



ZCC USA INC.

ZHUZHOU CEMENTED CARBIDE CUTTING TOOLS U.S.A. INC.

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VSM-4 ENDMILLS SERIES

High Efficiency

Feed rate increased up to 50% significantly increased machining process efficiency.

High Accuracy

Excellent vibration resistance and smooth cutting process significantly improved the surface quality of workpiece.

Longevity

Up to 30% increase in tool life
Ideal for both rough and fine machining.

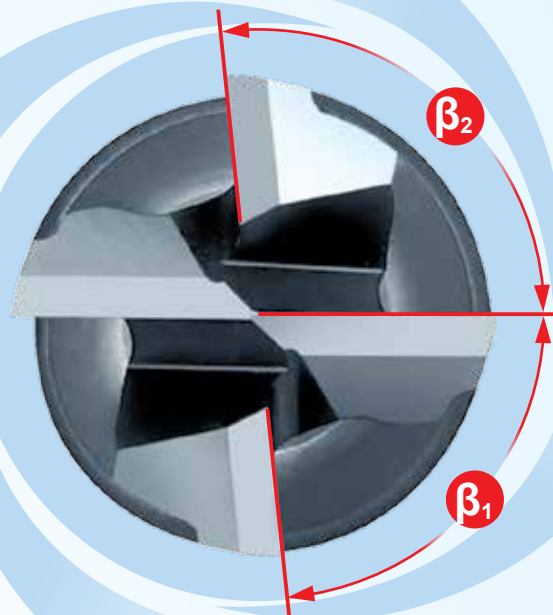
- **VSM-4E**
- **VSM-4R**
- **VSM-4EFP**
- **VSM-4RFP**

• Ideal choice for difficult cutting materials such as stainless steel, heat-resistant alloys and titanium alloys, etc.

• Ideal surface finishing and long-lasting tool life.

• Enable diversity and versatility in machining methods.

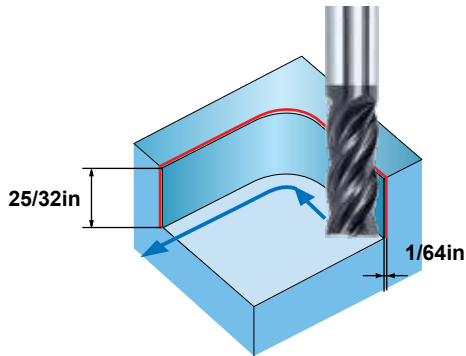
• Unique helix design substantially increase tool's vibration resistance, thus effectively reduce the chipping of the tool.



$\beta_1 \neq \beta_2$

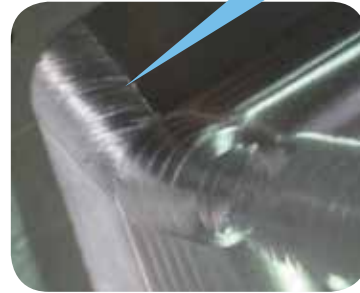
• VSM-4E Endmills Finish Workpiece Corners with High Efficiency

Tool Type	VSM-4E-3/8"
Workpiece Material	SUS304
Rotating Speed	6400 RPM
Feed Rate	64 IPM (.0025/ tooth)
Cooling Method	Water-Soluble Coolant



Note: VSM-4E Endmills can effectively suppress vibration and improve the surface quality of the corners of workpiece.

Ordinary Endmill

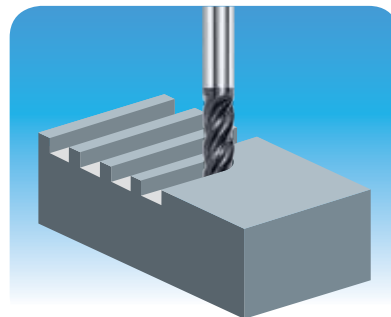


VSM-4E Series Endmill



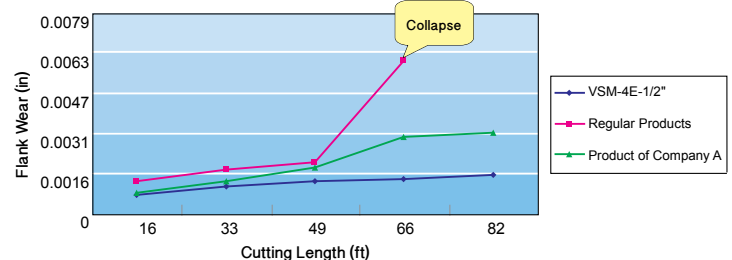
• VSM-4E-1/2" Slot Milling of Stainless Steel

Machine Tool	MIKRON UCP1000
Tool Holder	HSK63-A
Workpiece Material	1Cr18Ni9Ti
Cutting Speed	3150 RPM
Feed Rate/ Tooth	0.002/ tooth
Axial Cutting Depth	1/4"
Radial Cutting Depth	1/2"
Cooling Method	Water Cooling
Milling Style	Slot Milling
Overhang	1-3/8"



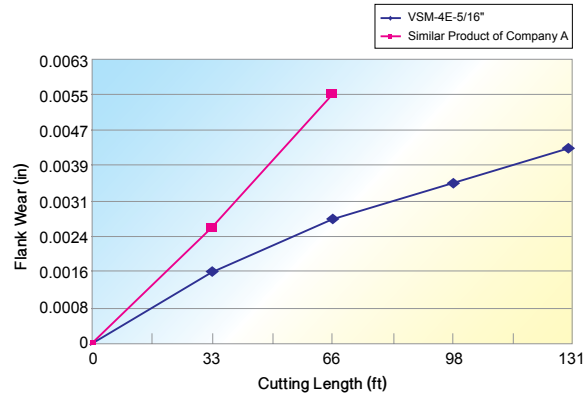
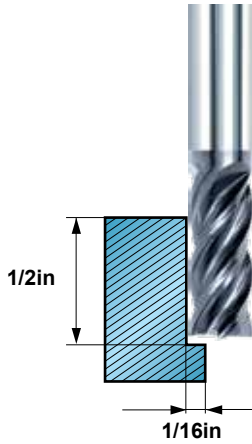
Note: • Compare with similar products, VSM Endmills have better wear resistance and longer tool life.
• Compare with ordinary endmills, VSM series have a much better chipping resistance.

Tool Wear Chart



• VSM-4E-5/16" Side Milling Machining Life Expectancy

Tool Type	VSM-4E-5/16"
Workpiece Material	SUS304
Rotating Speed	4000 RPM
Feed Rate	38 IPM (.0025/ tooth)
Cooling Method	Water-Soluble Coolant



Flank Wear Condition



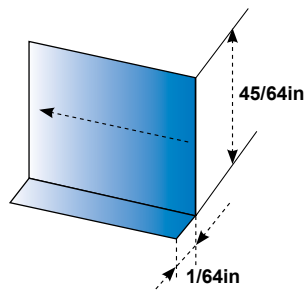
VSM-4E-5/16"



Similar Product of Company A

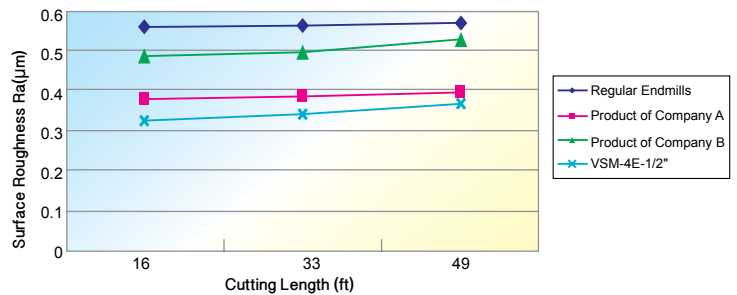
• VSM-4E-1/2" Surface Roughness of Stainless Steel Side Machining Comparison

Workpiece Material	1Cr18Ni9Ti	Radial Cutting Depth	0.0118"
Cutting Speed	262 SFM	Cooling Method	Water Cooling
Feed Rate/ Tooth	0.003/ tooth	Milling Style	Side Milling
Axial Cutting Depth	.7"	Overhang	1-1/2"



- Note:
- Compare to similar products of other manufacturers, VSM series have the most ideal surface quality after machining.
 - Due to the damping effect, the VSM series have less surface roughness.

Parallel Feeding Roughness Value Comparison Chart (Side)



VSM-4E

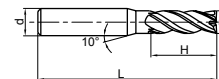


Image 1

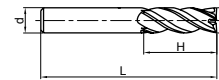
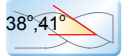


Image 2



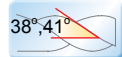
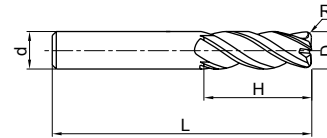
$D \leq 1/4"$	-0.0008~-0.0015	$1/4" < D \leq 3/8"$	-0.001~-0.0019
$3/8" < D \leq 5/8"$	-0.0013~-0.0023	$5/8" < D$	-0.0015~-0.0029



Ordering No.	Basic Dimensions (in)				No. of Teeth Z	Geometry	Stock
	D	d	L	H			
VSM-4E-1/8"	1/8"	1/8"	2"	1/2"	4	Image 2	•
VSM-4E-3/16"	3/16"	3/16"	2-1/2"	3/4"	4	Image 2	•
VSM-4E-1/4"	1/4"	1/4"	2-1/2"	3/4"	4	Image 2	•
VSM-4EL-1/4"	1/4"	1/4"	3"	1-1/8"	4	Image 2	•
VSM-4E-5/16"	5/16"	5/16"	2-1/2"	3/4"	4	Image 2	•
VSM-4EL-5/16"	5/16"	5/16"	3"	1-1/4"	4	Image 2	•
VSM-4E-3/8"	3/8"	3/8"	2-1/2"	1"	4	Image 2	•
VSM-4EL-3/8"	3/8"	3/8"	3"	1-1/4"	4	Image 2	•
VSM-4E-1/2"	1/2"	1/2"	3"	1-1/4"	4	Image 2	•
VSM-4EL-1/2"	1/2"	1/2"	4"	1-3/4"	4	Image 2	•
VSM-4E-5/8"	5/8"	5/8"	3-1/2"	1-1/2"	4	Image 2	•
VSM-4EL-5/8"	5/8"	5/8"	4"	2-1/8"	4	Image 2	•
VSM-4E-3/4"	3/4"	3/4"	4"	1-3/4"	4	Image 2	•
VSM-4E-1"	1"	1"	4"	1-3/4"	4	Image 2	•

• Available in Stock ○ Make-to-Order

VSM-4R



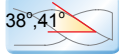
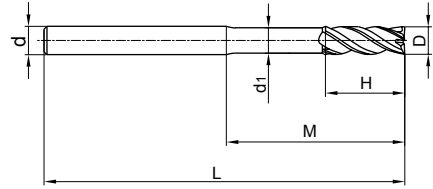
$D \leq 1/4"$	-0.0008~-0.0015	$1/4" < D \leq 3/8"$	-0.001~-0.0019
$3/8" < D \leq 5/8"$	-0.0013~-0.0023	$5/8" < D$	-0.0015~-0.0029



Ordering No.	Basic Dimensions (in)					No. of Teeth Z	Stock
	D	R	d	L	H		
VSM-4R-1/8"R010"	1/8"	0.010"	1/8"	2"	1/2"	4	•
VSM-4RL-3/16"R010"	3/16"	0.010"	3/16"	2-1/2"	3/4"	4	•
VSM-4RL-3/16"R020"	3/16"	0.020"	3/16"	2-1/2"	3/4"	4	•
VSM-4R-1/4"R020"	1/4"	0.020"	1/4"	2-1/2"	3/4"	4	•
VSM-4R-1/4"R030"	1/4"	0.030"	1/4"	2-1/2"	3/4"	4	•
VSM-4RL-1/4"R020"	1/4"	0.020"	1/4"	4"	1-1/4"	4	•
VSM-4R-5/16"R020"	5/16"	0.020"	5/16"	2-1/2"	3/4"	4	•
VSM-4RL-5/16"R020"	5/16"	0.020"	5/16"	3"	1-1/4"	4	•
VSM-4R-3/8"R020"	3/8"	0.020"	3/8"	2-1/2"	1"	4	•
VSM-4RL-3/8"R020"	3/8"	0.020"	3/8"	3-1/2"	2"	4	•
VSM-4R-1/2"R020"	1/2"	0.020"	1/2"	3"	1-1/4"	4	•
VSM-4R-1/2"R030"	1/2"	0.030"	1/2"	3"	1-1/4"	4	•
VSM-4RL-1/2"R030"	1/2"	0.030"	1/2"	4-1/2"	2-1/2"	4	•
VSM-4R-5/8"R030"	5/8"	0.030"	5/8"	3-1/2"	1-1/2"	4	•
VSM-4RL-5/8"R030"	5/8"	0.030"	5/8"	5"	3"	4	•
VSM-4RL-5/8"R060"	5/8"	0.060"	5/8"	4"	2-1/8"	4	•
VSM-4R-3/4"R030"	3/4"	0.030"	3/4"	4"	1-1/2"	4	•
VSM-4RL-3/4"R030"	3/4"	0.030"	3/4"	5"	3"	4	•
VSM-4R-3/4"R060"	3/4"	0.060"	3/4"	4"	1-1/2"	4	•
VSM-4RL-3/4"R060"	3/4"	0.060"	3/4"	5"	3"	4	•
VSM-4R-1"R030"	1"	0.030"	1"	4"	1-1/2"	4	•
VSM-4RL-1"R060"	1"	0.060"	1"	5"	3"	4	•

• Available in Stock ○ Make-to-Order

VSM-4EFP



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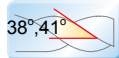
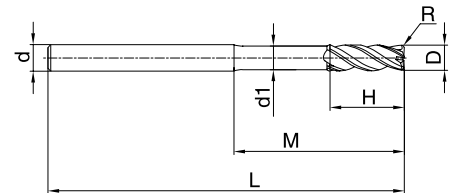
D	D _{≤1/4"} -0.0008~-0.0015	1/4"<D _{≤3/8"} -0.001~-0.0019
d	3/8"<D _{≤5/8"} -0.0013~-0.0023	5/8"<D -0.0015~-0.0029



Ordering No	Basic Dimensions (in)						No. of Teeth Z	Stock
	D	d	H	M	d _i	L		
VSM-4EFP-1/4"	1/4"	1/4"	3/8"	1-1/16"	15/64"	3"	4	●
VSM-4EFP-3/8"	3/8"	3/8"	1/2"	1-1/2"	23/64"	4"	4	●
VSM-4EFP-1/2"	1/2"	1/2"	5/8"	2"	31/64"	4"	4	●
VSM-4EFP-5/8"	5/8"	5/8"	3/4"	2-3/8"	39/64"	6"	4	●

● Available in Stock ○ Make-to-Order

VSM-4RFP



Coated
AITIN

D	D _{≤1/4"} -0.0008~-0.0015	1/4"<D _{≤3/8"} -0.001~-0.0019
d	3/8"<D _{≤5/8"} -0.0013~-0.0023	5/8"<D -0.0015~-0.0029



Ordering No	Basic Dimensions (in)							No. of Teeth Z	Stock
	D	R	d	d _i	H	M	L		
VSM-4RFP-1/4"R020	1/4"	0.020"	1/4"	15/64"	3/8"	1-1/16"	3"	4	●
VSM-4RFP-1/4"R040	1/4"	0.040"	1/4"	15/64"	3/8"	1-1/16"	3"	4	●
VSM-4RFP-3/8"R020	3/8"	0.020"	3/8"	23/64"	1/2"	1-1/2"	4"	4	●
VSM-4RFP-3/8"R040	3/8"	0.040"	3/8"	23/64"	1/2"	1-1/2"	4"	4	●
VSM-4RFP-1/2"R020	1/2"	0.020"	1/2"	23/64"	1/2"	1-1/2"	4"	4	●
VSM-4RFP-1/2"R040	1/2"	0.040"	1/2"	23/64"	1/2"	1-1/2"	4"	4	●
VSM-4RFP-5/8"R030	5/8"	0.030"	5/8"	39/64"	3/4"	2-3/8"	6"	4	●
VSM-4RFP-5/8"R060	5/8"	0.060"	5/8"	39/64"	3/4"	2-3/8"	6"	4	●

● Available in Stock ○ Make-to-Order

■ Applicable Workpiece Material Table ○ Very Suitable ○ Suitable

Workpiece Material											
Carbon Steel	Alloy Steel	Pre-hardened Steel & Hardened Steel				Stainless Steel	Cast Iron & Nodular Cast Iron	Copper Alloy	Aluminum Alloy	Titanium Alloy	Heat Resistant Alloy
		~40HRC	~50HRC	~55HRC	~68HRC						
○	○					○				○	○

VSM-4E * VSM-4EFP

Workpiece Material	Carbon Steel & Alloy Steel		Stainless Steel		Heat Resistant Alloy & Titanium Alloy	
	Diameter (in)	Rotating Speed (min ⁻¹)	Feed Speed (in/min)	Rotating Speed (min ⁻¹)	Feed Speed (in/min)	Rotating Speed (min ⁻¹)
5/32	6400	27	3700	6	3055	3
1/4	5300	29	2700	7	2470	4
5/16	3900	27	2000	8	1820	5
1/2	2600	23	1300	6	1235	4
5/8	1900	20	1000	5	935	3

Maximum Cutting Depth		
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VSM-4R * VSM-4RFP

Workpiece Material	Carbon Steel & Alloy Steel		Stainless Steel		Heat Resistant Alloy & Titanium Alloy	
	Diameter (in)	Rotating Speed (min ⁻¹)	Feed Speed (in/min)	Rotating Speed (min ⁻¹)	Feed Speed (in/min)	Rotating Speed (min ⁻¹)
1/4	5300	35	2700	9	2470	5
5/16	3900	33	2000	10	1820	6
1/2	2600	28	1300	8	1235	5
5/8	1900	24	1000	7	935	4

Maximum Cutting Depth		
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1. Above table shows the standard value of side milling. When milling slot, 80%~100% of rotating speed and 60%~80% of feed speed stated above are recommended as standard.

2. When cutting stainless steel, titanium alloy and heat resistant alloy, non- water soluble cutting fluid is recommended.

3. Please select high rigidity, high precision machine tools and tool holders.

4. Adjust machine's rigidity speed and feed rate based on the depth of cut and machine's rigidity.

5. Climb milling recommended.

6. Make overhang of the tool as short as possible under the conditions of non-interference.

7. Table above is based on the recommended value of $L/D \leq 4$. When $L/D > 4$, reduce both rotating and feed speed down to 70%.