



Anti Vibration Carbide End mill

AE-VMS SERIES

Volume 6



KEY FEATURES: AE-VMS • AE-VMSS



1 Dularise coating

2 Positive rake angle

3 New flute form

4 High rigidity

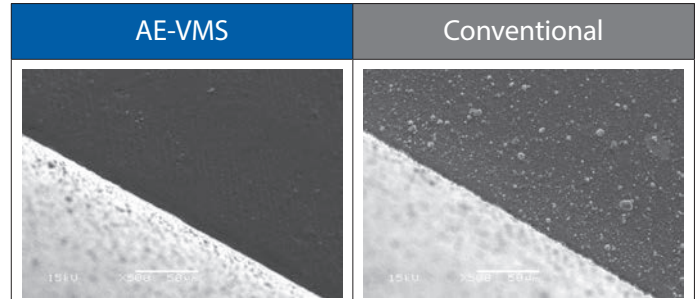
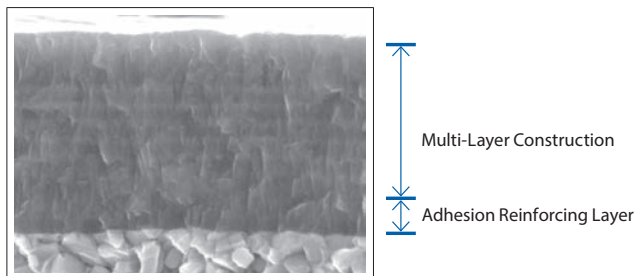
5 Solid carbide



AE-VMS: THE A-BRAND END MILL

Duarise coating

The new duarise coating provides excellent lubricity, superior friction-resistance and high oxidation temperature. Multi-layer construction minimizes the thermal cracks that often occurred while using water-soluble oil.



Smoothing surface coating treatment made an excellent quality of surface finishing.

Positive rake angle

A stable performance is gathered by reducing cutting forces as a result of a sharp and positive rake angle.

New flute form

The new flute form with its excellent chip evacuation properties enables stable milling and the suppression of burrs.

Figure 1. 10% lower cutting force versus the competitors

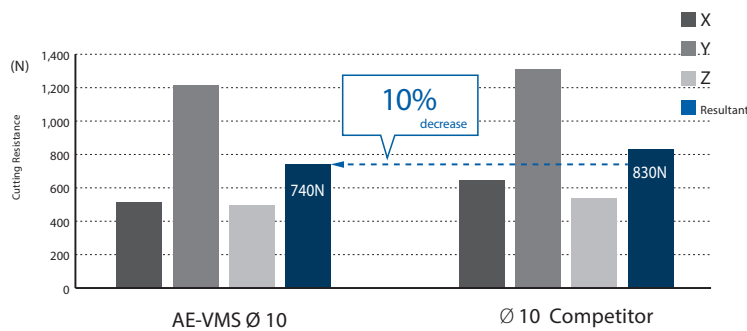
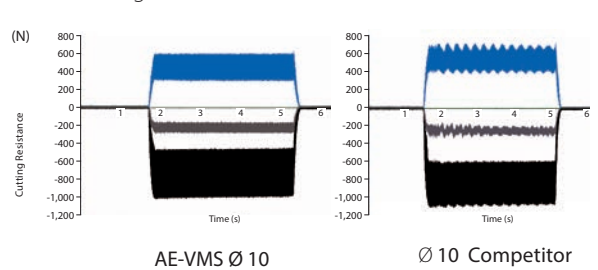
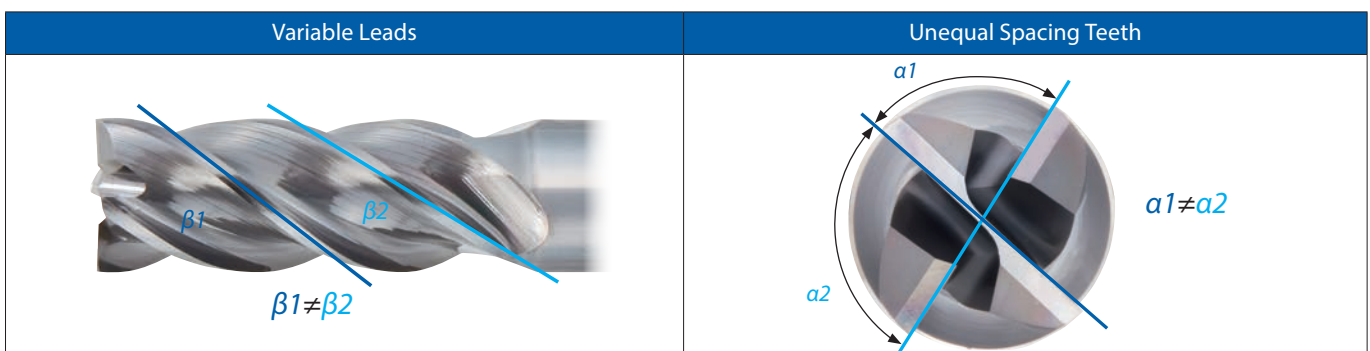


Figure 2. Stable performance even when the overhang length is L/D=4



High rigidity

The unequal spacing of teeth and variable-lead geometry enables stable and high efficiency milling and the suppression of vibration.



KEY FEATURES: AE-VML

1 Dularise coating

2 Microrelief geometry

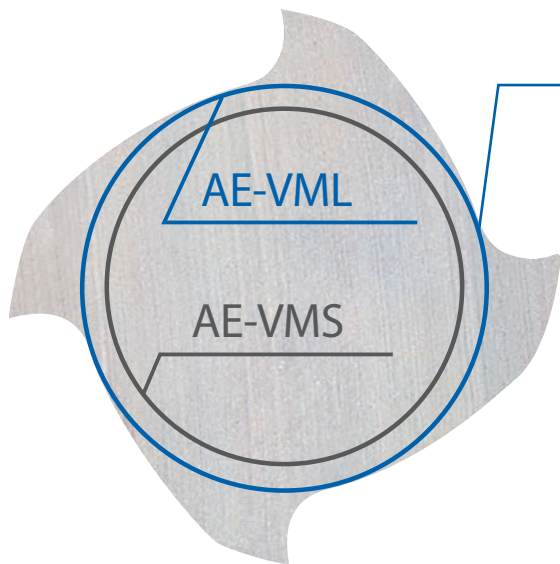
3 For high-speed side milling

4 Long flutes

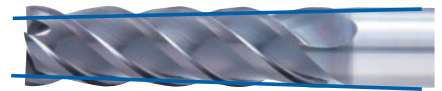
5 Solid carbide



AE-VML: ULTIMATE SIDE MILLING EFFICIENCY



High Rigidity



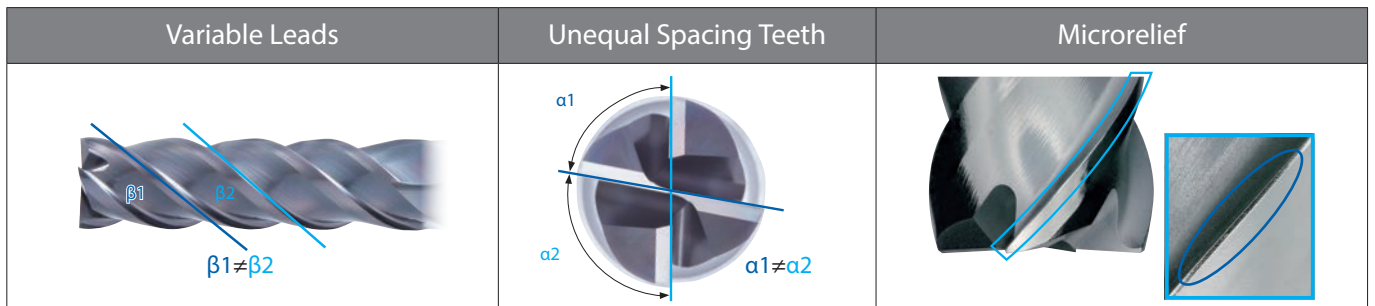
High-speed side milling is made possible by the large thick core design. The web taper geometry, where the thickness of core changes from the cutting edge to the shank, greatly improves tool rigidity, thereby prevents the machining surface from tilting

High Helix

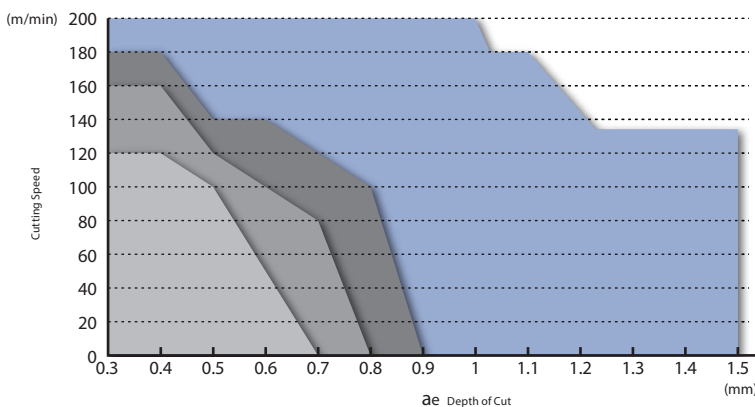
Reduces cutting force to enable stable milling

Suppression of vibration

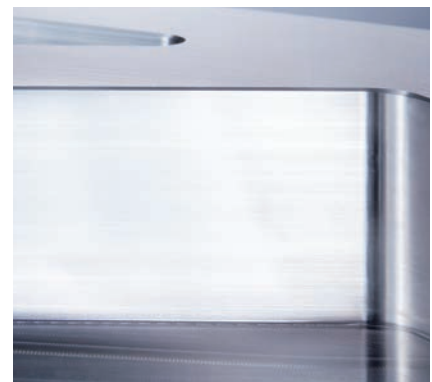
The combination of variable lead, unequal spacing teeth and microrelief geometry contributes to stable and high efficiency milling performance.



Chattering is greatly suppressed even during high-speed, high-depth milling, resulting in unrivaled high efficiency performance.



AE-VML Ø10x40
 A Competitor
 B Competitor
 C Competitor
 S50C
 Work Material
 (ap) 40mm
 Depth of Cut

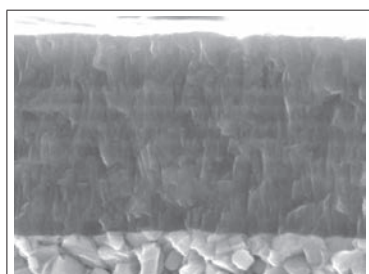


Milling | Solid carbide

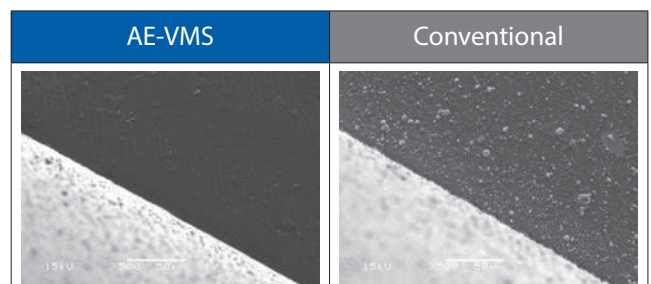


DUARISE Coating

Provides excellent lubricity, superior friction-resistance and high oxidation temperature. Multi-layer construction minimizes the thermal cracks that often occurred while using watersoluble oil.



Multi-Layer Construction
 Adhesion Reinforcing Layer



Smoothing surface coating treatment made an excellent quality of surface finishing.

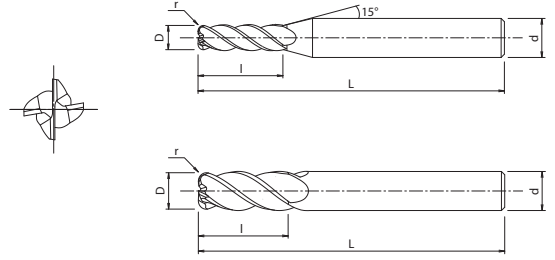
AE-VMS

Milling | Solid carbide



Type 1

Type 2



- First choice in quality and performance
- Carbide end mill with Duarise coating
- Wide variety in applications and work materials
- 4 flutes, variable helix and unequal spacing



EDP	D	R	L	l	d	Type	Price
8555830	3	-	60	8	6	1	
8556050	3	0,2	60	8	6	1	
8556060	3	0,5	60	8	6	1	
8555840	4	-	60	11	6	1	
8556070	4	0,2	60	11	6	1	
8556080	4	0,5	60	11	6	1	
8556090	4	1	60	11	6	1	
8555850	5	-	60	13	6	1	
8556100	5	0,2	60	13	6	1	
8556110	5	0,5	60	13	6	1	
8556120	5	1	60	13	6	1	
8555860	6	-	60	13	6	2	
8556130	6	0,3	60	13	6	2	
8556140	6	0,5	60	13	6	2	
8556150	6	1	60	13	6	2	
8555880	8	-	70	19	8	2	
8556160	8	0,3	70	19	8	2	
8556170	8	0,5	70	19	8	2	
8556180	8	1	70	19	8	2	
8556190	8	1,5	70	19	8	2	
8556200	8	2	70	19	8	2	
8555900	10	-	80	22	10	2	
8556210	10	0,3	80	22	10	2	
8556220	10	0,5	80	22	10	2	
8556230	10	1	80	22	10	2	
8556240	10	1,5	80	22	10	2	
8556250	10	2	80	22	10	2	
8556260	10	3	80	22	10	2	
8555920	12	-	90	26	12	2	
8556270	12	0,5	90	26	12	2	
8556280	12	1	90	26	12	2	
8556290	12	1,5	90	26	12	2	
8556300	12	2	90	26	12	2	
8556310	12	3	90	26	12	2	
8555960	16	-	100	32	16	2	
8556000	20	-	110	40	20	2	
8556010	25	-	120	50	25	2	

Milling | Solid carbide

CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-VMS / AE-VMSS

Square Type

Side milling

Cutting Speed	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm ²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel ≤200HB	
	130 (100-150) (m/min)		120 (100-150) (m/min)		100 (80-120) (m/min)		80 (60-100) (m/min)	
Ø	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	38.200	840	28.700	690	25.500	510	22.300	450
1,5	25.500	920	21.200	760	17.000	540	14.900	460
2	19.900	1.430	17.500	840	14.300	630	11.100	470
2,5	15.900	1.590	14.000	900	11.500	690	8.900	480
3	13.800	1.660	12.700	1.070	10.600	760	8.000	480
4	10.400	1.830	9.600	1.150	8.000	800	6.000	530
5	8.300	1.990	7.600	1.220	6.400	900	4.800	560
6	6.900	2.070	6.400	1.540	5.300	1.060	4.200	640
8	5.200	1.770	4.800	1.540	4.000	1.040	3.200	610
10	4.100	1.640	3.800	1.370	3.200	900	2.500	580
12	3.500	1.400	3.200	1.280	2.700	760	2.100	530
16	2.600	1.250	2.400	1.060	2.000	640	1.400	450
20	2.100	1.010	1.900	840	1.600	510	1.100	370
25	1.700	820	1.500	660	1.300	420	900	310

Depth of cut	ap	ae
	1,5D	0,2D

Slotting

Cutting Speed	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm ²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel ≤200HB	
	100 (80-120) (m/min)		90 (70-110) (m/min)		80 (60-100) (m/min)		70 (50-80) (m/min)	
Ø	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	28.700	570	25.500	460	22.300	360	19.100	340
1,5	19.100	610	17.000	480	14.900	420	12.700	360
2	14.300	630	12.700	510	11.100	440	9.600	380
2,5	11.500	780	10.200	570	8.900	460	7.600	430
3	10.600	930	9.600	690	8.500	510	7.400	470
4	8.000	960	7.200	720	6.400	510	5.600	490
5	6.400	1.020	5.700	800	5.100	610	4.500	560
6	5.300	1.060	4.800	900	4.200	670	3.700	370
8	4.000	910	3.600	720	3.200	640	2.800	370
10	3.200	840	2.900	700	2.500	550	2.200	350
12	2.700	810	2.400	670	2.100	550	1.900	330
16	2.000	600	1.800	500	1.600	420	1.200	310
20	1.600	480	1.400	390	1.300	340	900	250
25	1.300	390	1.100	310	1.000	260	600	170

Depth of cut	ap	
	1D	

Dc	ap	
	Dc≤6	0,5D
	Dc>6	1D

- The above milling condition is a guideline for the overhang length is 3xD.
- Use a rigid and precise machine and holder.
- The rotational speed is calculated by the median of the recommended cutting speed. Adjustment may be necessary depending on the rigidity of the workpiece fixture and machine.
- Please use a suitable fluid with high smoke retardant properties.
- During dry (no fluid) milling, please use air blow to remove disposable chips from the milling area and to eliminate chip packing.
- Please use water-soluble oil when machining stainless steel.
- Reduce speed and feed as well as depth of cut when high precision is required.
- Adjust the speed and feed accordingly when the overhang length is longer than specified.

Milling | Solid carbide



CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-VMS / AE-VMSS

Radius Type

Side milling

Cutting Speed	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm ²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel ≤200HB	
	130 (100-150) (m/min)		120 (100-150) (m/min)		100 (80-120) (m/min)		80 (60-100) (m/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	13.800	1.410	12.700	910	10.600	610	8.000	380
4	10.400	1.560	9.600	980	8.000	640	6.000	480
5	8.300	1.690	7.600	1.030	6.400	720	4.800	450
6	6.900	1.970	6.400	1.460	5.300	950	4.200	570
8	5.200	1.680	4.800	1.460	4.000	940	3.200	550
10	4.100	1.560	3.800	1.300	3.200	810	2.500	520
12	3.500	1.330	3.200	1.220	2.700	680	2.100	480
Depth of cut			ap 1,5D		ae 0,2D			

Slotting

Cutting Speed	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm ²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel ≤200HB	
	100 (80-120) (m/min)		90 (70-110) (m/min)		80 (60-100) (m/min)		70 (50-80) (m/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	10.600	790	9.600	590	8.500	410	7.400	380
4	8.000	820	7.200	610	6.400	410	5.600	390
5	6.400	870	5.700	680	5.100	490	4.500	450
6	5.300	1.010	4.800	860	4.200	600	3.700	330
8	4.000	870	3.600	680	3.200	580	2.800	330
10	3.200	800	2.900	660	2.500	500	2.200	320
12	2.700	770	2.400	640	2.100	490	1.900	300
Depth of cut			ap 1D				Dc Dc≤6 0,5D Dc>6 1D	

1. The above milling condition is a guideline for the overhang length is 3xD.
2. Use a rigid and precise machine and holder.
3. The rotational speed is calculated by the median of the recommended cutting speed. Adjustment may be necessary depending on the rigidity of the workpiece fixture and machine.
4. Please use a suitable fluid with high smoke retardant properties.
5. During dry (no fluid) milling, please use air blow to remove disposable chips from the milling area and to eliminate chip packing.
6. Please use water-soluble oil when machining stainless steel.
7. Reduce speed and feed as well as depth of cut when high precision is required.
8. Adjust the speed and feed accordingly when the overhang length is longer than specified.

Fix rate cutting condition

Work Material	L/D	Mild Steel - Carbon Steel Cast Iron SS400 • S55C • FC250 ~750N/mm ²		Alloy Steel Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel Hardened Steel PX5 • NAK80 • 30~45 HRC		Stainless Steel (≤ 200HB)	
		S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)
Side Milling	4	90%		90%		80%		70%	
	5	80%		80%		70%		70%	
Slotting	4	80%		70%		70%		60%	
	5	70%		60%		60%		50%	

Milling | Solid carbide



CUTTING CONDITIONS

Milling | Endmills | Cutting conditions

AE-VML

ae=0.05D

Cutting Speed	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm ²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB					
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)				
160 (140-180) (m/min)			150 (130-170) (m/min)		140 (120-160) (m/min)		125 (100-140) (m/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)				
6	8.500	2.480	8.000	2.180	7.400	2.010	6.600	1.660				
8	6.400	1.870	6.000	1.630	5.600	1.520	5.000	1.260				
10	5.100	1.730	4.800	1.440	4.500	1.350	4.000	1.120				
12	4.200	1.430	4.000	1.200	3.700	1.110	3.300	920				
Depth of cut	<table border="1"> <tr> <td>ap</td> <td>ae</td> </tr> <tr> <td>3D</td> <td>0,05D</td> </tr> </table>								ap	ae	3D	0,05D
ap	ae											
3D	0,05D											

1. Use a rigid and precise machine and holder.
2. The rotational speed is calculated by the median of the recommended cutting speed. Adjustment may be necessary depending on the rigidity of the workpiece fixture and machine.
3. Please use a suitable fluid with high smoke retardant properties.
4. During dry (no fluid) milling, please use air blow to remove disposable chips from the milling area and to eliminate chip packing.
5. Please use water-soluble coolant when machining stainless steel.

ae=0.1D

Cutting Speed	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm ²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB					
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)				
220 (200-240) (m/min)			170 (150-190) (m/min)		135 (110-150) (m/min)		130 (110-150) (m/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)				
6	11.700	3.180	9.000	2.270	7.200	1.810	6.900	1.600				
8	8.800	2.390	6.800	1.710	5.400	1.360	5.200	1.210				
10	7.000	2.240	5.400	1.510	4.300	1.200	4.100	1.070				
12	5.800	1.860	4.500	1.260	3.600	1.010	3.500	910				
Depth of cut	<table border="1"> <tr> <td>ap</td> <td>ae</td> </tr> <tr> <td>3D</td> <td>0,1D</td> </tr> </table>								ap	ae	3D	0,1D
ap	ae											
3D	0,1D											

ae=0.15D

Cutting Speed	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm ²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB					
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)				
140 (120-160) (m/min)			100 (80-120) (m/min)		90 (70-110) (m/min)		85 (60-100) (m/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)				
6	7.400	1.860	5.600	1.300	4.800	1.110	4.500	950				
8	5.600	1.410	4.200	970	3.600	840	3.400	720				
10	4.500	1.350	3.300	860	2.900	750	2.700	650				
12	3.700	1.110	2.800	730	2.400	620	2.300	550				
Depth of cut	<table border="1"> <tr> <td>ap</td> <td>ae</td> </tr> <tr> <td>3D</td> <td>0,15D</td> </tr> </table>								ap	ae	3D	0,15D
ap	ae											
3D	0,15D											

ae≤0.2D

Cutting Speed	Mild Steel • Carbon Steel • Cast Iron SS400 • S55C • FC250 ~750N/mm ²		Alloy Steel • Tool Steel SCM • SKS • SKD ~30HRC		Prehardened Steel • Hardened Steel PX5 • NAK80 30~45HRC		Stainless Steel SUS304 • SUS420 ≤200HB					
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)				
100 (80-120) (m/min)			80 (60-100) (m/min)		70 (50-90) (m/min)		65 (40-80) (m/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)				
6	5.300	1.230	4.200	890	3.700	780	3.500	670				
8	4.000	930	3.200	680	2.800	590	2.600	500				
10	3.200	900	2.500	600	2.200	530	2.100	460				
12	2.700	760	2.100	500	1.900	460	1.700	370				
Depth of cut	<table border="1"> <tr> <td>ap</td> <td>ae</td> </tr> <tr> <td>3D</td> <td>≤0,2D</td> </tr> </table>								ap	ae	3D	≤0,2D
ap	ae											
3D	≤0,2D											

Milling | Solid carbide

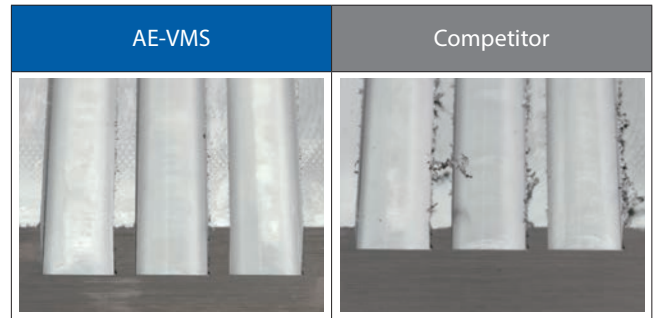


CUTTING DATA

Suppression of Burrs

Great surface finish without vibration and minimal burrs.

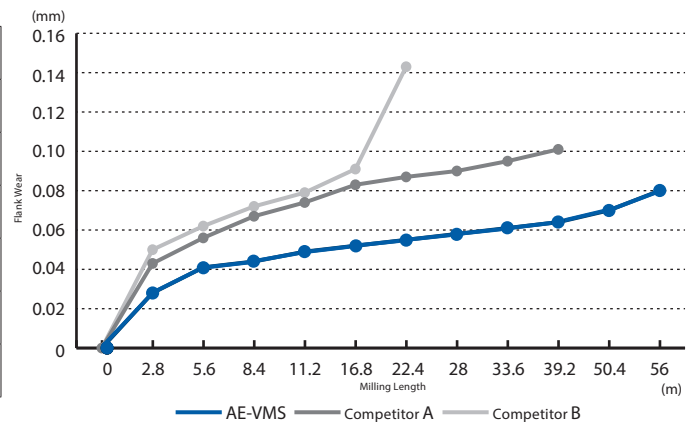
Tool	AE-VMS Ø 10	Competitor Ø 10
Work Material	SUS316	
Cutting Speed	69m/min (2.200 min ⁻¹)	
Feed Rate	350mm/min (0,04mm/t)	
Depth of Cut	ap = 10mm	ap=5mm
Coolant	Water Soluble	
Machine	Vertical Machining Center	
M.R.R.	35 cm ³ /min	17,5 cm ³ /min



Stable Performance

Stable performance on stainless steel

Tool	AE-VMS Ø 10
Work Material	SUS304
Cutting Speed	70m/min (2.250 min ⁻¹)
Feed Rate	475mm/min (0,053mm/t)
Depth of Cut	ap = 10mm
Coolant	Water Soluble
Machine	Vertical Machining Center



Cutting edge wear comparison

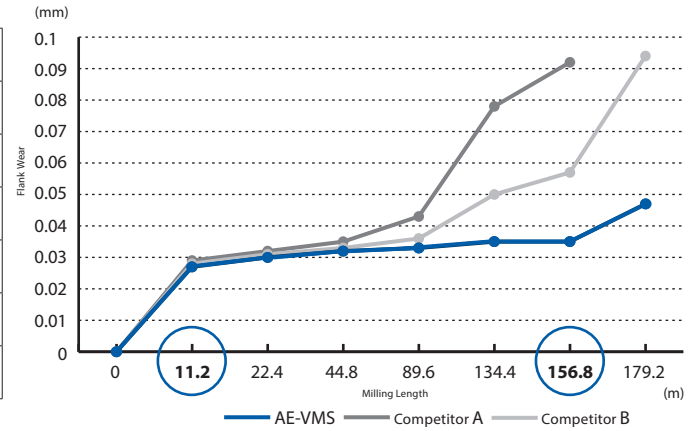


CUTTING DATA

Suppression of Burrs

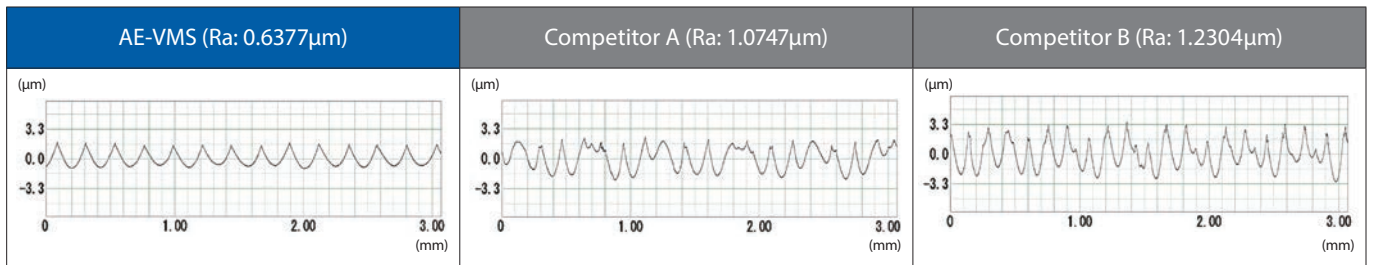
Suppression of cutting heat generation minimizes tool wear

Tool	AE-VMS Ø 6
Work Material	SCM440
Cutting Speed	140m/min (7.500 min ⁻¹)
Feed Rate	1.800mm/min (0,06mm/t)
Depth of Cut	ap = 9mm ae= 1,2mm
Coolant	Air Blow
Machine	Vertical Machining Center



Surface roughness comparison

Surface roughness after milling 11,2m



Tool condition comparison

Tool condition after milling 156,8m

	Cutting Chips	Wear Comparison
AE-VMS	<p>Brown about 500°C</p>	<p>No Cutting Edge Recession</p>
Competitor A	<p>Purple about 600°C</p>	<p>Excessive Cutting Edge Recession</p>
Competitor B	<p>Blue about 700°C</p>	<p>Minimal Cutting Edge Recession</p>

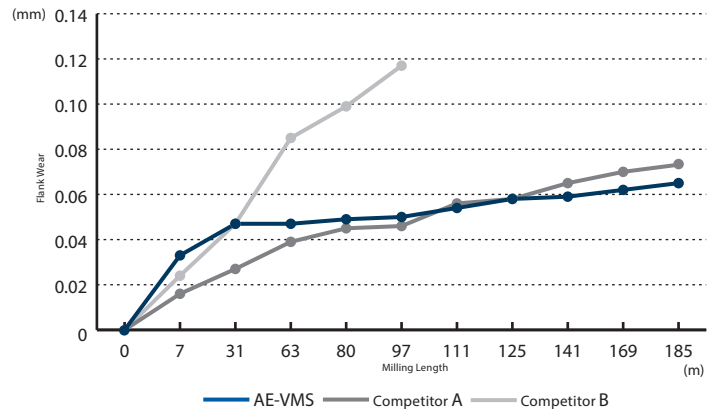
Milling | Solid carbide

CUTTING DATA

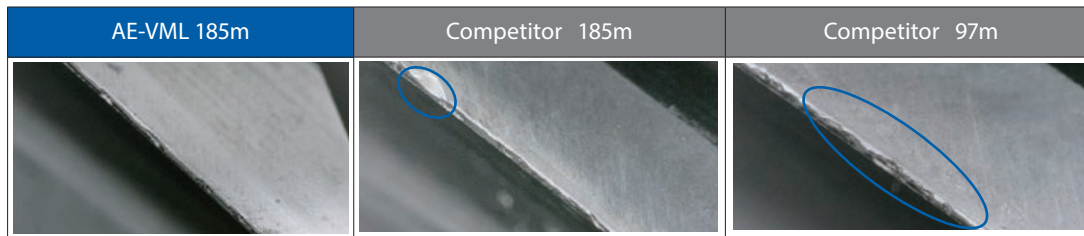
Stable performance

Stable performance even at 4D depth of cut

Tool	AE-VML Ø 10 x 40
Work Material	S50C
Milling Method	Side milling
Cutting Speed	130m/min (4,200min ⁻¹)
Feed Rate	1.200mm/min (0,07mm/t)
Depth of Cut	ap=40mm ae=0.5mm
Coolant	Air Blow
Machine	Horizontal Machining Center



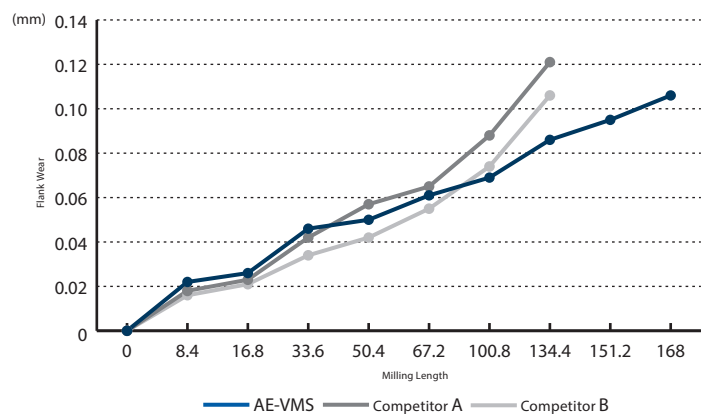
Wear comparison of the peripheral cutting edge



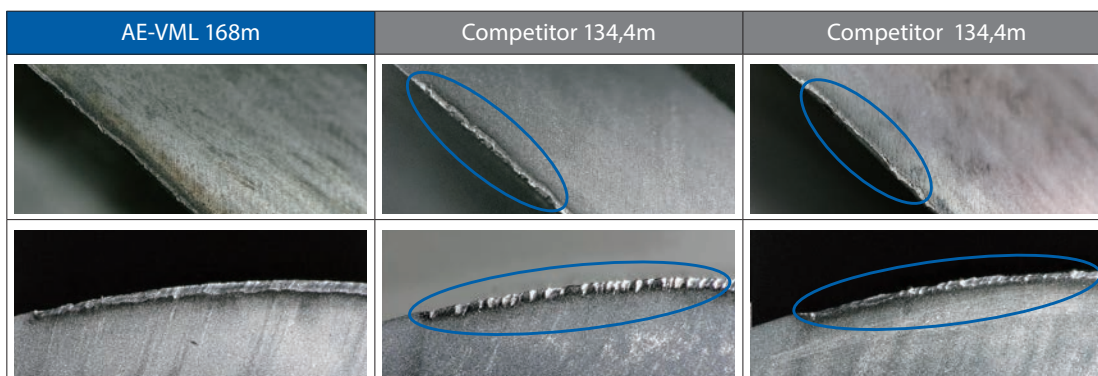
Long tool life

DUARISE coating greatly reduces tool wear progression even with the use of water-soluble coolant.

Tool	AE-VML Ø 10 x 31
Work Material	SCM440(30HRC)
Milling Method	Side milling
Cutting Speed	180m/min (5.700min ⁻¹)
Feed Rate	1.400mm/min (0,06mm/t)
Depth of Cut	ap=25mm ae=1mm
Coolant	Water Soluble
Machine	Vertical Machining Center



Wear comparison of the peripheral cutting edge



Milling | Solid carbide





shaping your dreams

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