2	2	1	4	50	1,6	11,9	6	1,95	10,64°	4,22°	4,44°	4,65°	4,85°	5,25°	1	
3042004	-	2	3	1,5	6	60	2,4	11,8	6	2,85	8,15°	6,25°	6,49°	6,72°	6,94°	7,36°	1	
3042005	-	2	4	2	8-4	60	3,2	-	4	3,85	-	-	-	-	-	-	2	
3042006	-	2	4	2	8	70	3,2	12	6	3,85	5,65°	8,32°	8,62°	8,9°	9,15°	9,71°	1	
3042007	o	2	4	2	8-5	45	3,2	12	6	3,85	5,65°	8,32°	8,62°	8,9°	9,15°	9,71°	1	
3042008	-	2	5	2,5	10	80	4	12,1	6	4,80	2,92°	10,36°	10,69°	10,99°	11,3°	-	1	
3042009	o	2	5	2,5	10-5	50	4	12,1	6	4,80	2,92°	10,36°	10,69°	10,99°	11,3°	-	1	
3042010	-	2	6	3	18	90	9	-	6	5,80	-	-	-	-	-	-	2	
3042011	o	2	6	3	18-5	55	9	-	6	5,80	-	-	-	-	-	-	2	
3042012	-	2	8	4	24	100	12	-	8	7,70	-	-	-	-	-	-	2	
3042013	o	2	8	4	24-5	75	12	-	8	7,70	-	-	-	-	-	-	2	
3042014	-	2	10	5	30	100	15	-	10	9,70	-	-	-	-	-	-	2	
3042015	o	2	10	5	30-5	75	15	-	10	9,70	-	-	-	-	-	-	2	
3042016	-	2	12	6	36	110	18	-	12	11,70	-	-	-	-	-	-	2	
3042017	o	2	12	6	36-5	80	18	-	12	11,70	-	-	-	-	-	-	2	

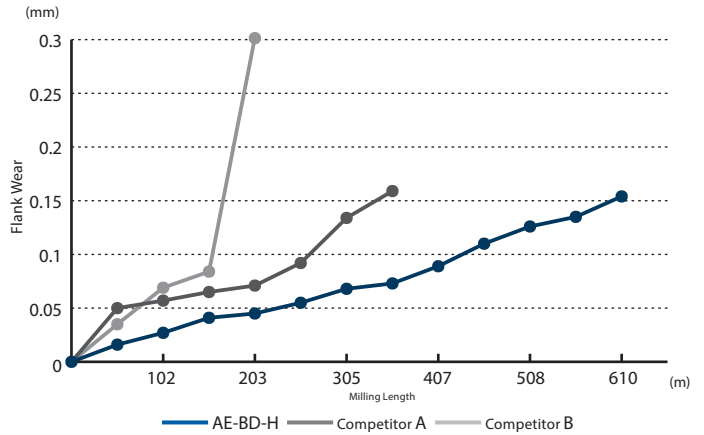
* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.



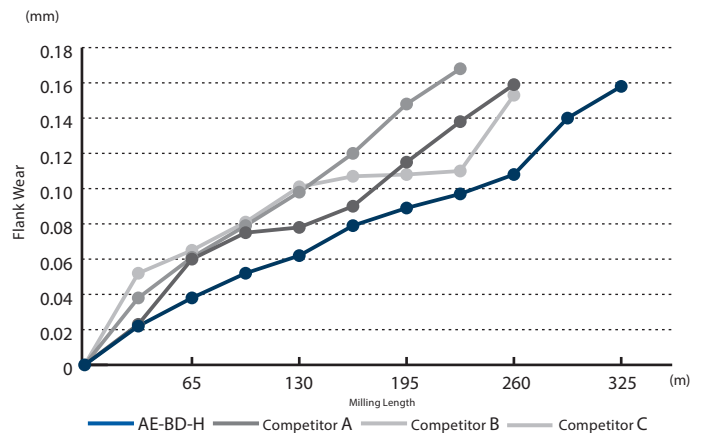
Long tool life

Exhibits superior endurance in high-hardness steel milling.

Tool	AE-BD-H R5X30	Competitor
Work Material	SKD11 (60HRC)	
Milling method	Pocket milling	
Cutting Speed	150m/min (4.800 min ⁻¹)	
Feed Rate	870mm/min (0,09 mm/t)	
Depth of Cut	ap = 0,2mm Pf = 0,5mm	
Coolant	Air Blow	
Machine	Horizontal Machining Center (HSK63)	



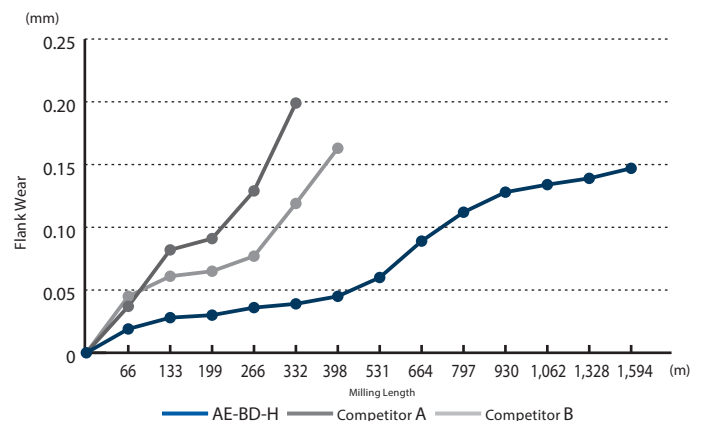
Tool	AE-BD-H R5X30	Competitor
Work Material	SKH51 (65HRC)	
Milling method	Pocket milling	
Cutting Speed	120m/min (3.850 min ⁻¹)	
Feed Rate	700mm/min (0,09 mm/t)	
Depth of Cut	ap = 0,2mm Pf = 0,5mm	
Coolant	Air Blow	
Machine	Horizontal Machining Center (HSK63)	



High speed milling

Enables stable machining even in high-speed milling of STAVAX (53 HRC)

Tool	AE-BD-H R5X30	Competitor
Work Material	STAVAX (53HRC)	
Milling method	Pocket milling	
Cutting Speed	300m/min (9.550 min ⁻¹)	
Feed Rate	2.670mm/min (0,14 mm/t)	
Depth of Cut	ap = 0,2mm Pf = 0,5mm	
Coolant	Air Blow	
Machine	Horizontal Machining Center (HSK63)	



CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-BD-H

Finishing

The machining path is on condition of contouring line operation.

R	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80		Hardened Steel							
	~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)
R0,5	38.400	2.350	38.400	2.350	38.400	2.000	38.400	1.600	38.400	1.450
R0,75	38.400	3.050	38.400	3.050	38.400	2.500	31.800	1.900	25.200	1.450
R1	38.400	3.600	38.400	3.550	28.800	2.200	24.000	1.750	19.200	1.250
R1,5	31.800	4.000	25.200	3.200	19.200	2.000	16.200	1.600	12.600	1.200
R2	24.000	3.650	19.200	2.950	14.400	1.900	11.900	1.500	9.500	1.150
R2,5	19.200	3.500	15.000	2.650	11.500	1.700	9.500	1.350	7.600	1.000
R3	16.200	3.350	12.600	2.300	9.500	1.550	8.000	1.250	6.400	955
R4	11.900	2.850	9.500	2.050	7.100	1.350	5.900	1.050	4.800	830
R5	9.500	2.550	7.600	1.800	5.800	1.150	4.800	875	3.800	700
R6	8.000	2.400	6.400	1.650	4.800	955	4.000	795	3.200	635

Depth of cut		~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
		ap	Pf	ap	Pf	ap	Pf	ap	Pf	ap	Pf
		0,05D	0,1D			0,03D	0,1D			0,02D	0,05D

AE-BD-H

High speed Finishing

The machining path is on condition of contouring line operation.

R	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80		Hardened Steel							
	~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)
R0,5	50.000	3.700	50.000	3.700	50.000	3.100	50.000	2.600	50.000	2.400
R0,75	50.000	4.800	50.000	4.800	50.000	3.900	50.000	3.050	38.400	2.300
R1	50.000	5.600	50.000	5.350	48.000	3.650	38.400	2.800	28.800	2.100
R1,5	49.800	6.200	38.400	4.800	31.800	3.350	25.200	2.550	19.200	1.900
R2	37.200	5.700	28.800	4.400	24.000	3.200	19.200	2.400	14.400	1.800
R2,5	30.000	5.450	22.800	4.000	19.200	2.850	15.600	2.150	11.500	1.600
R3	24.600	5.200	19.200	3.450	16.200	2.550	12.600	2.050	9.500	1.550
R4	18.600	4.450	14.400	3.050	11.900	2.250	9.500	1.800	7.100	1.350
R5	15.000	3.950	11.500	2.650	9.500	1.900	7.600	1.550	5.800	1.150
R6	12.600	3.700	9.500	2.500	8.000	1.600	6.400	1.350	4.800	995

Depth of cut		~45HRC		~55HRC		~62HRC		~66HRC		~70HRC	
		ap	Pf	ap	Pf	ap	Pf	ap	Pf	ap	Pf
		0,02D	0,05D					0,01D	0,05D		

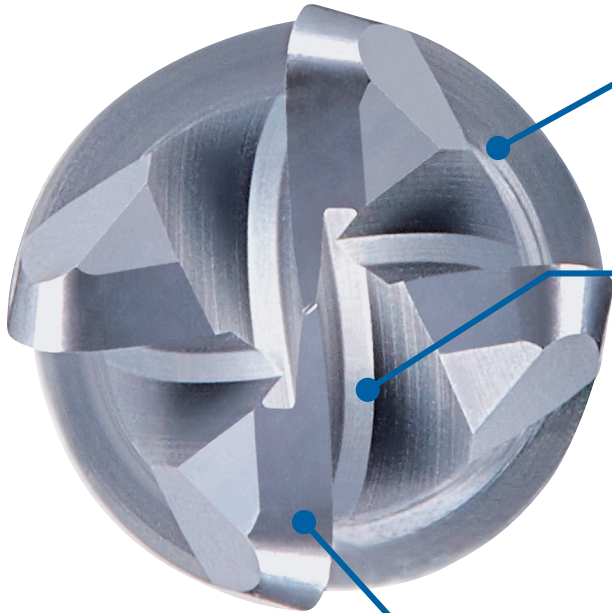
1. Use a rigid and precise machine and holder.
2. We suggest using air blow or MQL (mist).
3. These milling conditions are for an end mill where the tool extension length is 4 times the diameter of the end mill. When length of the tool extension from the machine is long, reduce the speed and feed and milling depth.
4. The above condition shows an approximate standard for contouring operation (side milling) with a low machining load. If abnormal cutting sounds, vibration or chattering occur depending on the machining shape, cutting amount, rigidity of the machine or work holding condition, etc., please adjust the speed, feed and the depth of cut.
5. When the radius of curvature is less than 1.5 times the tool diameter, please reduce the speed to 50-80%, the feed rate to 50-80%, and the pick feed to 20-60% of the above shown cutting conditions.
6. When the machining incline angle (β) is more than 15°, please reduce the speed to 40-60%, the feed 30-50%, and the axial cutting depth to 30-60% of the above shown cutting conditions.
7. If the cutting depth is small, it is possible to further increase the speed and feed.



KEY FEATURES & BENEFITS

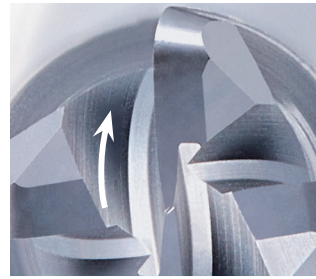
AE-CPR4-H

4-flute high-efficiency finishing long neck carbide radius end mill for high-hardness steel

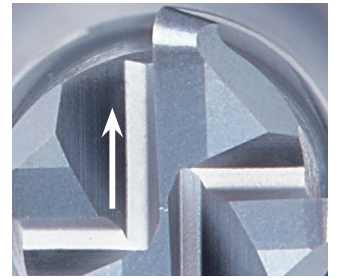


New spiral-shaped gash specification

The new gash specification with a spiral shape from the center to the corner R improves chip evacuation and prevents chips from getting caught



AE-CPR4-H



Conventional

*Applicable to sizes with an outer diameter of $\theta 1$ or more and a corner R exceeding R0.1

Milling | Solid carbide

Superior R precision

High precision corner R with R accuracy of ± 0.005



Superior shank accuracy

Supports h4 tolerance (0/-0.004)



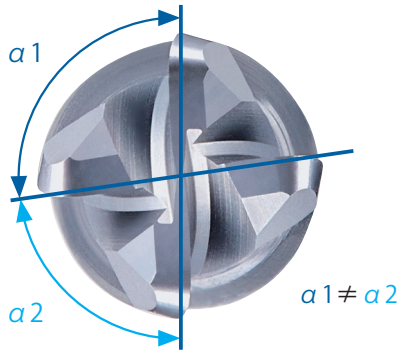
KEY FEATURES & BENEFITS

Achieves high efficiency milling with 4-flute specification

4-flute configuration for all sizes

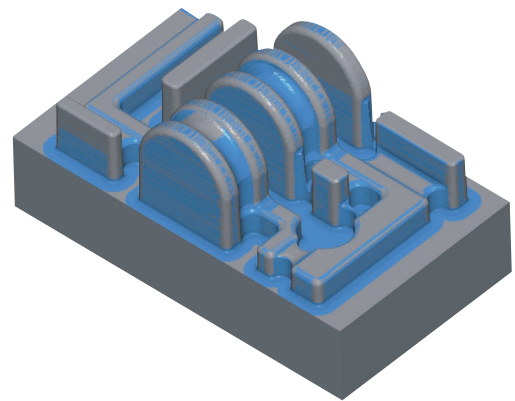
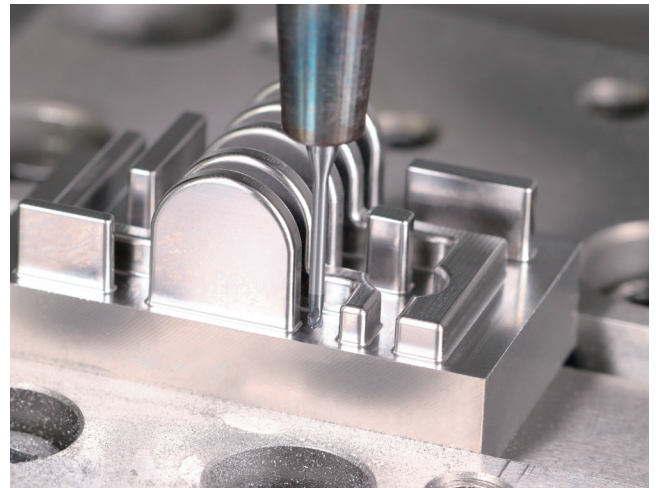
Unequal spacing teeth suppresses chattering

Achieves highly efficient machining by the suppression of chattering even in deep milling of $L/D = 14$



Tool	AE-CPR4-H Ø2 X R0.3 X 20
Work Material	SKD61 (50HRC)
Milling method	Contour Milling
Cutting Speed	58m/min (9.300 min ⁻¹)
Feed	1.300mm/min (0,035 mm/t)
Depth of Cut	ap = 0,05mm Pf = 0,36mm
Overhang Length	28mm (L/D=14)
Coolant	Air Blow
Machine	Vertical Machining Center (HSK-A63)

Processed shape

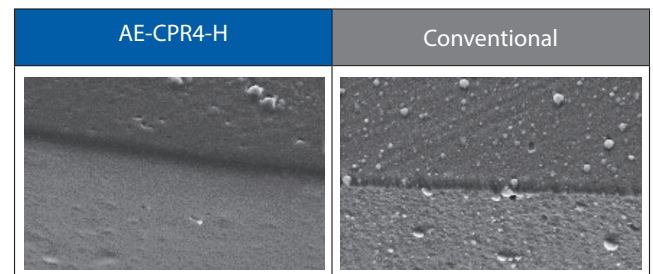


Smooth Surface Treatment

Improves surface accuracy by smoothing the coating surface

Abundant Variations

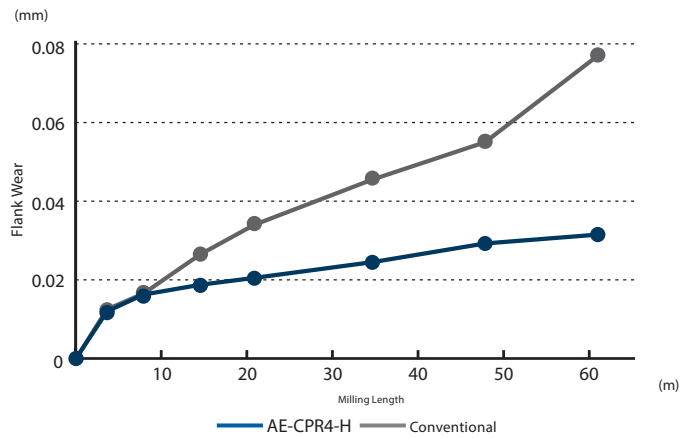
206 items (Ø0.2 to Ø4) are available to accommodate a wide range of applications



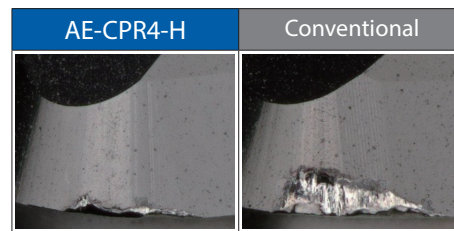
Stable Performance

Highly efficient and excellent durability in high hardness steel

Tool	AE-CPR4-H Ø2 x R0,3 x 8	Conventional 2 flutes
Work Material	SKD11 (60HRC)	
Milling method	Frontal milling	
Cutting Speed	72m/min (11.500 min ⁻¹)	
Feed Rate	2.000mm/min (0,043 mm/t)	1.000mm/min (0,043 mm/t)
Depth of Cut	ap = 0,036mm ae = 0,48mm	
Coolant	Air Blow	
Machine	Vertical Machining Center (BT40)	



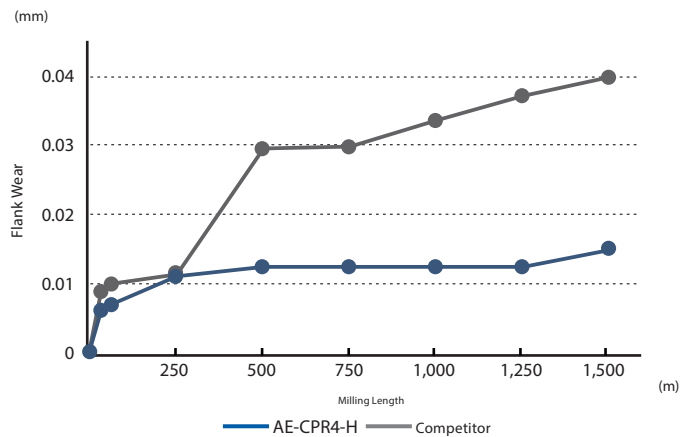
Wear comparison of the cutting edge after milling 61.2 m



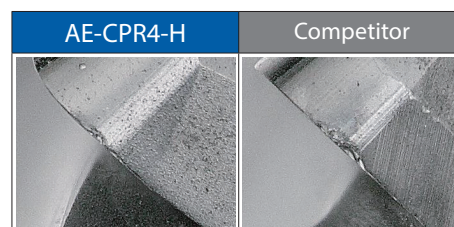
Long Tool Life

Stable wear transition in pre-hardened steel NAK80 (40 HRC)

Tool	AE-CPR4-H Ø3 x R0,5 x 20
Work Material	NAK80 (40HRC)
Milling method	Frontal milling
Cutting Speed	120m/min (12.730 min ⁻¹)
Feed Rate	1.782mm/min (0,035 mm/t)
Depth of Cut	ap = 0,04mm ae = 0,734mm
Coolant	Air Blow
Machine	Vertical Machining Center (BT40)



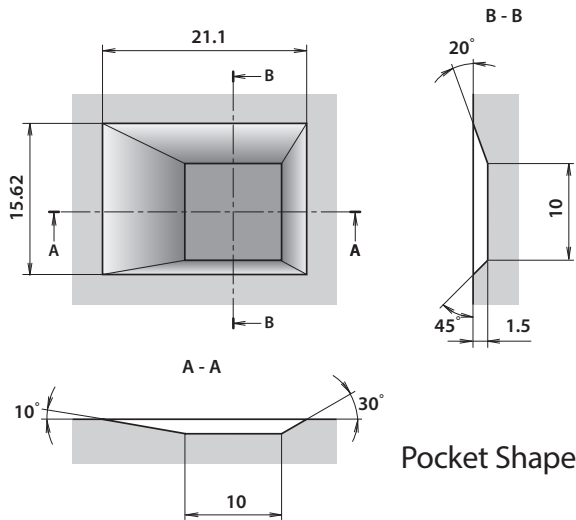
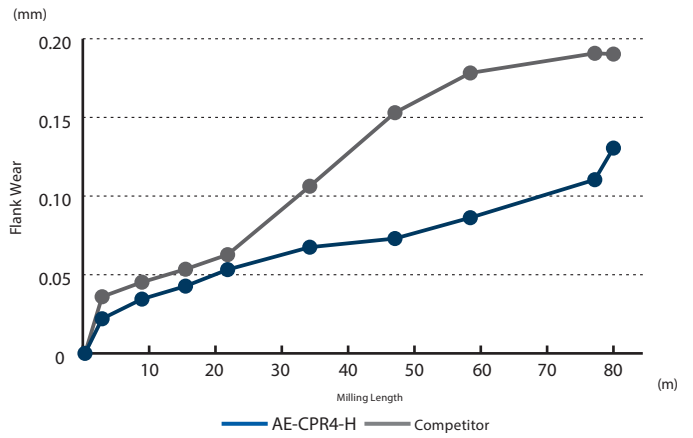
Wear comparison of the cutting edge after milling 1.512 m



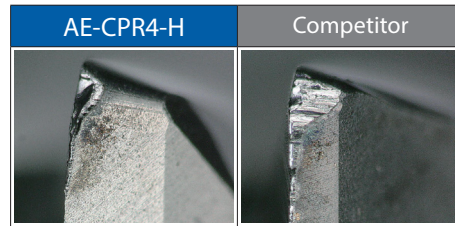
Stable Performance

Achieves excellent durability and machined surface accuracy in profiling of high-hardness steel

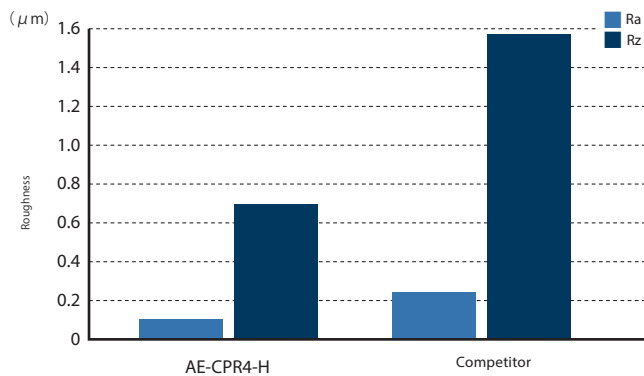
Tool	AE-CPR4-H Ø3 x R0,5 x 8
Work Material	SKD11 (60HRC)
Milling method	Pocket milling
Cutting Speed	79m/min (8.400 min ⁻¹)
Feed Rate	540mm/min (0,016 mm/t)
Depth of Cut	ap = 0,04mm ae = 14mm
Coolant	Air Blow
Machine	Vertical Machining Center (BT40)



Wear comparison of the cutting edge after milling 80,2 m



Bottom surface roughness after milling 80,2m



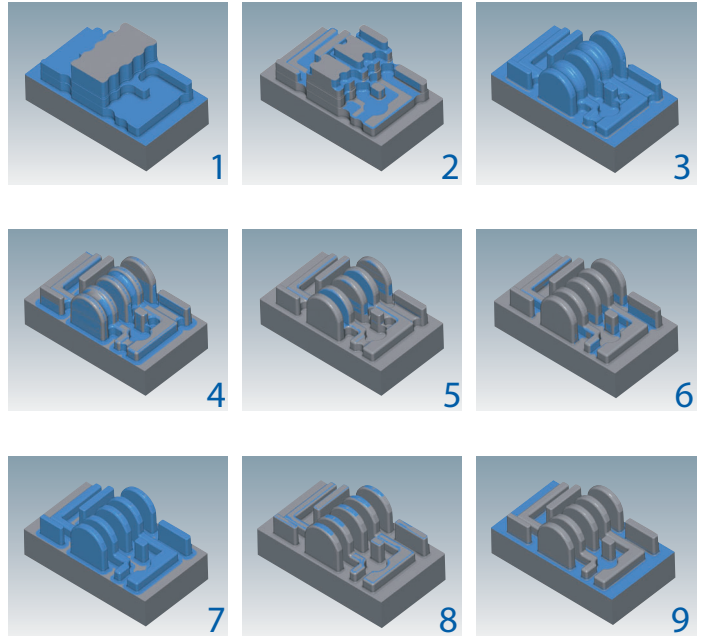
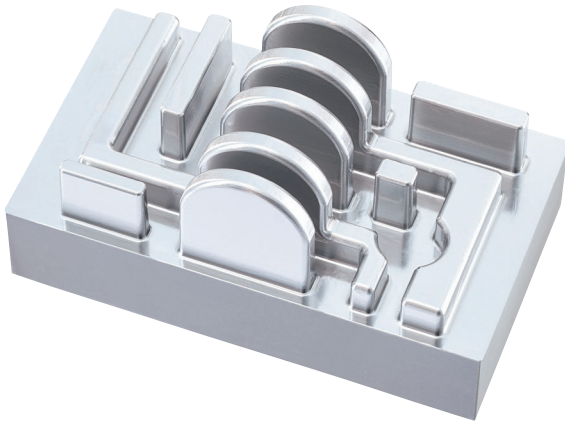
Good machined surface roughness even when milling long distance



CUTTING DATA

Highly efficient deep milling at L/D = 14 with narrow groove width

Work Material: SKD61(50HRC)
 Coolant: Air Blow
 Machine: Vertical Machining center
 Main Spindle: HSK-A63
 Maximum RPM: 20.000 min⁻¹
 Holder: Shrink Fit



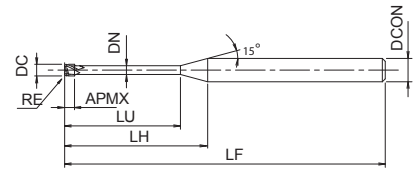
Process	Milling part	Milling method	Milling process	Tool	Overhang Length (mm)	Cutting Speed (m/min)	Feed (mm/min)	ap (mm)	ae (mm)
1	Overall	Contour Milling	High-efficiency roughing	AE-MS-H Ø6 x R0,3	30	90 (4.780min ⁻¹)	1.720 (0,06mm/t)	9	0,5
2	Overall	Contour Milling	Roughing	AE-MS-H Ø4 x R1	20	90 (7.170min ⁻¹)	1.150 (0,04mm/t)	5	0,2
3	Overall	Contour Milling	High-efficiency roughing	PHX-LN-DFR Ø4 x R1 x 20	25	75 (6.000min ⁻¹)	1.250 (0,069mm/t)	0,14	0,7
4	Overall	Contour Milling	High-efficiency roughing	AE-CPR4-H Ø2 x R0,3 x 20	28	58 (9.300min ⁻¹)	1.300 (0,035mm/t)	0,05	0,36
5	Upper R	Contour Milling	Leftover Milling					0,05	0,36
6	Corner R	Contour Milling	Leftover Milling					0,05	0,36
7	Shape	Contour Milling	Finishing					0,012	0,36
8	Upper Shape	Linear Milling	Finishing	AE-LNBD-H R1 x 22 x 4	30	68 (10.800min ⁻¹)	860 (0,04mm/t)	0,03	0,1
9	Bottom	Flat surface Milling	Finishing	AE-CPR4-H Ø2 x R0,3 x 20	28	38 (6.000min ⁻¹)	1.300 (0,054mm/t)	0,012	0,1

Milling | Solid carbide

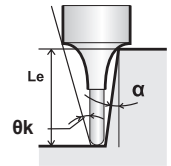


AE-CPR4-H NEW SIZES

Milling | Solid carbide



- First choice in quality and performance
- Carbide end mill with DUOREY coating
- For hardened material up to 70HRC
- 4 flutes, unequal spacing. New spiral-shaped gash specification
- 206 sizes



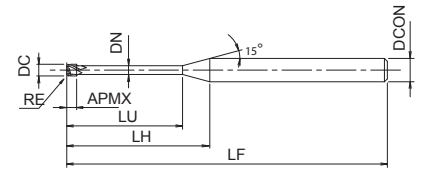
EDP	DC	RE	LU	APMX	DCON	DN	LF	LH	θk	Le (α=0,5°)	Le (α=1°)	Le (α=1,5°)	Le (α=2°)	Le (α=3°)	ZEFP
8557470	0,2	0,02	0,5	0,15	4	0,18	45	7,7	13,88	0,53	0,57	0,61	0,65	0,73	4
8557471	0,2	0,02	1	0,15	4	0,18	45	8,2	13,07	1,06	1,13	1,2	1,26	1,38	4
8557472	0,2	0,02	1,5	0,15	4	0,18	45	8,7	12,34	1,6	1,69	1,77	1,85	2	4
8557473	0,2	0,02	2	0,15	4	0,18	45	9,2	11,69	2,12	2,24	2,33	2,43	2,62	4
8557474	0,2	0,05	0,5	0,15	4	0,18	45	7,7	13,93	0,53	0,56	0,6	0,64	0,72	4
8557475	0,2	0,05	1	0,15	4	0,18	45	8,2	13,11	1,06	1,13	1,19	1,25	1,37	4
8557476	0,2	0,05	1,5	0,15	4	0,18	45	8,7	12,37	1,59	1,68	1,77	1,84	1,99	4
8557477	0,2	0,05	2	0,15	4	0,18	45	9,2	11,72	2,12	2,23	2,33	2,42	2,61	4
8557478	0,3	0,02	1	0,25	4	0,28	45	8	13,02	1,06	1,13	1,2	1,26	1,38	4
8557479	0,3	0,02	1,5	0,25	4	0,28	45	8,5	12,28	1,6	1,69	1,77	1,85	2	4
8557480	0,3	0,02	2	0,25	4	0,28	45	9	11,62	2,12	2,24	2,33	2,43	2,62	4
8557481	0,3	0,02	2,5	0,25	4	0,28	45	9,5	11,02	2,65	2,78	2,89	3	3,24	4
8557482	0,3	0,02	3	0,25	4	0,28	45	10	10,48	3,18	3,32	3,45	3,58	3,87	4
8557483	0,3	0,05	1	0,25	4	0,28	45	8	13,06	1,06	1,13	1,19	1,25	1,37	4
8557484	0,3	0,05	1,5	0,25	4	0,28	45	8,5	12,32	1,59	1,68	1,77	1,84	1,99	4
8557485	0,3	0,05	2	0,25	4	0,28	45	9	11,65	2,12	2,23	2,33	2,42	2,61	4
8557486	0,3	0,05	2,5	0,25	4	0,28	45	9,5	11,05	2,65	2,78	2,89	3	3,24	4
8557487	0,3	0,05	3	0,25	4	0,28	45	10	10,51	3,18	3,32	3,44	3,57	3,86	4
8557488	0,4	0,02	1	0,3	4	0,37	45	8,2	12,41	1,08	1,17	1,28	1,38	1,62	4
8557489	0,4	0,02	1,5	0,3	4	0,37	45	8,7	11,71	1,62	1,76	1,89	2,03	2,32	4
8557490	0,4	0,02	2	0,3	4	0,37	45	9,2	11,09	2,16	2,33	2,5	2,67	3	4
8557491	0,4	0,02	2,5	0,3	4	0,37	45	9,7	10,53	2,7	2,9	3,1	3,29	3,66	4
8557492	0,4	0,02	3	0,3	4	0,37	45	10,2	10,03	3,24	3,47	3,69	3,9	4,31	4
8557493	0,4	0,02	4	0,3	4	0,37	45	11,2	9,15	4,31	4,59	4,85	5,1	5,57	4
8557494	0,4	0,05	1	0,3	4	0,37	45	8,2	12,45	1,08	1,17	1,27	1,37	1,6	4
8557495	0,4	0,05	1,5	0,3	4	0,37	45	8,7	11,75	1,62	1,75	1,89	2,03	2,31	4
8557496	0,4	0,05	2	0,3	4	0,37	45	9,2	11,12	2,16	2,33	2,49	2,66	2,99	4
8557497	0,4	0,05	2,5	0,3	4	0,37	45	9,7	10,56	2,7	2,9	3,09	3,28	3,65	4
8557498	0,4	0,05	3	0,3	4	0,37	45	10,2	10,05	3,24	3,46	3,68	3,89	4,3	4
8557499	0,4	0,05	4	0,3	4	0,37	45	11,2	9,17	4,31	4,59	4,85	5,1	5,56	4
8557500	0,4	0,1	1	0,3	4	0,37	45	8,2	12,51	1,07	1,16	1,26	1,36	1,58	4
8557501	0,4	0,1	2	0,3	4	0,37	45	9,2	11,18	2,16	2,32	2,48	2,65	2,98	4
8557502	0,4	0,1	3	0,3	4	0,37	45	10,2	10,1	3,23	3,46	3,67	3,88	4,29	4
8557503	0,4	0,1	4	0,3	4	0,37	45	11,2	9,21	4,3	4,58	4,84	5,09	5,55	4
8557504	0,5	0,02	1	0,4	4	0,46	45	8	12,39	1,08	1,17	1,26	1,37	1,59	4
8557505	0,5	0,02	2	0,4	4	0,46	45	9	11,04	2,16	2,32	2,48	2,64	2,97	4
8557506	0,5	0,02	3	0,4	4	0,46	45	10	9,96	3,23	3,45	3,67	3,87	4,27	4
8557507	0,5	0,02	4	0,4	4	0,46	45	11	9,07	4,3	4,57	4,83	5,07	5,53	4
8557508	0,5	0,02	5	0,4	4	0,46	45	12	8,32	5,36	5,68	5,98	6,25	6,77	4
8557509	0,5	0,02	6	0,4	4	0,46	45	13	7,69	6,42	6,79	7,11	7,41	8,02	4
8557510	0,5	0,05	1	0,4	4	0,46	45	8	12,43	1,08	1,16	1,26	1,36	1,58	4
8557511	0,5	0,05	2	0,4	4	0,46	45	9	11,08	2,15	2,31	2,47	2,64	2,96	4
8557512	0,5	0,05	3	0,4	4	0,46	45	10	9,99	3,23	3,45	3,66	3,87	4,27	4
8557513	0,5	0,05	4	0,4	4	0,46	45	11	9,09	4,3	4,57	4,82	5,07	5,52	4
8557514	0,5	0,05	5	0,4	4	0,46	45	12	8,34	5,36	5,68	5,97	6,25	6,77	4
8557515	0,5	0,05	6	0,4	4	0,46	45	13	7,71	6,42	6,79	7,11	7,41	8,01	4

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.

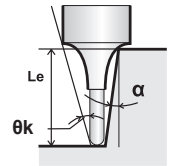


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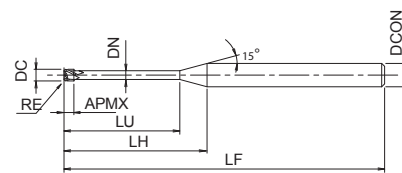
EDP	DC	RE	LU	APMX	DCON	DN	LF	LH	θk	Le (α=0,5°)	Le (α=1°)	Le (α=1,5°)	Le (α=2°)	Le (α=3°)	ZEFP
8557516	0,5	0,1	1	0,4	4	0,46	45	8	12,5	1,07	1,15	1,24	1,34	1,55	4
8557517	0,5	0,1	2	0,4	4	0,46	45	9	11,13	2,15	2,31	2,46	2,62	2,95	4
8557518	0,5	0,1	3	0,4	4	0,46	45	10	10,03	3,22	3,44	3,65	3,86	4,25	4
8557519	0,5	0,1	4	0,4	4	0,46	45	11	9,13	4,29	4,56	4,82	5,06	5,51	4
8557520	0,5	0,1	5	0,4	4	0,46	45	12	8,37	5,36	5,68	5,97	6,24	6,76	4
8557521	0,5	0,1	6	0,4	4	0,46	45	13	7,73	6,42	6,78	7,1	7,4	8	4
8544821	0,6	0,1	1	0,48	4	0,55	45	7,8	12,48	1,07	1,15	1,23	1,33	1,53	4
8557522	0,6	0,1	2	0,48	4	0,55	45	8,8	11,08	2,14	2,29	2,45	2,6	2,92	4
8557523	0,6	0,1	4	0,48	4	0,55	45	10,8	9,05	4,28	4,55	4,79	5,03	5,48	4
8557524	0,6	0,1	6	0,48	4	0,55	45	12,8	7,64	6,41	6,76	7,08	7,37	7,97	4
8557525	0,7	0,02	2	0,55	4	0,65	45	8,6	10,9	2,15	2,31	2,46	2,62	2,94	4
8557526	0,7	0,02	4	0,55	4	0,65	45	10,6	8,88	4,29	4,55	4,81	5,05	5,5	4
8557527	0,7	0,02	6	0,55	4	0,65	45	12,6	7,48	6,41	6,77	7,09	7,38	7,98	4
8557528	0,7	0,05	2	0,55	4	0,65	45	8,6	10,94	2,15	2,3	2,46	2,62	2,93	4
8557529	0,7	0,05	4	0,55	4	0,65	45	10,6	8,9	4,28	4,55	4,8	5,04	5,49	4
8557530	0,7	0,05	6	0,55	4	0,65	45	12,6	7,5	6,41	6,76	7,08	7,38	7,98	4
8557531	0,7	0,1	2	0,55	4	0,65	45	8,6	10,99	2,14	2,29	2,45	2,6	2,92	4
8557532	0,7	0,1	4	0,55	4	0,65	45	10,6	8,94	4,28	4,55	4,79	5,03	5,48	4
8557533	0,7	0,1	6	0,55	4	0,65	45	12,6	7,53	6,41	6,76	7,08	7,37	7,97	4
8544822	0,8	0,1	2	0,65	4	0,75	45	8,4	10,9	2,14	2,29	2,45	2,6	2,92	4
8557534	0,8	0,1	4	0,65	4	0,75	45	10,4	8,83	4,28	4,55	4,79	5,03	5,48	4
8557535	0,8	0,1	6	0,65	4	0,75	45	12,4	7,41	6,41	6,76	7,08	7,37	7,97	4
8544823	0,8	0,2	2	0,65	4	0,75	45	8,4	11,02	2,14	2,28	2,43	2,58	2,88	4
8557536	0,8	0,2	4	0,65	4	0,75	45	10,4	8,9	4,28	4,53	4,78	5,01	5,46	4
8557537	0,8	0,2	6	0,65	4	0,75	45	12,4	7,47	6,4	6,75	7,06	7,36	7,94	4
8557538	0,8	0,2	8	0,65	4	0,75	45	14,4	6,43	8,52	8,94	9,31	9,66	10,43	4
8557539	0,9	0,1	4	0,7	4	0,85	45	10,2	8,71	4,28	4,55	4,79	5,03	5,48	4
8557540	0,9	0,1	8	0,7	4	0,85	45	14,2	6,27	8,52	8,95	9,32	9,67	10,45	4
8544831	1	0,05	2	0,8	4	0,94	45	8	10,68	2,14	2,29	2,44	2,6	2,91	4
8557541	1	0,05	4	0,8	4	0,94	45	10	8,57	4,28	4,54	4,78	5,02	5,46	4
8557542	1	0,05	6	0,8	4	0,94	45	12	7,16	6,4	6,75	7,06	7,35	7,95	4
8557543	1	0,05	8	0,8	4	0,94	45	14	6,14	8,51	8,93	9,3	9,65	10,43	4
8557544	1	0,05	10	0,8	4	0,94	45	16	5,38	10,61	11,1	11,52	11,95	12,92	4
8557545	1	0,05	12	0,8	4	0,94	45	18	4,78	12,71	13,26	13,74	14,25	15,41	4
8544834	1	0,1	2	0,8	4	0,94	45	8	10,74	2,14	2,28	2,43	2,58	2,89	4
8557546	1	0,1	4	0,8	4	0,94	45	10	8,61	4,27	4,53	4,77	5,01	5,45	4
8557547	1	0,1	6	0,8	4	0,94	45	12	7,18	6,39	6,74	7,05	7,34	7,93	4
8557548	1	0,1	8	0,8	4	0,94	45	14	6,16	8,51	8,93	9,3	9,65	10,42	4
8557549	1	0,1	10	0,8	4	0,94	45	16	5,39	10,61	11,1	11,52	11,95	12,91	4
8557550	1	0,1	12	0,8	4	0,94	45	18	4,79	12,71	13,25	13,73	14,25	15,39	4
8544837	1	0,2	2	0,8	4	0,94	45	8	10,86	2,13	2,27	2,41	2,56	2,86	4
8557551	1	0,2	4	0,8	4	0,94	45	10	8,69	4,27	4,52	4,76	4,99	5,42	4
8557552	1	0,2	6	0,8	4	0,94	45	12	7,24	6,39	6,73	7,04	7,33	7,91	4
8557553	1	0,2	8	0,8	4	0,94	45	14	6,2	8,5	8,92	9,29	9,63	10,4	4
8557554	1	0,2	10	0,8	4	0,94	45	16	5,42	10,61	11,09	11,51	11,93	12,88	4
8557555	1	0,2	12	0,8	4	0,94	45	18	4,82	12,7	13,24	13,72	14,23	15,37	4

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.

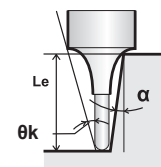
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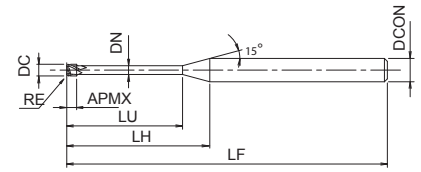
EDP	DC	RE	LU	APMX	DCON	DN	LF	LH	θk	Le (α=0,5°)	Le (α=1°)	Le (α=1,5°)	Le (α=2°)	Le (α=3°)	ZEFP	
8557556	1	0,2	16	0,8	4	0,94	55	22	3,94	16,89	17,53	18,16	18,83	20,34	4	
8557557	1	0,2	20	0,8	4	0,94	55	26	3,33	21,05	21,81	22,59	23,43	25,32	4	
8544840	NEW	1	0,3	2	0,8	4	0,94	45	8	10,98	2,12	2,26	2,39	2,54	4	
8557558	1	0,3	4	0,8	4	0,94	45	10	8,77	4,26	4,51	4,74	4,97	5,4	4	
8557559	1	0,3	6	0,8	4	0,94	45	12	7,3	6,38	6,72	7,03	7,31	7,89	4	
8557560	1	0,3	8	0,8	4	0,94	45	14	6,24	8,5	8,91	9,27	9,62	10,37	4	
8557561	1	0,3	10	0,8	4	0,94	45	16	5,46	10,6	11,08	11,5	11,92	12,86	4	
8557562	1	0,3	12	0,8	4	0,94	45	18	4,84	12,7	13,24	13,71	14,22	15,35	4	
8557563	1,2	0,2	6	1	4	1,14	45	11,6	6,98	6,39	6,73	7,04	7,33	7,91	4	
8557564	1,2	0,2	8	1	4	1,14	45	13,6	5,95	8,5	8,92	9,29	9,63	10,4	4	
8557565	1,2	0,2	10	1	4	1,14	45	15,6	5,19	10,61	11,09	11,51	11,93	12,88	4	
8557566	1,2	0,3	6	1	4	1,14	45	11,6	7,04	6,38	6,72	7,03	7,31	7,89	4	
8557567	1,2	0,3	8	1	4	1,14	45	13,6	5,99	8,5	8,91	9,27	9,62	10,37	4	
8557568	1,2	0,3	10	1	4	1,14	45	15,6	5,22	10,6	11,08	11,5	11,92	12,86	4	
8544858	NEW	1,5	0,1	4	1,2	4	1,43	45	9	7,95	4,26	4,52	4,75	4,98	4	
8544859	NEW	1,5	0,1	6	1,2	4	1,43	45	11	6,52	6,38	6,72	7,03	7,32	7,91	4
8544860	NEW	1,5	0,1	8	1,2	4	1,43	45	13	5,52	8,49	8,91	9,27	9,62	10,39	4
8544861	NEW	1,5	0,1	10	1,2	4	1,43	45	15	4,78	10,6	11,07	11,49	11,92	12,88	4
8544862	NEW	1,5	0,1	12	1,2	4	1,43	45	17	4,22	12,69	13,23	13,71	14,22	15,36	4
8544863	NEW	1,5	0,1	16	1,2	4	1,43	50	21	3,42	16,87	17,51	18,14	18,82	20,34	4
8544865	NEW	1,5	0,2	4	1,2	4	1,43	45	9	8,03	4,26	4,5	4,74	4,97	5,4	4
8557569	1,5	0,2	6	1,2	4	1,43	45	11	6,57	6,38	6,71	7,02	7,3	7,88	4	
8557570	1,5	0,2	8	1,2	4	1,43	45	13	5,56	8,49	8,9	9,26	9,6	10,37	4	
8557571	1,5	0,2	10	1,2	4	1,43	45	15	4,81	10,59	11,07	11,48	11,9	12,85	4	
8557572	1,5	0,2	12	1,2	4	1,43	45	17	4,25	12,69	13,22	13,7	14,2	15,34	4	
8557573	1,5	0,2	16	1,2	4	1,43	50	21	3,44	16,87	17,51	18,13	18,8	20,31	4	
8544867	NEW	1,5	0,3	4	1,2	4	1,43	45	9	8,12	4,25	4,49	4,72	4,95	5,37	4
8557574	1,5	0,3	6	1,2	4	1,43	45	11	6,63	6,37	6,7	7,01	7,29	7,86	4	
8557575	1,5	0,3	8	1,2	4	1,43	45	13	5,6	8,48	8,89	9,25	9,59	10,34	4	
8557576	1,5	0,3	10	1,2	4	1,43	45	15	4,85	10,59	11,06	11,47	11,89	12,83	4	
8557577	1,5	0,3	12	1,2	4	1,43	45	17	4,27	12,68	13,21	13,69	14,19	15,32	4	
8557578	1,5	0,3	16	1,2	4	1,43	50	21	3,45	16,86	17,5	18,12	18,79	20,29	4	
8544889	NEW	2	0,1	4	1,6	4	1,92	50	8,1	7,13	4,26	4,5	4,74	4,96	5,39	4
8557579	2	0,1	8	1,6	4	1,92	50	12,1	4,77	8,48	8,89	9,25	9,59	10,37	4	
8557580	2	0,1	10	1,6	4	1,92	50	14,1	4,09	10,58	11,05	11,47	11,89	12,85	4	
8557581	2	0,1	12	1,6	4	1,92	50	16,1	3,58	12,68	13,21	13,68	14,19	15,34	4	
8557582	2	0,1	16	1,6	4	1,92	50	20,1	2,87	16,85	17,49	18,12	18,79	-	4	
8557583	2	0,1	20	1,6	4	1,92	60	24,1	2,39	21,02	21,77	22,55	23,39	-	4	
8557584	2	0,1	25	1,6	4	1,92	60	29,1	1,98	26,2	27,12	28,09	-	-	4	
8544891	NEW	2	0,2	4	1,6	4	1,92	50	8,1	7,21	4,25	4,49	4,72	4,94	5,37	4
8557585	2	0,2	8	1,6	4	1,92	50	12,1	4,81	8,48	8,88	9,24	9,58	10,34	4	
8557586	2	0,2	10	1,6	4	1,92	50	14,1	4,12	10,58	11,05	11,46	11,88	12,83	4	
8557587	2	0,2	12	1,6	4	1,92	50	16,1	3,6	12,67	13,2	13,67	14,18	15,31	4	
8557588	2	0,2	16	1,6	4	1,92	50	20,1	2,88	16,85	17,48	18,11	18,78	-	4	
8557589	2	0,2	20	1,6	4	1,92	60	24,1	2,4	21,01	21,76	22,54	23,38	-	4	
8557590	2	0,2	25	1,6	4	1,92	60	29,1	1,99	26,2	27,11	28,08	-	-	4	

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.

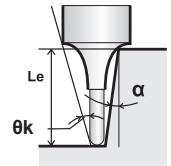


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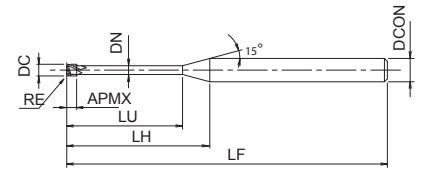
EDP	DC	RE	LU	APMX	DCON	DN	LF	LH	θk	Le (α=0,5°)	Le (α=1°)	Le (α=1,5°)	Le (α=2°)	Le (α=3°)	ZEFP
8544893	NEW 2	0,3	4	1,6	4	1,92	50	8,1	7,3	4,24	4,48	4,71	4,93	5,35	4
8557591	2	0,3	8	1,6	4	1,92	50	12,1	4,85	8,47	8,87	9,23	9,56	10,32	4
8557592	2	0,3	10	1,6	4	1,92	50	14,1	4,15	10,57	11,04	11,45	11,86	12,8	4
8557593	2	0,3	12	1,6	4	1,92	50	16,1	3,63	12,67	13,19	13,66	14,16	15,29	4
8557594	2	0,3	16	1,6	4	1,92	50	20,1	2,9	16,85	17,48	18,1	18,76	-	4
8557595	2	0,3	20	1,6	4	1,92	60	24,1	2,41	21,01	21,75	22,53	23,36	-	4
8544895	NEW 2	0,5	4	1,6	4	1,92	50	8,1	7,48	4,23	4,46	4,68	4,89	5,3	4
8557596	2	0,5	8	1,6	4	1,92	50	12,1	4,93	8,46	8,85	9,2	9,54	10,27	4
8557597	2	0,5	10	1,6	4	1,92	50	14,1	4,21	10,56	11,02	11,42	11,83	12,76	4
8557598	2	0,5	12	1,6	4	1,92	50	16,1	3,67	12,66	13,18	13,64	14,13	15,24	4
8557599	2	0,5	16	1,6	4	1,92	50	20,1	2,92	16,84	17,46	18,07	18,73	-	4
8557600	2	0,5	20	1,6	4	1,92	60	24,1	2,43	21	21,74	22,51	23,33	-	4
8557601	2	0,5	25	1,6	4	1,92	60	29,1	2,01	26,19	27,09	28,05	29,08	-	4
8557602	2,5	0,2	10	2	4	2,4	55	13,1	3,33	10,55	11,01	11,41	11,83	12,78	4
8557603	2,5	0,2	20	2	4	2,4	55	23,1	1,88	20,98	21,72	22,5	-	-	4
8557604	2,5	0,5	10	2	4	2,4	55	13,1	3,4	10,54	10,98	11,38	11,79	12,71	4
8557605	2,5	0,5	20	2	4	2,4	55	23,1	1,9	20,97	21,7	22,46	-	-	4
8544921	NEW 3	0,2	6	2,5	6	2,85	55	11,8	7,34	6,31	6,6	6,88	7,14	7,7	4
8557606	3	0,2	8	2,5	6	2,85	55	13,8	6,28	8,41	8,77	9,11	9,44	10,19	4
8557607	3	0,2	12	2,5	6	2,85	55	17,8	4,86	12,59	13,07	13,54	14,04	15,16	4
8557608	3	0,2	16	2,5	6	2,85	55	21,8	3,97	16,75	17,35	17,97	18,64	20,14	4
8557609	3	0,2	20	2,5	6	2,85	55	25,8	3,35	20,9	21,63	22,4	23,24	25,11	4
8557610	3	0,2	25	2,5	6	2,85	70	30,8	2,81	26,08	26,98	27,95	28,99	-	4
8557611	3	0,2	30	2,5	6	2,85	70	35,8	2,41	31,25	32,33	33,49	34,74	-	4
8557612	3	0,2	35	2,5	6	2,85	70	40,8	2,12	36,41	37,68	39,03	40,49	-	4
8544924	NEW 3	0,3	6	2,5	6	2,85	55	11,8	6	6,31	6,6	6,87	7,12	7,68	4
8557613	3	0,3	12	2,5	6	2,85	55	17,8	4,89	12,58	13,07	13,53	14,02	15,14	4
8557614	3	0,3	16	2,5	6	2,85	55	21,8	3,99	16,75	17,34	17,96	18,62	20,11	4
8557615	3	0,3	20	2,5	6	2,85	55	25,8	3,37	20,9	21,62	22,39	23,22	25,08	4
8557616	3	0,3	25	2,5	6	2,85	70	30,8	2,82	26,07	26,97	27,94	28,97	-	4
8557617	3	0,3	30	2,5	6	2,85	70	35,8	2,42	31,24	32,32	33,48	34,72	-	4
8557618	3	0,3	35	2,5	6	2,85	70	40,8	2,12	36,41	37,67	39,02	40,47	-	4
8544928	NEW 3	0,5	6	2,5	6	2,85	55	11,8	6	6,3	6,58	6,84	7,1	7,63	4
8557619	3	0,5	12	2,5	6	2,85	55	17,8	4,94	12,57	13,05	13,51	13,99	15,09	4
8557620	3	0,5	16	2,5	6	2,85	55	21,8	4,02	16,74	17,33	17,94	18,59	20,06	4
8557621	3	0,5	20	2,5	6	2,85	55	25,8	3,39	20,89	21,61	22,37	23,19	25,04	4
8557622	3	0,5	25	2,5	6	2,85	70	30,8	2,83	26,07	26,96	27,91	28,94	-	4
8557623	3	0,5	30	2,5	6	2,85	70	35,8	2,43	31,24	32,31	33,46	34,69	-	4
8557624	3	0,5	35	2,5	6	2,85	70	40,8	2,13	36,4	37,66	39	40,44	-	4
8544943	NEW 4	0,2	8	3,2	6	3,84	60	12	8	8,4	8,76	9,09	9,42	10,17	4
8544944	NEW 4	0,2	12	3,2	6	3,84	60	16	12	12,58	13,06	13,52	14,02	15,15	4
8557625	4	0,2	16	3,2	6	3,84	60	20	2,9	16,74	17,34	17,96	18,62	-	4
8557626	4	0,2	20	3,2	6	3,84	60	24	2,41	20,89	21,62	22,39	23,22	-	4
8557627	4	0,2	25	3,2	6	3,84	60	29	2	26,06	26,96	27,93	-	-	4
8557628	4	0,2	30	3,2	6	3,84	75	34	1,7	31,23	32,31	33,47	-	-	4
8557629	4	0,2	40	3,2	6	3,84	75	44	1,31	41,57	43,01	-	-	-	4

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.

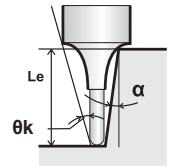
Milling | Solid carbide

AE-CPR4-H NEW SIZES

Milling | Solid carbide



- First choice in quality and performance
- Carbide end mill with DUREY coating
- For hardened material up to 70HRC
- 4 flutes, unequal spacing. New spiral-shaped gash specification
- 206 sizes



EDP	DC	RE	LU	APMX	DCON	DN	LF	LH	θk	Le (α=0,5°)	Le (α=1°)	Le (α=1,5°)	Le (α=2°)	Le (α=3°)	ZEFP
8544945	4	0,3	8	3,2	6	3,84	60	12	8	8,4	8,75	9,08	9,41	10,15	4
8544946	4	0,3	12	3,2	6	3,84	60	16	12	12,57	13,05	13,51	14,01	15,12	4
8557630	4	0,3	16	3,2	6	3,84	60	20	2,92	16,74	17,33	17,95	18,61	-	4
8557631	4	0,3	20	3,2	6	3,84	60	24	2,42	20,89	21,61	22,38	23,21	-	4
8557632	4	0,3	25	3,2	6	3,84	60	29	2	26,06	26,96	27,92	-	-	4
8557633	4	0,3	30	3,2	6	3,84	75	34	1,71	31,23	32,31	33,46	-	-	4
8557634	4	0,3	40	3,2	6	3,84	75	44	1,32	41,56	43	-	-	-	4
8544947	4	0,5	8	3,2	6	3,84	60	12	8	8,39	8,74	9,06	9,38	10,1	4
8544948	4	0,5	12	3,2	6	3,84	60	16	12	12,56	13,04	13,49	13,98	15,07	4
8557635	4	0,5	16	3,2	6	3,84	60	20	2,95	16,73	17,32	17,92	18,58	-	4
8557636	4	0,5	20	3,2	6	3,84	60	24	2,44	20,88	21,59	22,36	23,18	-	4
8557637	4	0,5	25	3,2	6	3,84	60	29	2,02	26,05	26,94	27,9	28,93	-	4
8557638	4	0,5	30	3,2	6	3,84	75	34	1,72	31,22	32,29	33,44	-	-	4
8557639	4	0,5	40	3,2	6	3,84	75	44	1,32	41,56	42,99	-	-	-	4
8557640	4	0,5	50	3,2	6	3,84	90	54	1,08	51,89	53,69	-	-	-	4
8544949	4	1	8	3,2	6	3,84	60	12	8	8,36	8,7	9	9,31	9,98	4
8544950	4	1	12	3,2	6	3,84	60	16	12	12,54	13	13,44	13,9	14,96	4
8557641	4	1	16	3,2	6	3,84	60	20	3,02	16,71	17,28	17,87	18,5	19,93	4
8557642	4	1	20	3,2	6	3,84	60	24	2,5	20,86	21,56	22,3	23,1	-	4
8557643	4	1	25	3,2	6	3,84	60	29	2,05	26,04	26,91	27,85	28,85	-	4
8557644	4	1	30	3,2	6	3,84	75	34	1,74	31,2	32,26	33,39	-	-	4
8557645	4	1	40	3,2	6	3,84	75	44	1,34	41,54	42,95	-	-	-	4

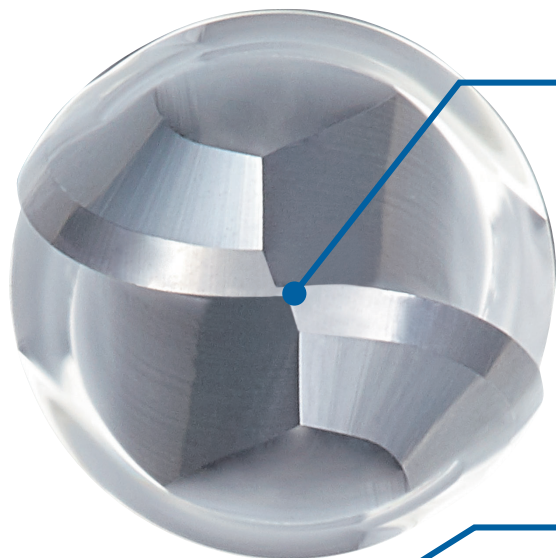
* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.



KEY FEATURES & BENEFITS

AE-LNBD-H

2 flutes high-precision finishing long neck Carbide ball end mill for high-hardness steel



Thickness at the center

Thickening of the center core to prevent deformation of the ball tip and improve control of chipping.

Smooth Surface Treatment

Improves surface accuracy by smoothing the coating surface (R0,3 or above).

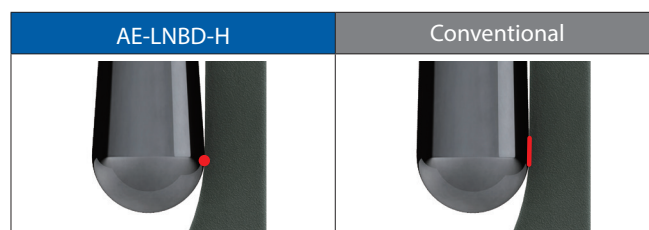
Superior ball R precision

Secures stable R accuracy across 180°



Teardrop-shaped outer periphery

Strong back taper geometry enables milling by point, which prevents chattering and chipping, resulting in improvement of surface accuracy.



Superior shank accuracy

Supports h4 tolerance (0/-0.004).

Abundant variations

261 items (R0.05 to R3) are available to accommodate a wide range of applications.

Milling | Solid carbide

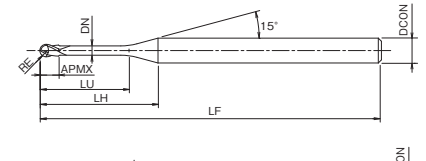


AE-LNBD-H

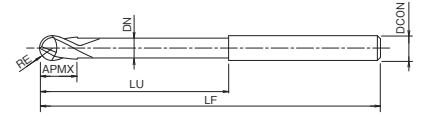
Milling | Solid carbide



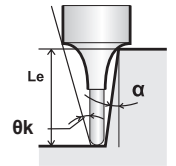
Type 1



Type 2



- First choice in quality and performance
- For high hardness materials
- 2 flutes, long neck type for high precision finishing



EDP	ZEFP	DC	RE	LU	LF	APMX	LH	DCON	DN	θk	Effective length by inclined angles Le (α)*					Type	Price
											0,5°	1°	1,5°	2°	3°		
3056100	2	0,1	0,05	0,2	45	0,08	7,5	4	0,095	14,69°	0,21	0,22	0,22	0,23	0,24	1	
3056101	2	0,1	0,05	0,3	45	0,08	7,6	4	0,095	14,52°	0,3	0,31	0,32	0,33	0,36	1	
3056102	2	0,1	0,05	0,5	45	0,08	7,8	4	0,095	14,16°	0,51	0,53	0,54	0,56	0,6	1	
3056103	2	0,2	0,1	0,3	45	0,16	7,4	4	0,19	14,55°	0,32	0,33	0,34	0,35	0,37	1	
3056104	2	0,2	0,1	0,5	45	0,16	7,6	4	0,19	14,18°	0,53	0,54	0,56	0,58	0,62	1	
3056105	2	0,2	0,1	0,75	45	0,16	7,9	4	0,19	13,74°	0,79	0,81	0,84	0,86	0,93	1	
3056106	2	0,2	0,1	1	45	0,16	8,1	4	0,19	13,33°	1,04	1,08	1,11	1,15	1,24	1	
3056107	2	0,2	0,1	1	45	0,16	11,8	6	0,19	13,86°	1,04	1,08	1,11	1,15	1,24	1	
3056108	2	0,2	0,1	1,25	45	0,16	8,4	4	0,19	12,94°	1,3	1,35	1,39	1,44	1,55	1	
3056109	2	0,2	0,1	1,5	45	0,16	8,6	4	0,19	12,58°	1,56	1,61	1,67	1,73	1,86	1	
3056110	2	0,2	0,1	1,75	45	0,16	8,9	4	0,19	12,23°	1,82	1,88	1,94	2,01	2,17	1	
3056111	2	0,2	0,1	2	45	0,16	9,1	4	0,19	11,9°	2,08	2,15	2,22	2,3	2,48	1	
3056112	2	0,2	0,1	2,5	45	0,16	9,6	4	0,19	11,29°	2,6	2,68	2,78	2,88	3,1	1	
3056113	2	0,2	0,1	3	45	0,16	10,1	4	0,19	10,74°	3,11	3,22	3,33	3,45	3,72	1	
3056114	2	0,3	0,15	0,5	45	0,24	7,4	4	0,29	14,24°	0,53	0,54	0,55	0,57	0,6	1	
3056115	2	0,3	0,15	0,6	45	0,24	7,5	4	0,29	14,06°	0,63	0,65	0,66	0,68	0,73	1	
3056116	2	0,3	0,15	0,75	45	0,24	7,7	4	0,29	13,79°	0,78	0,81	0,83	0,86	0,92	1	
3056117	2	0,3	0,15	1	45	0,24	7,9	4	0,29	13,36°	1,04	1,07	1,11	1,14	1,23	1	
3056118	2	0,3	0,15	1,25	45	0,24	8,2	4	0,29	12,96°	1,3	1,34	1,39	1,43	1,54	1	
3056119	2	0,3	0,15	1,5	45	0,24	8,4	4	0,29	12,59°	1,56	1,61	1,66	1,72	1,85	1	
3056120	2	0,3	0,15	1,5	45	0,24	12,2	6	0,29	13,34°	1,56	1,61	1,66	1,72	1,85	1	
3056121	2	0,3	0,15	1,75	45	0,24	8,7	4	0,29	12,23°	1,82	1,88	1,94	2,01	2,16	1	
3056122	2	0,3	0,15	2	45	0,24	8,9	4	0,29	11,89°	2,08	2,14	2,22	2,29	2,47	1	
3056123	2	0,3	0,15	2,25	45	0,24	9,2	4	0,29	11,57°	2,34	2,41	2,49	2,58	2,78	1	
3056124	2	0,3	0,15	2,5	45	0,24	9,4	4	0,29	11,27°	2,59	2,68	2,77	2,87	3,09	1	
3056125	2	0,3	0,15	3	45	0,24	9,9	4	0,29	10,71°	3,11	3,21	3,32	3,44	3,71	1	
3056126	2	0,3	0,15	3,5	45	0,24	10,4	4	0,29	10,2°	3,63	3,75	3,88	4,02	4,33	1	
3056127	2	0,3	0,15	4	45	0,24	10,9	4	0,29	9,74°	4,14	4,28	4,43	4,59	4,96	1	
3056128	2	0,3	0,15	4,5	45	0,24	11,4	4	0,29	9,31°	4,66	4,82	4,99	5,17	5,58	1	
3056129	2	0,3	0,15	5	45	0,24	11,9	4	0,29	8,93°	5,18	5,35	5,54	5,74	6,2	1	
3056130	2	0,4	0,2	0,5	45	0,30	7,3	4	0,38	14,27°	0,54	0,56	0,57	0,58	0,62	1	
3056131	2	0,4	0,2	0,75	45	0,30	7,5	4	0,38	13,8°	0,8	0,82	0,85	0,87	0,93	1	
3056132	2	0,4	0,2	0,8	45	0,30	7,6	4	0,38	13,71°	0,85	0,88	0,9	0,93	0,99	1	
3056133	2	0,4	0,2	1	45	0,30	7,8	4	0,38	13,37°	1,06	1,09	1,12	1,16	1,24	1	
3056134	2	0,4	0,2	1	45	0,30	11,5	6	0,38	13,91°	1,06	1,09	1,12	1,16	1,24	1	
3056135	2	0,4	0,2	1,5	45	0,30	8,3	4	0,38	12,57°	1,58	1,63	1,68	1,73	1,86	1	
3056136	2	0,4	0,2	2	45	0,30	8,8	4	0,38	11,86°	2,09	2,16	2,23	2,31	2,48	1	
3056137	2	0,4	0,2	2	45	0,30	12,5	6	0,38	12,82°	2,09	2,16	2,23	2,31	2,48	1	
3056138	2	0,4	0,2	2,5	45	0,30	9,3	4	0,38	11,22°	2,61	2,7	2,79	2,88	3,1	1	
3056139	2	0,4	0,2	3	45	0,30	9,8	4	0,38	10,65°	3,13	3,23	3,34	3,46	3,72	1	
3056140	2	0,4	0,2	3,5	45	0,30	10,3	4	0,38	10,14°	3,64	3,76	3,89	4,03	4,35	1	
3056141	2	0,4	0,2	4	45	0,30	10,8	4	0,38	9,67°	4,16	4,3	4,45	4,61	4,97	1	
3056142	2	0,4	0,2	4,5	45	0,30	11,3	4	0,38	9,24°	4,68	4,83	5	5,18	5,59	1	
3056143	2	0,4	0,2	5	45	0,30	11,8	4	0,38	8,85°	5,2	5,37	5,56	5,76	6,21	1	

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.



AE-LNBD-H

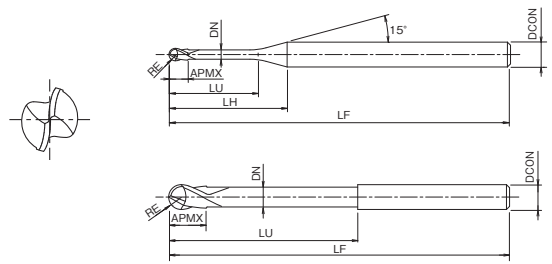
Milling | Solid carbide



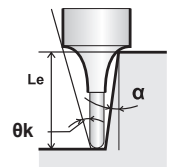
Type 1



Type 2



- First choice in quality and performance
- For high hardness materials
- 2 flutes, long neck type for high precision finishing



EDP	ZEFP	DC	RE	LU	LF	APMX	LH	DCON	DN	θk	Effective length by inclined angles Le (α)*					Type	Price
											0,5°	1°	1,5°	2°	3°		
3056144	2	0,4	0,2	5,5	45	0,30	12,3	4	0,38	8,49°	5,71	5,9	6,11	6,33	6,83	1	
3056145	2	0,4	0,2	6	45	0,30	12,8	4	0,38	8,15°	6,23	6,44	6,66	6,91	7,45	1	
3056146	2	0,5	0,25	0,75	45	0,40	7,3	4	0,48	13,85°	0,8	0,82	0,84	0,86	0,91	1	
3056147	2	0,5	0,25	1	45	0,40	7,6	4	0,48	13,4°	1,06	1,09	1,12	1,15	1,23	1	
3056148	2	0,5	0,25	1,5	45	0,40	8,1	4	0,48	12,58°	1,58	1,62	1,67	1,73	1,85	1	
3056149	2	0,5	0,25	2	45	0,40	8,6	4	0,48	11,85°	2,09	2,16	2,23	2,3	2,47	1	
3056150	2	0,5	0,25	2,5	45	0,40	9,1	4	0,48	11,2°	2,61	2,69	2,78	2,88	3,09	1	
3056151	2	0,5	0,25	3	45	0,40	9,6	4	0,48	10,62°	3,13	3,23	3,33	3,45	3,71	1	
3056152	2	0,5	0,25	3,5	45	0,40	10,1	4	0,48	10,09°	3,64	3,76	3,89	4,03	4,33	1	
3056153	2	0,5	0,25	4	45	0,40	10,6	4	0,48	9,61°	4,16	4,3	4,44	4,6	4,95	1	
3056154	2	0,5	0,25	4,5	45	0,40	11,1	4	0,48	9,18°	4,68	4,83	5	5,18	5,58	1	
3056155	2	0,5	0,25	5	45	0,40	11,6	4	0,48	8,78°	5,19	5,37	5,55	5,75	6,2	1	
3056156	2	0,5	0,25	5,5	45	0,40	12,1	4	0,48	8,41°	5,71	5,9	6,11	6,33	6,82	1	
3056157	2	0,5	0,25	6	45	0,40	12,6	4	0,48	8,08°	6,23	6,44	6,66	6,9	7,44	1	
3056158	2	0,5	0,25	7	45	0,40	13,6	4	0,48	7,48°	7,26	7,51	7,77	8,05	8,68	1	
3056159	2	0,5	0,25	8	45	0,40	14,6	4	0,48	6,97°	8,29	8,58	8,88	9,2	9,93	1	
3056160	2	0,5	0,25	9	45	0,40	15,6	4	0,48	6,52°	9,33	9,64	9,98	10,35	11,17	1	
3056161	2	0,5	0,25	10	45	0,40	16,6	4	0,48	6,12°	10,36	10,71	11,09	11,5	12,41	1	
3056162	2	0,6	0,3	0,75	45	0,50	7,2	4	0,55	13,8°	0,86	0,88	0,9	0,92	0,97	1	
3056163	2	0,6	0,3	1	45	0,50	7,4	4	0,55	13,34°	1,12	1,14	1,17	1,21	1,28	1	
3056164	2	0,6	0,3	1,2	45	0,50	7,6	4	0,55	12,99°	1,32	1,36	1,4	1,44	1,53	1	
3056165	2	0,6	0,3	1,5	45	0,50	7,9	4	0,55	12,5°	1,63	1,68	1,73	1,78	1,9	1	
3056166	2	0,6	0,3	2	45	0,50	8,4	4	0,55	11,76°	2,15	2,21	2,28	2,36	2,53	1	
3056167	2	0,6	0,3	2	45	0,50	12,2	6	0,55	12,78°	2,15	2,21	2,28	2,36	2,53	1	
3056168	2	0,6	0,3	2,5	45	0,50	8,9	4	0,55	11,1°	2,67	2,75	2,84	2,93	3,15	1	
3056169	2	0,6	0,3	3	45	0,50	9,4	4	0,55	10,51°	3,18	3,28	3,39	3,51	3,77	1	
3056170	2	0,6	0,3	3	45	0,50	13,2	6	0,55	11,83°	3,18	3,28	3,39	3,51	3,77	1	
3056171	2	0,6	0,3	3,5	45	0,50	9,9	4	0,55	9,98°	3,7	3,82	3,95	4,08	4,39	1	
3056172	2	0,6	0,3	4	45	0,50	10,4	4	0,55	9,5°	4,22	4,35	4,5	4,66	5,01	1	
3056173	2	0,6	0,3	4	45	0,50	14,2	6	0,55	11°	4,22	4,35	4,5	4,66	5,01	1	
3056174	2	0,6	0,3	4,5	45	0,50	10,9	4	0,55	9,06°	4,73	4,89	5,05	5,23	5,63	1	
3056175	2	0,6	0,3	5	45	0,50	11,4	4	0,55	8,67°	5,25	5,42	5,61	5,81	6,26	1	
3056176	2	0,6	0,3	5,5	45	0,50	11,9	4	0,55	8,3°	5,77	5,96	6,16	6,38	6,88	1	
3056177	2	0,6	0,3	6	45	0,50	12,4	4	0,55	7,96°	6,28	6,49	6,72	6,96	7,5	1	
3056178	2	0,6	0,3	6,5	45	0,50	12,9	4	0,55	7,65°	6,8	7,03	7,27	7,53	8,12	1	
3056179	2	0,6	0,3	7	45	0,50	13,4	4	0,55	7,37°	7,32	7,56	7,82	8,11	8,74	1	
3056180	2	0,6	0,3	7,5	45	0,50	13,9	4	0,55	7,1°	7,83	8,1	8,38	8,68	9,36	1	
3056181	2	0,6	0,3	8	45	0,50	14,4	4	0,55	6,85°	8,35	8,63	8,93	9,26	9,99	1	
3056182	2	0,6	0,3	8,5	45	0,50	14,9	4	0,55	6,62°	8,87	9,17	9,49	9,83	10,61	1	
3056183	2	0,6	0,3	9	45	0,50	15,4	4	0,55	6,41°	9,38	9,7	10,04	10,41	11,23	1	
3056184	2	0,6	0,3	9,5	45	0,50	15,9	4	0,55	6,2°	9,9	10,24	10,6	10,98	11,85	1	
3056185	2	0,6	0,3	10	45	0,50	16,4	4	0,55	6,01°	10,42	10,77	11,15	11,56	12,47	1	
3056186	2	0,6	0,3	11	50	0,50	17,4	4	0,55	5,67°	11,45	11,84	12,26	12,71	13,71	1	
3056187	2	0,6	0,3	12	50	0,50	18,4	4	0,55	5,36°	12,49	12,91	13,37	13,86	14,96	1	

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.

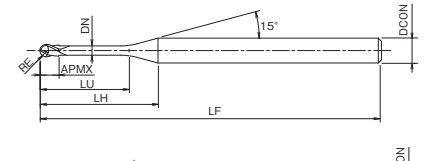
Milling | Solid carbide

AE-LNBD-H

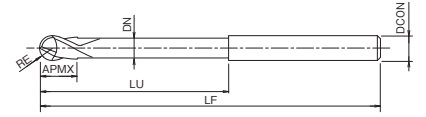
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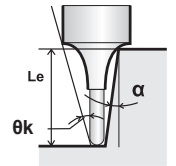
Type 1



Type 2



- First choice in quality and performance
- For high hardness materials
- 2 flutes, long neck type for high precision finishing



EDP	ZEFP	DC	RE	LU	LF	APMX	LH	DCON	DN	θk	Effective length by inclined angles Le (α)*					Type	Price
											0,5°	1°	1,5°	2°	3°		
3056188	2	0,8	0,4	1	45	0,60	7,1	4	0,75	13,41°	1,11	1,14	1,16	1,19	1,26	1	
3056189	2	0,8	0,4	1,5	45	0,60	7,6	4	0,75	12,52°	1,63	1,67	1,72	1,77	1,88	1	
3056190	2	0,8	0,4	2	45	0,60	8,1	4	0,75	11,74°	2,15	2,21	2,27	2,34	2,5	1	
3056191	2	0,8	0,4	2	45	0,60	11,8	6	0,75	12,81°	2,15	2,21	2,27	2,34	2,5	1	
3056192	2	0,8	0,4	2,5	45	0,60	8,6	4	0,75	11,04°	2,66	2,74	2,83	2,92	3,12	1	
3056193	2	0,8	0,4	3	45	0,60	9,1	4	0,75	10,42°	3,18	3,28	3,38	3,49	3,75	1	
3056194	2	0,8	0,4	4	45	0,60	10,1	4	0,75	9,37°	4,21	4,35	4,49	4,64	4,99	1	
3056195	2	0,8	0,4	5	45	0,60	11,1	4	0,75	8,51°	5,25	5,42	5,6	5,79	6,23	1	
3056196	2	0,8	0,4	6	45	0,60	12,1	4	0,75	7,8°	6,28	6,49	6,71	6,94	7,48	1	
3056197	2	0,8	0,4	7	45	0,60	13,1	4	0,75	7,19°	7,31	7,55	7,81	8,09	8,72	1	
3056198	2	0,8	0,4	8	45	0,60	14,1	4	0,75	6,67°	8,35	8,62	8,92	9,24	9,96	1	
3056199	2	0,8	0,4	9	45	0,60	15,1	4	0,75	6,22°	9,38	9,69	10,03	10,39	11,2	1	
3056200	2	0,8	0,4	10	45	0,60	16,1	4	0,75	5,83°	10,41	10,76	11,14	11,54	12,45	1	
3056201	2	0,8	0,4	12	50	0,60	18,1	4	0,75	5,18°	12,48	12,9	13,36	13,84	14,93	1	
3056202	2	1	0,5	1,5	45	0,80	7,2	4	0,95	12,54°	1,63	1,66	1,71	1,75	1,86	1	
3056203	2	1	0,5	2	45	0,80	7,7	4	0,95	11,71°	2,14	2,2	2,26	2,33	2,48	1	
3056204	2	1	0,5	2	45	0,80	11,4	6	0,95	12,83°	2,14	2,2	2,26	2,33	2,48	1	
3056205	2	1	0,5	2,5	45	0,80	8,2	4	0,95	10,97°	2,66	2,73	2,82	2,9	3,1	1	
3056206	2	1	0,5	3	45	0,80	8,7	4	0,95	10,33°	3,18	3,27	3,37	3,48	3,72	1	
3056207	2	1	0,5	3	45	0,80	12,4	6	0,95	11,8°	3,18	3,27	3,37	3,48	3,72	1	
3056208	2	1	0,5	4	45	0,80	9,7	4	0,95	9,23°	4,21	4,34	4,48	4,63	4,97	1	
3056209	2	1	0,5	4	45	0,80	13,4	6	0,95	10,91°	4,21	4,34	4,48	4,63	4,97	1	
3056210	2	1	0,5	5	45	0,80	10,7	4	0,95	8,35°	5,24	5,41	5,59	5,78	6,21	1	
3056211	2	1	0,5	5	45	0,80	14,4	6	0,95	10,15°	5,24	5,41	5,59	5,78	6,21	1	
3056212	2	1	0,5	6	45	0,80	11,7	4	0,95	7,62°	6,28	6,48	6,69	6,93	7,45	1	
3056213	2	1	0,5	6	45	0,80	15,4	6	0,95	9,49°	6,28	6,48	6,69	6,93	7,45	1	
3056214	2	1	0,5	7	45	0,80	12,7	4	0,95	7°	7,31	7,55	7,8	8,08	8,69	1	
3056215	2	1	0,5	7	45	0,80	16,4	6	0,95	8,91°	7,31	7,55	7,8	8,08	8,69	1	
3056216	2	1	0,5	8	45	0,80	13,7	4	0,95	6,48°	8,34	8,62	8,91	9,23	9,94	1	
3056217	2	1	0,5	8	45	0,80	17,4	6	0,95	8,39°	8,34	8,62	8,91	9,23	9,94	1	
3056218	2	1	0,5	9	45	0,80	14,7	4	0,95	6,03°	9,38	9,69	10,02	10,38	11,18	1	
3056219	2	1	0,5	10	45	0,80	15,7	4	0,95	5,64°	10,41	10,76	11,13	11,53	12,42	1	
3056220	2	1	0,5	10	50	0,80	19,4	6	0,95	7,52°	10,41	10,76	11,13	11,53	12,42	1	
3056221	2	1	0,5	12	45	0,80	17,7	4	0,95	4,99°	12,48	12,9	13,34	13,83	14,91	1	
3056222	2	1	0,5	13	50	0,80	18,7	4	0,95	4,71°	13,51	13,97	14,45	14,98	16,15	1	
3056223	2	1	0,5	14	50	0,80	19,7	4	0,95	4,47°	14,55	15,04	15,56	16,13	17,4	1	
3056224	2	1	0,5	16	50	0,80	21,7	4	0,95	4,05°	16,61	17,18	17,78	18,43	19,88	1	
3056225	2	1	0,5	18	55	0,80	23,7	4	0,95	3,7°	18,68	19,31	19,99	20,73	22,37	1	
3056226	2	1	0,5	20	55	0,80	25,7	4	0,95	3,41°	20,75	21,45	22,21	23,03	24,86	1	
3056227	2	1	0,5	22	60	0,80	27,7	4	0,95	3,16°	22,82	23,59	24,43	25,33	27,34	1	
3056228	2	1	0,5	22	60	0,80	31,4	6	0,95	4,62°	22,82	23,59	24,43	25,33	27,34	1	
3056229	2	1,2	0,6	2	45	1,00	7,3	4	1,15	11,67°	2,14	2,19	2,25	2,31	2,46	1	
3056230	2	1,2	0,6	2	45	1,00	11,1	6	1,15	12,86°	2,14	2,19	2,25	2,31	2,46	1	
3056231	2	1,2	0,6	2,4	45	1,00	7,7	4	1,15	11,04°	2,55	2,62	2,69	2,77	2,95	1	

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.



AE-LNBD-H

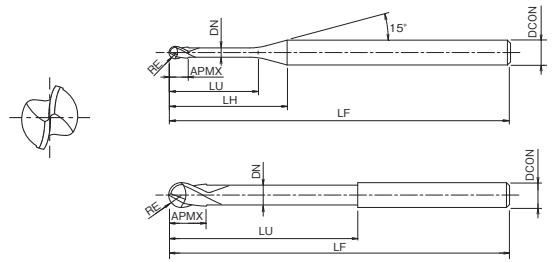
Milling | Solid carbide



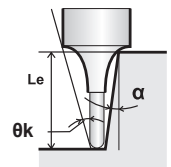
Type 1



Type 2



- First choice in quality and performance
- For high hardness materials
- 2 flutes, long neck type for high precision finishing



EDP	ZEFP	DC	RE	LU	LF	APMX	LH	DCON	DN	θk	Effective length by inclined angles Le (α)*					Type	Price
											0,5°	1°	1,5°	2°	3°		
3056232	2	1,2	0,6	2,5	45	1,00	7,8	4	1,15	10,9°	2,66	2,73	2,81	2,89	3,08	1	
3056233	2	1,2	0,6	3	45	1,00	8,3	4	1,15	10,22°	3,17	3,26	3,36	3,46	3,7	1	
3056234	2	1,2	0,6	4	45	1,00	9,3	4	1,15	9,08°	4,21	4,33	4,47	4,61	4,94	1	
3056235	2	1,2	0,6	4	45	1,00	13,1	6	1,15	10,87°	4,21	4,33	4,47	4,61	4,94	1	
3056236	2	1,2	0,6	6	45	1,00	11,3	4	1,15	7,42°	6,27	6,47	6,68	6,91	7,43	1	
3056237	2	1,2	0,6	8	45	1,00	13,3	4	1,15	6,27°	8,34	8,61	8,9	9,21	9,91	1	
3056238	2	1,2	0,6	10	45	1,00	15,3	4	1,15	5,43°	10,41	10,75	11,12	11,51	12,4	1	
3056239	2	1,2	0,6	12	45	1,00	17,3	4	1,15	4,78°	12,48	12,89	13,33	13,81	14,89	1	
3056240	2	1,2	0,6	14	50	1,00	19,3	4	1,15	4,28°	14,54	15,03	15,55	16,11	17,37	1	
3056241	2	1,2	0,6	16	50	1,00	21,3	4	1,15	3,87°	16,61	17,17	17,77	18,41	19,86	1	
3056242	2	1,2	0,6	18	55	1,00	23,3	4	1,15	3,53°	18,68	19,31	19,98	20,71	22,35	1	
3056243	2	1,2	0,6	20	55	1,00	25,3	4	1,15	3,24°	20,74	21,45	22,2	23,01	24,83	1	
3056244	2	1,5	0,75	2	45	1,20	6,8	4	1,45	11,61°	2,13	2,18	2,23	2,29	2,42	1	
3056245	2	1,5	0,75	2,5	45	1,20	7,3	4	1,45	10,76°	2,65	2,72	2,79	2,87	3,04	1	
3056246	2	1,5	0,75	3	45	1,20	7,8	4	1,45	10,03°	3,17	3,25	3,34	3,44	3,66	1	
3056247	2	1,5	0,75	3	45	1,20	11,5	6	1,45	11,75°	3,17	3,25	3,34	3,44	3,66	1	
3056248	2	1,5	0,75	4	45	1,20	8,8	4	1,45	8,81°	4,2	4,32	4,45	4,59	4,91	1	
3056249	2	1,5	0,75	5	45	1,20	9,8	4	1,45	7,86°	5,23	5,39	5,56	5,74	6,15	1	
3056250	2	1,5	0,75	5	45	1,20	13,5	6	1,45	9,97°	5,23	5,39	5,56	5,74	6,15	1	
3056251	2	1,5	0,75	6	45	1,20	10,8	4	1,45	7,09°	6,27	6,46	6,67	6,89	7,39	1	
3056252	2	1,5	0,75	6	45	1,20	14,5	6	1,45	9,26°	6,27	6,46	6,67	6,89	7,39	1	
3056253	2	1,5	0,75	8	45	1,20	12,8	4	1,45	5,93°	8,34	8,6	8,88	9,19	9,88	1	
3056254	2	1,5	0,75	8	45	1,20	16,5	6	1,45	8,11°	8,34	8,6	8,88	9,19	9,88	1	
3056255	2	1,5	0,75	10	45	1,20	14,8	4	1,45	5,09°	10,4	10,74	11,1	11,49	12,36	1	
3056256	2	1,5	0,75	12	45	1,20	16,8	4	1,45	4,46°	12,47	12,88	13,32	13,79	14,85	1	
48363151	2	1,5	0,75	12	50	1,20	20,5	6	1,45	6,49°	12,48	12,89	13,33	13,80	14,87	1	
3056257	2	1,5	0,75	14	50	1,20	18,8	4	1,45	3,97°	14,54	15,02	15,53	16,09	17,34	1	
3056258	2	1,5	0,75	16	50	1,20	20,8	4	1,45	3,58°	16,6	17,16	17,75	18,39	19,82	1	
3056259	2	1,5	0,75	18	55	1,20	22,8	4	1,45	3,25°	18,67	19,3	19,97	20,69	22,31	1	
3056260	2	1,5	0,75	20	55	1,20	24,8	4	1,45	2,98°	20,74	21,44	22,18	22,99	-	1	
3056261	2	1,5	0,75	22	60	1,20	26,8	4	1,45	2,75°	22,81	23,58	24,4	25,29	-	1	
3056262	2	1,5	0,75	25	65	1,20	29,8	4	1,45	2,47°	25,91	26,79	27,73	28,74	-	1	
3056263	2	1,5	0,75	30	70	1,20	34,8	4	1,45	2,11°	31,08	32,13	33,27	34,49	-	1	
3056264	2	1,6	0,8	4	45	1,30	8,6	4	1,55	8,72°	4,2	4,32	4,45	4,58	4,89	1	
3056265	2	1,6	0,8	8	45	1,30	12,6	4	1,55	5,81°	8,33	8,6	8,88	9,18	9,87	1	
3056266	2	1,6	0,8	12	45	1,30	16,6	4	1,55	4,35°	12,47	12,88	13,31	13,78	14,84	1	
3056267	2	1,6	0,8	16	50	1,30	20,6	4	1,55	3,47°	16,6	17,15	17,75	18,38	19,81	1	
3056268	2	1,6	0,8	20	55	1,30	24,6	4	1,55	2,89°	20,74	21,43	22,18	22,98	-	1	
3056269	2	2	1	2,5	45	1,60	6,3	4	1,95	10,46°	2,64	2,7	2,76	2,83	2,98	1	
3056270	2	2	1	3	45	1,60	6,8	4	1,95	9,61°	3,16	3,23	3,32	3,4	3,6	1	
3056271	2	2	1	3	45	1,60	10,6	6	1,95	11,7°	3,16	3,23	3,32	3,4	3,6	1	
3056272	2	2	1	4	45	1,60	7,8	4	1,95	8,25°	4,19	4,3	4,42	4,55	4,85	1	
3056273	2	2	1	4	45	1,60	11,6	6	1,95	10,64°	4,19	4,3	4,42	4,55	4,85	1	
3056274	2	2	1	5	45	1,60	8,8	4	1,95	7,23°	5,23	5,37	5,53	5,7	6,09	1	

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.

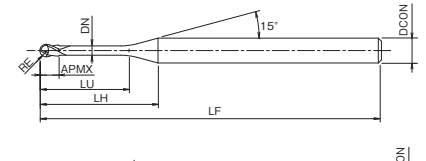
Milling | Solid carbide

AE-LNBD-H

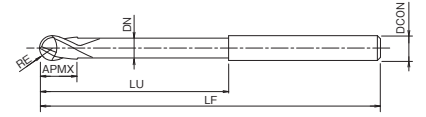
Milling | Solid carbide



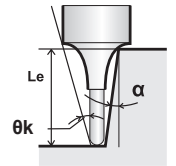
Type 1



Type 2



- First choice in quality and performance
- For high hardness materials
- 2 flutes, long neck type for high precision finishing



EDP	ZEFP	DC	RE	LU	LF	APMX	LH	DCON	DN	θk	Effective length by inclined angles Le (α)*					Type	Price
											0,5°	1°	1,5°	2°	3°		
3056275	2	2	1	6	45	1,60	9,8	4	1,95	6,43°	6,26	6,44	6,64	6,85	7,33	1	
3056276	2	2	1	6	45	1,60	13,6	6	1,95	9°	6,26	6,44	6,64	6,85	7,33	1	
3056277	2	2	1	8	45	1,60	11,8	4	1,95	5,26°	8,33	8,58	8,86	9,15	9,82	1	
3056278	2	2	1	8	45	1,60	15,6	6	1,95	7,79°	8,33	8,58	8,86	9,15	9,82	1	
3056279	2	2	1	10	45	1,60	13,8	4	1,95	4,45°	10,39	10,72	11,07	11,45	12,31	1	
3056280	2	2	1	10	50	1,60	17,6	6	1,95	6,87°	10,39	10,72	11,07	11,45	12,31	1	
3056281	2	2	1	12	45	1,60	15,8	4	1,95	3,86°	12,46	12,86	13,29	13,75	14,79	1	
3056282	2	2	1	12	50	1,60	19,6	6	1,95	6,14°	12,46	12,86	13,29	13,75	14,79	1	
3056283	2	2	1	13	50	1,60	16,8	4	1,95	3,61°	13,5	13,93	14,4	14,9	16,04	1	
3056284	2	2	1	14	50	1,60	17,8	4	1,95	3,4°	14,53	15	15,51	16,05	17,28	1	
3056285	2	2	1	16	50	1,60	19,8	4	1,95	3,04°	16,6	17,14	17,72	18,35	19,76	1	
3056286	2	2	1	16	55	1,60	23,6	6	1,95	5,06°	16,6	17,14	17,72	18,35	19,76	1	
3056287	2	2	1	18	55	1,60	21,8	4	1,95	2,75°	18,66	19,28	19,94	20,65	-	1	
3056288	2	2	1	20	55	1,60	23,8	4	1,95	2,51°	20,73	21,42	22,16	22,95	-	1	
3056289	2	2	1	20	60	1,60	27,6	6	1,95	4,31°	20,73	21,42	22,16	22,95	24,74	1	
3056290	2	2	1	22	60	1,60	25,8	4	1,95	2,31°	22,8	23,56	24,37	25,25	-	1	
3056291	2	2	1	25	65	1,60	28,8	4	1,95	2,06°	25,9	26,77	27,7	28,7	-	1	
3056292	2	2	1	25	65	1,60	32,6	6	1,95	3,63°	25,9	26,77	27,7	28,7	30,95	1	
3056293	2	2	1	30	70	1,60	33,8	4	1,95	1,75°	31,07	32,12	33,24	-	-	1	
3056294	2	2	1	35	70	1,60	38,8	4	1,95	1,52°	36,24	37,46	38,78	-	-	1	
3056295	2	2	1	40	80	1,60	43,8	4	1,95	1,34°	41,4	42,81	-	-	-	1	
3056296	2	2,5	1,25	6	45	2,00	9,1	4	2,35	5,44°	6,44	6,63	6,82	7,03	7,51	1	
3056297	2	2,5	1,25	8	45	2,00	11,1	4	2,35	4,35°	8,51	8,77	9,04	9,33	9,99	1	
3056298	2	2,5	1,25	10	45	2,00	13,1	4	2,35	3,62°	10,58	10,9	11,25	11,63	12,48	1	
3056299	2	2,5	1,25	15	50	2,00	18,1	4	2,35	2,55°	15,75	16,25	16,8	17,38	-	1	
3056300	2	2,5	1,25	20	55	2,00	23,1	4	2,35	1,97°	20,92	21,6	22,34	-	-	1	
3056301	2	2,5	1,25	25	65	2,00	28,1	4	2,35	1,61°	26,08	26,95	27,88	-	-	1	
3056302	2	2,5	1,25	30	70	2,00	33,1	4	2,35	1,35°	31,25	32,3	-	-	-	1	
3056303	2	2,5	1,25	35	70	2,00	38,1	4	2,35	1,17°	36,42	37,65	-	-	-	1	
3056304	2	3	1,5	6	50	2,40	11,9	6	2,85	8,15°	6,44	6,61	6,79	7	7,45	1	
3056305	2	3	1,5	8	50	2,40	13,9	6	2,85	6,87°	8,5	8,75	9,01	9,29	9,93	1	
3056306	2	3	1,5	10	50	2,40	15,9	6	2,85	5,93°	10,57	10,89	11,23	11,59	12,42	1	
3056307	2	3	1,5	12	55	2,40	17,9	6	2,85	5,22°	12,64	13,03	13,44	13,89	14,91	1	
3056308	2	3	1,5	13	55	2,40	18,9	6	2,85	4,92°	13,67	14,1	14,55	15,04	16,15	1	
3056309	2	3	1,5	14	55	2,40	19,9	6	2,85	4,66°	14,71	15,17	15,66	16,19	17,39	1	
3056310	2	3	1,5	15	55	2,40	20,9	6	2,85	4,42°	15,74	16,24	16,77	17,34	18,63	1	
3056311	2	3	1,5	16	55	2,40	21,9	6	2,85	4,2°	16,77	17,31	17,88	18,49	19,88	1	
3056312	2	3	1,5	20	60	2,40	25,9	6	2,85	3,52°	20,91	21,58	22,31	23,09	24,85	1	
3056313	2	3	1,5	25	65	2,40	30,9	6	2,85	2,92°	26,08	26,93	27,85	28,84	-	1	
3056314	2	3	1,5	30	70	2,40	35,9	6	2,85	2,5°	31,24	32,28	33,39	34,59	-	1	
3056315	2	3	1,5	35	80	2,40	40,9	6	2,85	2,18°	36,41	37,63	38,94	40,34	-	1	
3056316	2	3	1,5	40	90	2,40	45,9	6	2,85	1,94°	41,58	42,98	44,48	-	-	1	
3056317	2	3,5	1,75	10	50	2,80	14,9	6	3,35	5,38°	10,56	10,87	11,2	11,56	12,36	1	
3056318	2	3,5	1,75	15	55	2,80	19,9	6	3,35	3,92°	15,73	16,22	16,74	17,31	18,58	1	

* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.



AE-LNBD-H

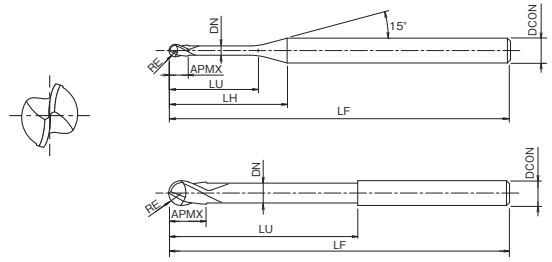
Milling | Solid carbide



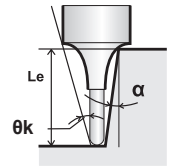
Type 1



Type 2



- First choice in quality and performance
- For high hardness materials
- 2 flutes, long neck type for high precision finishing



EDP	ZEFP	DC	RE	LU	LF	APMX	LH	DCON	DN	θk	Effective length by inclined angles Le (α)*					Type	Price
											0,5°	1°	1,5°	2°	3°		
3056319	2	3,5	1,75	16	55	2,80	20,9	6	3,35	3,72°	16,76	17,29	17,85	18,46	19,82	1	
3056320	2	3,5	1,75	20	60	2,80	24,9	6	3,35	3,08°	20,9	21,57	22,28	23,06	24,79	1	
3056321	2	3,5	1,75	25	65	2,80	29,9	6	3,35	2,54°	26,07	26,92	27,83	28,81	-	1	
3056322	2	3,5	1,75	30	70	2,80	34,9	6	3,35	2,16°	31,24	32,26	33,37	34,55	-	1	
3056323	2	3,5	1,75	35	80	2,80	39,9	6	3,35	1,88°	36,4	37,61	38,91	-	-	1	
3056324	2	3,5	1,75	40	90	2,80	44,9	6	3,35	1,66°	41,57	42,96	44,45	-	-	1	
3056325	2	3,5	1,75	45	90	2,80	49,9	6	3,35	1,49°	46,74	48,31	-	-	-	1	
3056326	2	4	2	8	55	3,20	-	4	3,85	-	-	-	-	-	-	2	
3056327	2	4	2	8	55	3,20	12	6	3,85	5,65°	8,49	8,71	8,96	9,22	9,81	1	
3056328	2	4	2	10	60	3,20	14	6	3,85	4,73°	10,55	10,85	11,17	11,52	12,3	1	
3056329	2	4	2	12	60	3,20	16	6	3,85	4,07°	12,62	12,99	13,39	13,82	14,79	1	
3056330	2	4	2	13	60	3,20	17	6	3,85	3,8°	13,65	14,06	14,5	14,97	16,03	1	
3056331	2	4	2	14	60	3,20	18	6	3,85	3,56°	14,69	15,13	15,61	16,12	17,27	1	
3056332	2	4	2	15	60	3,20	19	6	3,85	3,36°	15,72	16,2	16,72	17,27	18,52	1	
3056333	2	4	2	16	60	3,20	20	6	3,85	3,17°	16,76	17,27	17,82	18,42	19,76	1	
3056334	2	4	2	20	65	3,20	24	6	3,85	2,6°	20,89	21,55	22,26	23,02	-	1	
3056335	2	4	2	25	70	3,20	29	6	3,85	2,12°	26,06	26,9	27,8	28,77	-	1	
3056336	2	4	2	30	80	3,20	34	6	3,85	1,79°	31,23	32,25	33,34	-	-	1	
3056337	2	4	2	35	80	3,20	39	6	3,85	1,55°	36,4	37,6	38,88	-	-	1	
3056338	2	4	2	40	90	3,20	44	6	3,85	1,37°	41,56	42,94	-	-	-	1	
3056339	2	4	2	45	90	3,20	49	6	3,85	1,22°	46,73	48,29	-	-	-	1	
3056340	2	4	2	50	100	3,20	54	6	3,85	1,11°	51,9	53,64	-	-	-	1	
3056341	2	5	2,5	10	60	4,00	12,1	6	4,85	2,95°	10,54	10,82	11,12	11,45	-	1	
3056342	2	5	2,5	15	60	4,00	17,1	6	4,85	1,95°	15,71	16,17	16,66	-	-	1	
3056343	2	5	2,5	20	70	4,00	22,1	6	4,85	1,46°	20,87	21,52	-	-	-	1	
3056344	2	5	2,5	25	70	4,00	27,1	6	4,85	1,17°	26,04	26,86	-	-	-	1	
3056345	2	5	2,5	30	80	4,00	32,1	6	4,85	0,97°	31,21	-	-	-	-	1	
3056346	2	5	2,5	35	80	4,00	37,1	6	4,85	0,83°	36,38	-	-	-	-	1	
3056347	2	5	2,5	40	90	4,00	42,1	6	4,85	0,73°	41,55	-	-	-	-	1	
3056348	2	5	2,5	45	100	4,00	47,1	6	4,85	0,65°	46,72	-	-	-	-	1	
3056349	2	5	2,5	50	100	4,00	52,1	6	4,85	0,58°	51,88	-	-	-	-	1	
3056350	2	6	3	10	60	4,80	-	6	5,85	-	-	-	-	-	-	2	
3056351	2	6	3	12	60	4,80	-	6	5,85	-	-	-	-	-	-	2	
3056352	2	6	3	15	65	4,80	-	6	5,85	-	-	-	-	-	-	2	
3056353	2	6	3	20	70	4,80	-	6	5,85	-	-	-	-	-	-	2	
3056354	2	6	3	25	70	4,80	-	6	5,85	-	-	-	-	-	-	2	
3056355	2	6	3	30	80	4,80	-	6	5,85	-	-	-	-	-	-	2	
3056356	2	6	3	35	80	4,80	-	6	5,85	-	-	-	-	-	-	2	
3056357	2	6	3	40	90	4,80	-	6	5,85	-	-	-	-	-	-	2	
3056358	2	6	3	45	100	4,80	-	6	5,85	-	-	-	-	-	-	2	
3056359	2	6	3	50	120	4,80	-	6	5,85	-	-	-	-	-	-	2	
3056360	2	6	3	60	120	4,80	-	6	5,85	-	-	-	-	-	-	2	

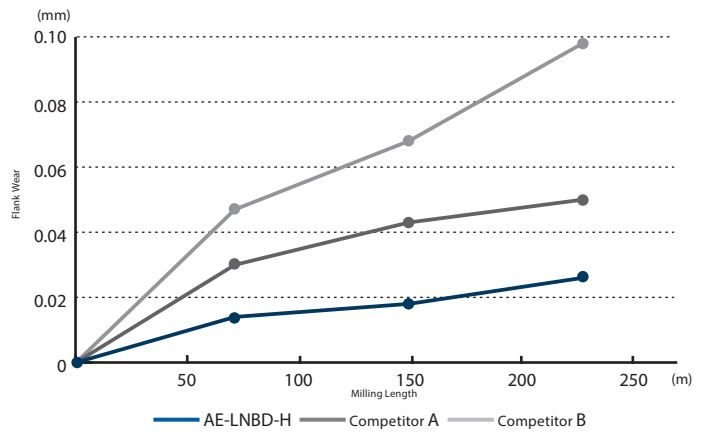
* If there is no value in the actual effective length (Le column) for the work gradient angle α, it indicates no interference.

Milling | Solid carbide

Stable Performance

Exhibits superior durability in SKD11 (60 HRC).

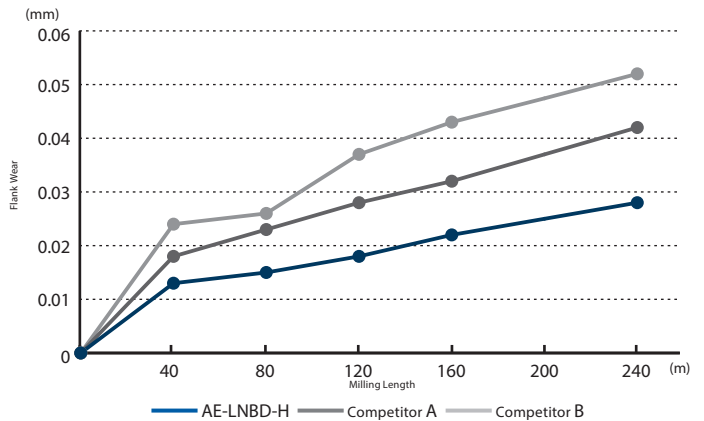
Tool	AE-LNBD-H R1X10X4	Competitor
Work Material	SKD11 (60HRC)	
Milling method	Scanning line cutting	
Cutting Speed	107m/min (17.000 min ⁻¹)	
Feed Rate	1.400mm/min (0,041 mm/t)	
Depth of Cut	ap = 0,05mm Pf = 0,1mm	
Coolant	Air Blow	
Machine	Vertical Machining Center (HSK32)	



Long Tool Life

Exhibits superior durability in hot die steel DH31S.

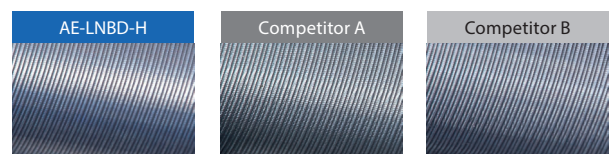
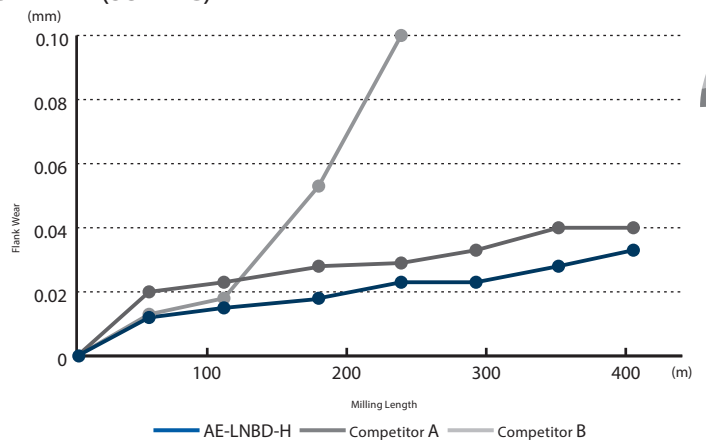
Tool	AE-LNBD-H R1X10X4	Competitor
Work Material	DH31S (43HRC)	
Milling method	Pocket milling	
Cutting Speed	88m/min (14.000 min ⁻¹)	
Feed Rate	1.000mm/min (0,036 mm/t)	
Depth of Cut	ap = 0,05mm Pf = 0,1mm	
Coolant	Air Blow	
Machine	Horizontal Machining Center (HSK63)	



Finishing

Enables excellent durability and surface finishing in STAVAX (53 HRC)

Tool	AE-LNBD-H R1X10X4	Competitor
Work Material	STAVAX (53 HRC)	
Milling method	Scanning line cutting	
Cutting Speed	150m/min (24.000 min ⁻¹)	
Feed Rate	2.400mm/min (0,05 mm/t)	
Depth of Cut	ap = 0,05mm Pf = 0,1mm	
Coolant	Air Blow	
Machine	Vertical Machining Center (HSK32)	



CUTTING CONDITIONS

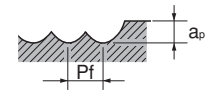
Milling | Endmills | Cutting conditions

AE-LNBD-H

The machining path is on condition of contouring line operation.

RE	LU	ToolSteel • Hardened Steel • Prehardened Steel SKD11 • SKD61 • NAK80				Hardened Steel															
		~45HRC				~55HRC				~62HRC				~66HRC				~70HRC			
		(mm)	S (min ⁻¹)	F (mm/min)	ap	Pf	S (min ⁻¹)	F (mm/min)	ap	Pf	S (min ⁻¹)	F (mm/min)	ap	Pf	S (min ⁻¹)	F (mm/min)	ap	Pf	S (min ⁻¹)	F (mm/min)	ap
R3	10	26.400	5.600	0,3	0,5	21.600	3.800	0,3	0,5	18.600	2.800	0,1	0,2	16.800	2.380	0,1	0,2	13.400	1.790	0,1	0,20
R3	12	24.000	5.200	0,3	0,5	19.200	3.400	0,3	0,5	16.200	2.500	0,1	0,2	14.600	2.130	0,1	0,2	11.700	1.600	0,1	0,20
R3	15	22.200	4.800	0,3	0,5	17.400	3.250	0,3	0,5	14.400	1.850	0,1	0,2	13.000	1.570	0,1	0,2	10.400	1.180	0,1	0,20
R3	20	19.200	3.900	0,3	0,5	14.400	3.000	0,3	0,5	9.600	1.600	0,1	0,2	8.700	1.360	0,1	0,2	7.000	1.020	0,1	0,20
R3	25	14.400	3.000	0,3	0,5	12.000	2.500	0,3	0,5	7.200	1.200	0,1	0,2	6.500	1.020	0,1	0,2	5.200	770	0,1	0,20
R3	30	12.000	2.400	0,3	0,5	10.800	2.100	0,3	0,5	4.800	740	0,1	0,2	4.400	630	0,1	0,2	3.500	470	0,1	0,20
R3	35	10.800	2.100	0,2	0,4	10.800	2.000	0,2	0,4	4.200	620	0,1	0,2	3.800	530	0,1	0,2	3.100	400	0,1	0,20
R3	40	10.800	1.900	0,2	0,3	10.800	1.800	0,2	0,3	3.600	480	0,1	0,2	3.300	410	0,1	0,2	2.600	310	0,1	0,20
R3	45	9.600	1.700	0,2	0,3	9.600	1.600	0,2	0,3	3.400	440	0,1	0,2	3.100	370	0,1	0,2	2.500	280	0,1	0,20
R3	50	8.400	1.500	0,2	0,3	8.400	1.400	0,2	0,3	3.000	400	0,1	0,2	2.700	340	0,1	0,2	2.200	260	0,1	0,20
R3	60	7.200	1.250	0,2	0,3	7.200	1.150	0,2	0,3	2.800	350	0,1	0,2	2.500	300	0,1	0,2	2.000	230	0,1	0,20

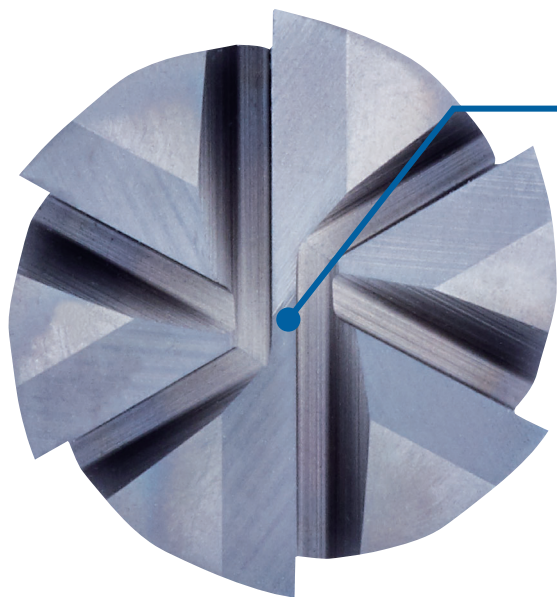
1. Use a rigid and precise machine and holder.
2. When machining carbon steels or hardened steels, using MQL (Minimum Quantity Lubrication / oil mist coolant) or air blow is recommended.
3. Use an air blow or a suitable cutting fluid with high smoke retardant properties.
4. The above cutting conditions are for contouring operation with low-load and stable condition. Refer to the table above to set the milling conditions in accordance with the actual situation.
5. Please adjust conditions based on machining accuracy, machining shape and machining path.
6. When using a tool with a diameter of ϕ 0.5 (R0.25) or less, or L/D (aspect ratio) is greater than 10, high loads can cause tool breakage. Therefore, adjust the cutting conditions based on the machining situation.
7. When RPM are insufficient, please reduce the RPM and feed rates at same ratio as listed above.



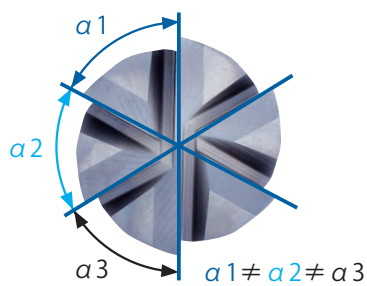
KEY FEATURES & BENEFITS

PXSH

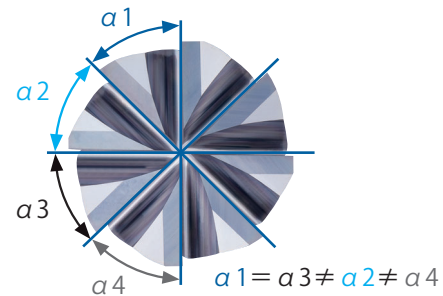
Multi-flute square type exchangeable head end mills for high-hardness steels



Unequal spacing teeth suppresses chattering



Outer diameter
Ø20 or above



Outer diameter
Ø25

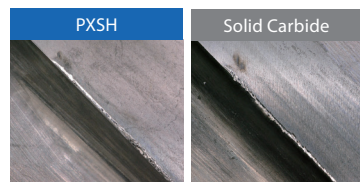
Optimal cutting edge specifications to enable stable machining of high-hardness steels



Milling | Solid carbide

Tool	Head: PXSH160C16-06R000 Holder: PXMZ-C16SS16-S100
Size	Ø16
Work Material	SKH51 (65HRC)
Milling method	Side Milling
Cutting Speed	60m/min (1.190 min ⁻¹)
Feed Rate	685mm/min (0,096 mm/t)
Depth of Cut	ap = 14,4mm ae = 0,32mm
Overhang Length	48mm (L/D=3)
Coolant	Air Blow
Machine	Vertical Machining Center (BT40)

Wear condition of outer peripheral cutting edge after milling 38,5m



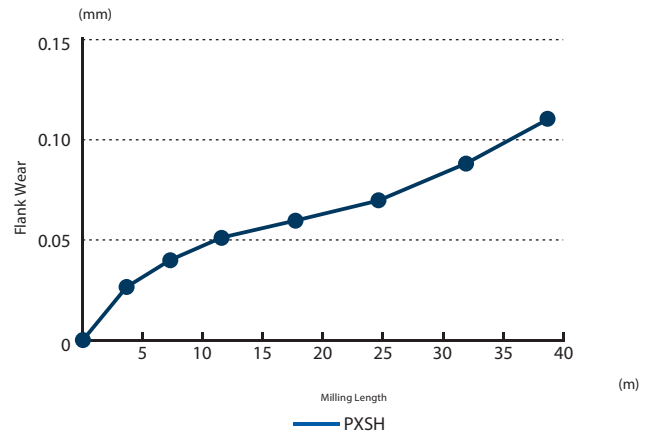
DUROREY Coating

Exhibits outstanding performance in high-hardness steels due to its excellent toughness, high heat resistance and abrasion resistance characteristics

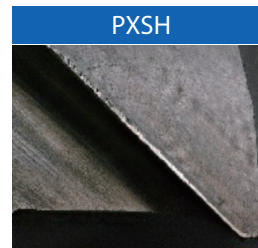
Long Tool Life

Achieves stable durability in high hardness steel of 65 HRC

Tool	Head: PXSH160C16-06R000 Holder: PXMZ-C16SS16-S100
Size	Ø16
Work Material	SKH51 (65HRC)
Milling method	Side Milling
Cutting Speed	60m/min (1.190 min ⁻¹)
Feed Rate	685mm/min (0,096 mm/t)
Depth of Cut	ap = 14,4mm ae = 0,32mm
Overhang Length	48mm (L/D=3)
Coolant	Air Blow
Machine	Vertical Machining Center (BT40)



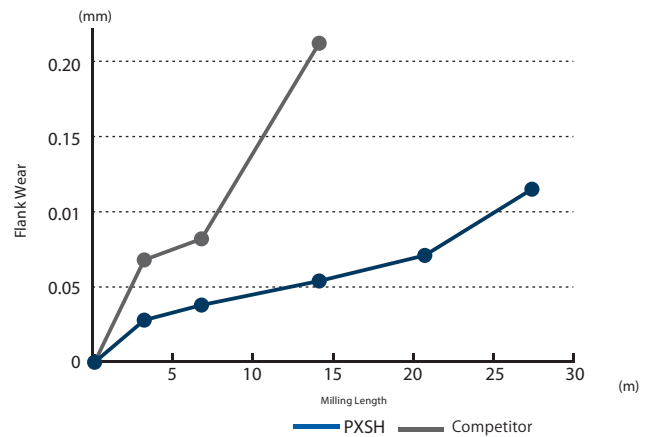
Wear condition of the cutting edge after milling 38.5m



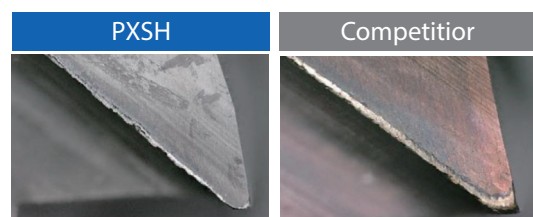
High Speed Milling

Stable wear transition in high-speed machining of high-hardness steel at L/D = 4

Tool	Head: PXSH160C16-06R0000 Holder: PXMZ-C16SS16-S090CS
Size	Ø16
Work Material	SKD11 (60HRC)
Milling method	Side Milling
Cutting Speed	105m/min (2.090 min ⁻¹)
Feed Rate	1.130mm/min (0,09 mm/t)
Depth of Cut	ap = 14,4mm ae = 0,24mm
Overhang Length	64mm (L/D=4)
Coolant	Air Blow
Machine	Vertical Machining Center (BT50)



Wear condition of the cutting edge



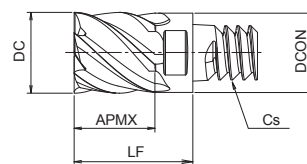
28mm Milling Length

14mm Milling Length



PXSH

Milling | Solid carbide



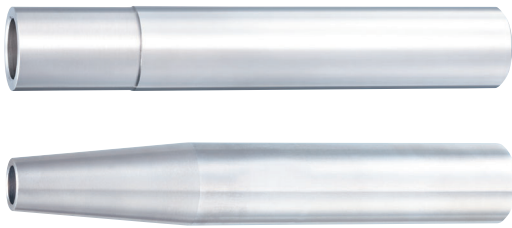
- Multi flute square solid carbide head
- For high hardness steels
- For PXMZ straight shank holder
- 12 - 25 mm



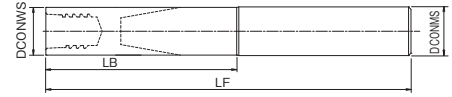
EDP	Designation	ZEFP	DC	APMX	LF	DCON	CS	FHA	Grade	P		M		K		N		S		H		Price
										dry	👉	dry	👉	GG	GGG	dry	👉	dry	👉	dry	👉	
7830380	PXSH120C12-06R000	6	12	12	18	11,7	C12	43	XP6703													●
7830381	PXSH160C16-06R000	6	16	16	23,5	15,7	C16	43	XP6703													●
7830382	PXSH200C20-06R000	6	20	20	27,5	19,6	C20	43	XP6703													●
7830383	PXSH250C25-08R000	8	25	25	35	24	C25	43	XP6703													●

Milling | Solid carbide

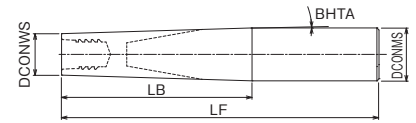




Type 1



Type 2



- Straight Shank Holder for PXM

EDP	Designation	CS	LF	DCONWS	LB	DCON	BHTA	Type	Shank material
48174001	PXMZC12SS12S100	C12	100	11,7	18	12	0	1	Steel
48174002	PXMZC12TP20S145	C12	145	11,7	47,4	20	5	2	Steel
48174003	PXMZC16SS16S100	C16	100	15,7	23	16	0	1	Steel
48174004	PXMZC16TP25S155	C16	155	15,7	53,1	25	5	2	Steel
48174005	PXMZC20SS20S120	C20	120	19,6	28	20	0	1	Steel
48174006	PXMZC20TP32S170	C20	170	19,6	70,8	32	5	2	Steel
48174007	PXMZC25SS25S140	C25	140	24	34,5	25	0	1	Steel
48174008	PXMZC12SS12S075CS	C12	75	11,7	24	12	0	1	Carbide
48174009	PXMZC12SS12L100CS	C12	100	11,7	45,9	12	0	1	Carbide
48174010	PXMZC12SS12L115CS	C12	115	11,7	64,2	12	0	1	Carbide
48174011	PXMZC12TP16LL135CS	C12	135	11,7	83,8	16	1,3	2	Carbide
48174012	PXMZC16SS16S090CS	C16	90	15,7	39,2	16	0	1	Carbide
48174013	PXMZC16SS16L130CS	C16	130	15,7	61,2	16	0	1	Carbide
48174014	PXMZC16SS16L135CS	C16	135	15,7	84,2	16	0	1	Carbide
48174015	PXMZC16TP20LL165CS	C16	165	15,7	115	20	1,1	2	Carbide
48174016	PXMZC20SS20S090CS	C20	90	19,6	39,1	20	0	1	Carbide
48174017	PXMZC20SS20L150CS	C20	150	19,6	78,4	20	0	1	Carbide
48174018	PXMZC20SS20L180CS	C20	180	19,6	109,1	20	0	1	Carbide
48174019	PXMZC20TP25LL200CS	C20	200	19,6	140	25	1,1	2	Carbide
48174020	PXMZC25SS25L200CS	C25	200	24	96,6	25	0	1	Carbide

Accessories and spare parts

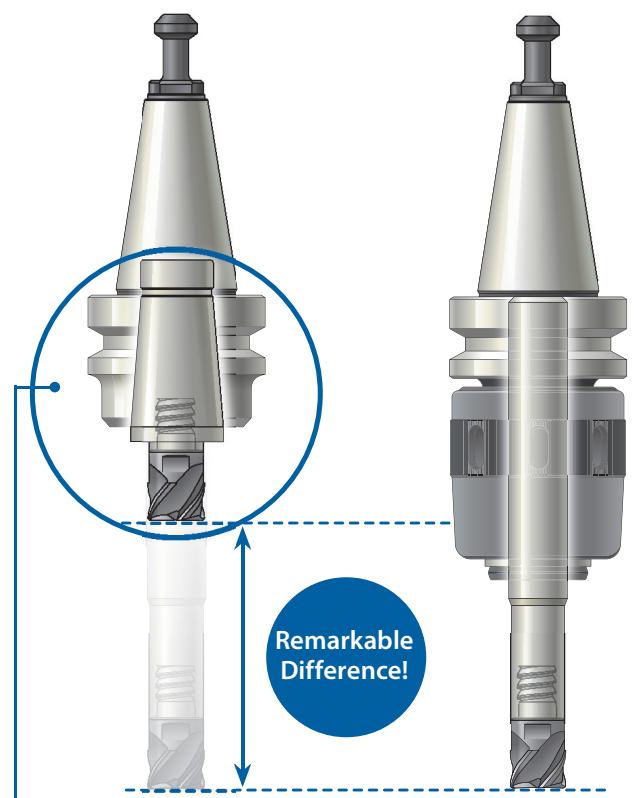
Applicable head	EDP	Designation	Torque	Specification
12-14	7801890	PXMP8-10	12 N.m	Spanner
16-18	7801891	PXMP13-16	30 N.m	Spanner
20-22	7801891	PXMP13-16	50 N.m	Spanner
25	7801892	PXMP21	60 N.m	Spanner



KEY FEATURES: PXMC COLLET

- 1** Powerful chip evacuation even on small machining center
- 2** The reduction of overhang length improves rigidity and rotational balance
- 3** A wide variety of exchangeable heads
 - Suitable for steel, stainless steel and aluminum
 - Wide processing range from roughing to finishing
- 4** Greater cost performance compared to monoblock type holders, only need to change the collet in case of trouble.

PXMC Collet Extra Short Type Conventional Combination

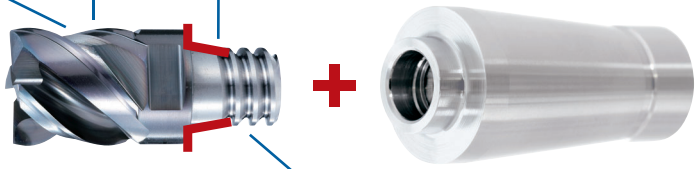


KEY FEATURES: PXM EXCHANGEABLE HEAD

Milling | Indexables

All the knowledge and know-how acquired by designing solid carbide end mills are found in these exchangeable heads.
 · Various types are available to meet variety of machining methods.

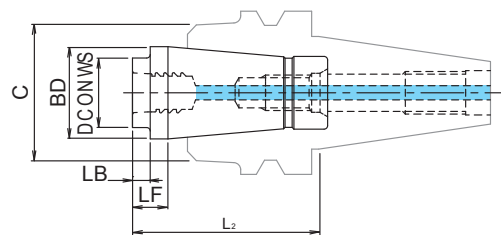
End Face + Taper = Double Face Clamping
 · High rigidity and accuracy of tightening
 · High precision of run out $\leq 0,015\text{mm}$
 · High head replacing accuracy = $\pm 0.03\text{mm}$



Applying buttress screw makes easy and reduces time to desorb heads

PXMC COLLET

Milling | Indexable | Collets



- PXMC collet for PHOENIX PXM series
- Applicable exchangeable heads: PXNH, PXNL, PXSE, PXSM, PXDR, PXRE, PXBE, PXBM
- With coolant hole
- Reducing overhang length allows high rigidity

EDP	Designation	CS	LF	DCONWS	LB	Type	BD	LU
7834001	PXMCC1205	C12	10,5	11,7	5	1	26	24
7834002	PXMCC1605	C16	10,5	15,7	5	1	26	45,9
7834003	PXMCC2005	C20	10,5	19,6	5	1	26	64,2
7834004	PXMCC2505	C25	10,5	24	5	1	26	83,8
7834011	PXMCC1230	C12	35,5	11,7	30	2	26	39,2
7834012	PXMCC1630	C16	35,5	15,7	30	2	26	61,2
7834013	PXMCC2030	C20	35,5	19,6	30	2	26	84,2
7834014	PXMCC2530	C25	35,5	24	30	2	26	115

CUTTING CONDITIONS

Milling | Indexables | Cutting conditions

PXSH For both PXMZ straight shank holder / PXMC collet

Side milling $L/D \leq 4$

Cutting Speed	Hardened Steel - Prehardened Steel SCM • SKD61 • NAK80		Hardened Steel																			
			~55HRC		~62HRC		~66HRC		~70HRC													
	110 ~ 130		80 ~ 100		60 ~ 80		50 ~ 70		40 ~ 60													
\emptyset	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)												
12	3.180	2.290	2.390	1.720	1.860	940	1.590	690	1.330	510												
16	2.390	2.290	1.790	1.720	1.390	930	1.190	690	1.000	510												
20	1.910	2.290	1.430	1.720	1.110	930	960	690	800	510												
25	1.530	2.450	1.150	1.840	890	1.000	760	730	640	510												
Depth of cut	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>1 D</td><td>0,05 D</td></tr> </table> <p>aeMax=1mm</p>		ap	ae	1 D	0,05 D	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>1 D</td><td>0,03 D</td></tr> </table> <p>aeMax=1mm</p>		ap	ae	1 D	0,03 D	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>1 D</td><td>0,02 D</td></tr> </table> <p>aeMax=0,5mm</p>						ap	ae	1 D	0,02 D
ap	ae																					
1 D	0,05 D																					
ap	ae																					
1 D	0,03 D																					
ap	ae																					
1 D	0,02 D																					

PXSH For both PXMZ straight shank holder / PXMC collet

Side milling $4 < L/D \leq 5$

Cutting Speed	Hardened Steel - Prehardened Steel SCM • SKD61 • NAK80		Hardened Steel																			
			~55HRC		~62HRC		~66HRC		~70HRC													
	75 ~ 95		55 ~ 75		40 ~ 60		35 ~ 55		25 ~ 45													
\emptyset	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)												
12	2.260	1.630	1.730	1.250	1.330	480	1.190	340	930	200												
16	1.690	1.620	1.290	1.240	1.000	480	900	350	700	200												
20	1.350	1.620	1.040	1.250	800	480	720	350	560	200												
25	1.080	1.730	830	1.330	640	720	570	550	450	360												
Depth of cut	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>1 D</td><td>0,03 D</td></tr> </table> <p>aeMax=1mm</p>		ap	ae	1 D	0,03 D	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>1 D</td><td>0,02 D</td></tr> </table> <p>aeMax=1mm</p>		ap	ae	1 D	0,02 D	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>0,7 D</td><td>0,02 D</td></tr> </table> <p>aeMax=0,5mm</p>						ap	ae	0,7 D	0,02 D
ap	ae																					
1 D	0,03 D																					
ap	ae																					
1 D	0,02 D																					
ap	ae																					
0,7 D	0,02 D																					

1. Use a rigid and precise machine and holder.
2. When chattering occurs, reduce the speed and feed simultaneously when machines with low rigidity are used.
3. Please adjust the cutting condition when the overhang length is longer.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.
5. Use an air blow or a suitable cutting uid with high smoke retardant properties.

CUTTING CONDITIONS

Milling | Indexables | Cutting conditions

PXSH For both PXMZ straight shank holder / PXMZ collet

High Speed Side milling L/D≤4

Cutting Speed	Hardened Steel - Prehardened Steel SCM • SKD61 • NAK80		Hardened Steel																											
			~55HRC		~62HRC		~66HRC		~70HRC																					
160 ~ 180			140 ~ 160		95 ~ 115		80 ~ 100		60 ~ 80																					
∅	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)																				
12	4.510	2.600	3.980	2.290	2.790	1.130	2.390	860	1.860	600																				
16	3.380	2.600	2.990	2.300	2.090	1.130	1.790	860	1.390	600																				
20	2.710	2.600	2.390	2.290	1.670	1.130	1.430	860	1.110	600																				
25	2.170	2.780	1.910	2.440	1.340	1.210	1.150	920	890	640																				
Depth of cut	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>1 D</td><td>0,05 D</td></tr> </table>		ap	ae	1 D	0,05 D	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>1 D</td><td>0,03 D</td></tr> </table>		ap	ae	1 D	0,03 D	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>1 D</td><td>0,015 D</td></tr> </table>		ap	ae	1 D	0,015 D	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>1 D</td><td>0,01 D</td></tr> </table>		ap	ae	1 D	0,01 D	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>1 D</td><td>0,01 D</td></tr> </table>		ap	ae	1 D	0,01 D
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1 D	0,01 D																													

1. Tools can cause sparks. Do not use flammable fluids.
2. Use a rigid and precise machine and holder.
3. When chattering occurs, reduce the speed and feed simultaneously.
4. Please consider the overhang length as the total length of replaceable head and overhang length of shank holder.
5. Use an air blow or a suitable cutting uid with high smoke retardant properties.

Caution: Sparks generated during operation or heat caused by tool breakage can cause fire. Be sure to use all proper fire - prevention measures. The conditions below are for high speed / high precision machining centers.

Abundant exchangeable milling heads! Exchangeable head end mill PXM

The PXM is an exchangeable head end mill series with the same high performance of a solid tool and the cost efficiency of an indexable tool. A single exchangeable head body is able to accommodate a wide range of exchangeable heads to meet various application needs.

Available shapes

- Square Type
- Roughing Type
- Corner Radius Type
- Ball Type

Please see OSG PHOENIX Catalog for details.



TIGHTENING PROCEDURE



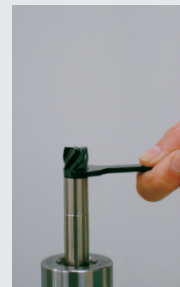
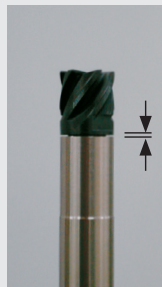
1. Cleaning

Remove dirt and chips from the connecting thread and shank.



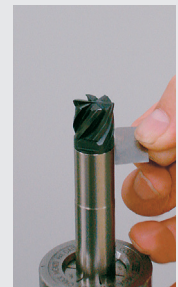
2. Initial Tightening

Tighten by hand



3. Final Tightening

Tighten with a spanner wrench



4. Confirmation

Confirm that there is no gap

Cautions during use

- Only use the spanner wrenches that are designed specifically for the PXM (P. 13). Please do not use alternative spanner wrenches sold on the market as a replacement.
- Please tighten until the head and the shank holder faces meet. Confirm that there is no gap.
- Degreasing the connecting thread may result in over tightening or a possible separation of the faces. Please do not degrease.
- Please make sure that the spanner wrench is inserted properly and turn it slowly during use.

MOUNTING PROCEDURE



1. Initial Tightening (BT30)

Make sure the fastening portion of the collet is clean then insert it into the holder. Turn the pull stud to tighten.

*For models other than BT30 please refer to the instructions below.



2. Final Tightening

Tighten with a spanner wrench



3. Cleaning

Remove dirt and chips from the connecting thread and collet

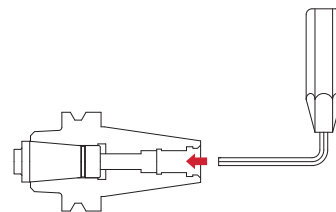


4. Mounting the Head

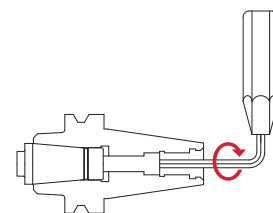
After screwing the head in by hand, use the PXM spanner wrench to tighten.

Mounting procedure for holders other than BT30

- ① Insert the hexagon socket wrench into the pull screw hexagonal section.
*For pull studs with holes (Ø6 or above), it is operational with the stud being attached.



- ② To prevent the collet from rotating, support the tip of the collet by hand, tighten with the wrench by turning to the right, then fastening to the required torque.
*Recommended tightening torque: 18N·m



Cautions during use

- Only use the spanner wrenches that are designed specifically for the PXM (p.24) for attaching PXM heads.
- Please do not use alternative spanner wrenches sold on the market as a replacement.
- Please refer to p.24 for tightening torque.
- Please tighten until the head and the collet faces meet. Confirm that there is no gap.
- Degreasing the connecting thread may result in over tightening or a possible separation of the faces. Please do not degrease.
- Please make sure that the spanner wrench is inserted properly and turn it slowly during use.



shaping your dreams

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