

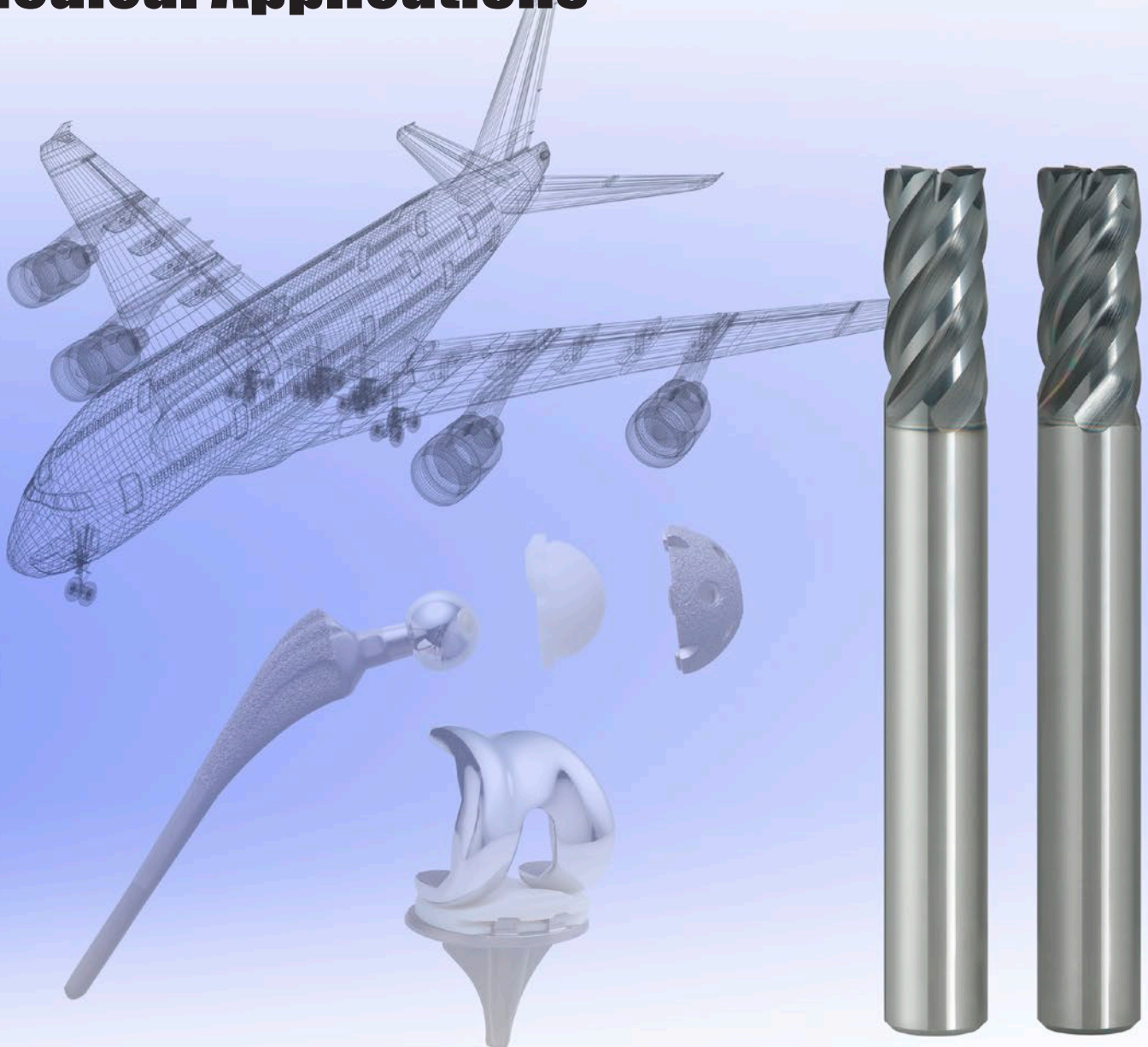
Vibration Control End Mills for High Efficiency Machining of Difficult-to-Cut Materials

SMART MIRACLE End Mill Series

VQ5MHV/MHV RB

New
Products

Highly Effective Machining of Titanium & Stainless Steel Materials for Aerospace & Medical Applications



Vibration Control End Mills for High Efficiency Machining of Difficult-to-Cut Materials

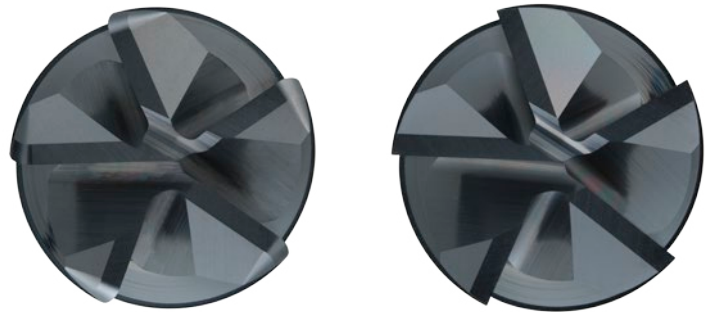
SMART MIRACLE End Mill Series

VQ5MHV/MHVVB

The combination of 5 flutes and irregular helix for reducing vibration enables highly efficient machining of difficult-to-cut materials.

5 Flutes

Optimal flute shape improves chip evacuation and is ideal for slot milling with deep depths of cut.



Variable helix: 39°/40°/41°

Excellent chatter resistance with variable helix angle for stability and smooth cutting.



Corner Radius

Strong chipping resistance and increased tool life in heavy cutting as a result of a new and improved geometric design.

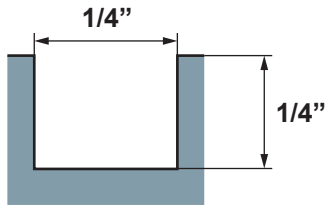
SMART MIRACLE Coating

Improved flank wear through use of SMART MIRACLE coating and Micro-grain Cemented Carbide.

VQ5MHVRB

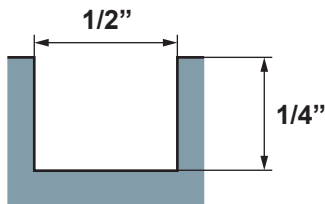
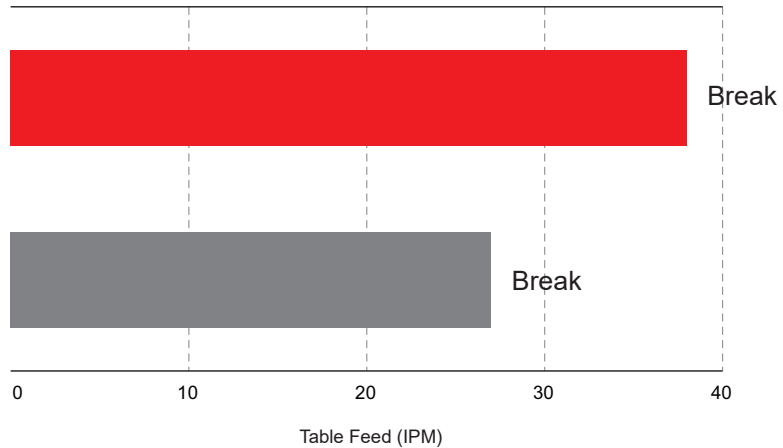
VQ5MHV

Application Example



<Cutting Conditions>
 Workpiece Material : 17-4PH (AISI S17400)
 Tool : VQ5MHVRBD1/4R020
 $\phi 1/4$ RE = .020
 Revolution : n = 3509 min⁻¹
 Cutting Speed : vc = 230 SFM
 Cutting Mode: External Coolant (Emulsion)
 Machine : Vertical M/C (HSK100A)

VQ5MHVRB

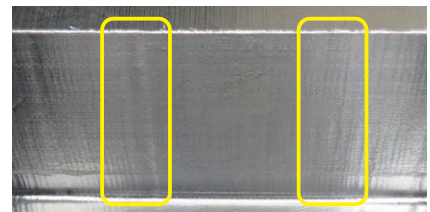
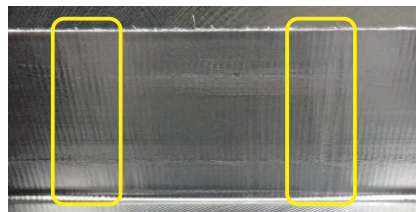
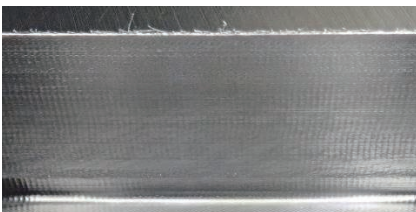


<Cutting Conditions>
 Workpiece Material : 17-4PH (AISI S17400)
 Tool : VQ5MHVRBD1/2R030
 $\phi 1/2$ RE = .030
 Revolution : n = 1754 min⁻¹
 Cutting Speed : vc = 230 SFM
 Table Feed : vf = 24.17 IPM
 Feed per Tooth : .0038 inch
 Cutting Mode : External Coolant (Emulsion)
 Machine : Vertical M/C (HSK100A)

VQ5MHVRB

Competitor A

Competitor B



Smooth Surface Finish

Uneven Surface

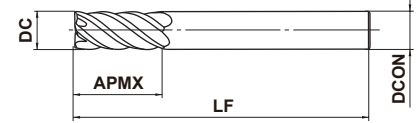
Vibration Control End Mills for High Efficiency Machining of Difficult-to-Cut Materials

VQ5MHV – Inch sizes NEW

End mill, Medium cut length, 5 flute, Irregular helix flutes



Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
○	○			○	○		



	$.2500" \leq DC \leq .5000"$				
	0 $-.0012"$				
	$.2500" \leq DCON \leq .3750"$	$DCON = .5000"$			
	0 $-.0002"$	0 $-.0003"$			

- SMART MIRACLE irregular helix end mills for reducing vibration and for delivering stable performance on difficult-to-cut materials and long overhang applications.

Order Number	DC	APMX	LF	DCON	No.F [*]	Stock
VQ5MHVD1/4	.2500	.625	2.500	.2500	5	●
VQ5MHVD5/16	.3125	.750	2.750	.3125	5	●
VQ5MHVD3/8	.3750	.875	3.250	.3750	5	●
VQ5MHVD1/2	.5000	1.125	4.000	.5000	5	●

Note 1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

* Number of Flutes

DC = Dia.
APMX = Length of Cut

LF = Overall Length
DCON = Shank Dia.

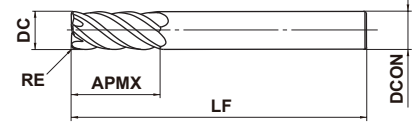
● : USA Stock

VQ5MHVRB - Inch sizes NEW

Corner radius, Medium cut length, 5 flute, Irregular helix flutes



Carbon Steel, Alloy Steel, Cast Iron ($\leq 30\text{HRC}$)	Tool Steel, Pre-Hardened Steel, Hardened Steel ($\leq 45\text{HRC}$)	Hardened Steel ($\leq 55\text{HRC}$)	Hardened Steel ($> 55\text{HRC}$)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
○	○			○	○		



	$.0010'' \leq RE \leq .030''$				
	$\pm .0006''$				
	$.2500'' \leq DC \leq .5000''$				
	0 $- .0012''$				
	$.2500'' \leq DCON \leq .3750''$	$DCON = .5000''$			
	0 $- .0002''$	0 $- .0003''$			

● SMART MIRACLE corner radius, irregular helix end mills for reducing vibration and for delivering stable performance on difficult-to-cut materials and long overhang applications.

Order Number	DC	RE	APMX	LF	DCON	No.F [*]	Stock
VQ5MHVRBD1/4R010	.2500	.010	.625	2.500	.2500	5	●
VQ5MHVRBD5/16R010	.3125	.015	.750	2.750	.3125	5	●
VQ5MHVRBD3/8R030	.3750	.030	.875	3.250	.3750	5	●
VQ5MHVRBD1/2R030	.5000	.030	1.125	4.000	.5000	5	●

Note 1) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work.
When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

* Number of Flutes

DC = Dia.
RE = Radius
APMX = Length of Cut

LF = Overall Length
DCON = Shank Dia.


VQ5MHV/MHVRB

Recommended Cutting Conditions


Shoulder Milling

(inch)

Workpiece Material		Carbon Steels(–30HRC)						Alloy Steels, Pre-hardened Steels					
		High Speed Cutting		General Purpose Cutting		Depth of Cut ap	Depth of Cut ae	High Speed Cutting		General Purpose Cutting		Depth of Cut ap	Depth of Cut ae
mm	inch	Revolution n (min ⁻¹)	Feed Rate vf (IPM)	Revolution n (min ⁻¹)	Feed Rate vf (IPM)			Revolution n (min ⁻¹)	Feed Rate vf (IPM)	Revolution n (min ⁻¹)	Feed Rate vf (IPM)		
6.350	.2500	7500	90.6	6000	63.0	.375	.075	6000	47.2	5000	31.5	.375	.075
7.938	.3125	6000	90.6	4800	63.0	.469	.094	4800	51.2	4000	35.4	.469	.094
9.525	.3750	5000	90.6	4000	59.1	.563	.113	4000	51.2	3300	33.5	.563	.113
12.700	.5000	3800	66.9	3000	43.3	.750	.150	3000	43.3	2500	29.5	.750	.150



Workpiece Material		Austenitic Stainless Steels, Titanium Alloys						Precipitation Hardening Stainless Steels, Cobalt Chrome Alloys					
		High Speed Cutting		General Purpose Cutting		Depth of Cut ap	Depth of Cut ae	High Speed Cutting		General Purpose Cutting		Depth of Cut ap	Depth of Cut ae
mm	inch	Revolution n (min ⁻¹)	Feed Rate vf (IPM)	Revolution n (min ⁻¹)	Feed Rate vf (IPM)			Revolution n (min ⁻¹)	Feed Rate vf (IPM)	Revolution n (min ⁻¹)	Feed Rate vf (IPM)		
6.350	.2500	5000	39.4	4000	25.6	.375	.050	3800	37.4	3500	21.7	.375	.050
7.938	.3125	4000	43.3	3200	29.5	.469	.063	3000	43.3	2800	25.6	.469	.063
9.525	.3750	3300	51.2	2700	33.5	.563	.075	2500	39.4	2300	23.6	.563	.075
12.700	.5000	2500	39.4	2000	27.6	.750	.100	1900	30.3	1800	19.7	.750	.100



Note 1) SMART MIRACLE coating has very low electrical conductivity; therefore, an external contact type of tool setter (electric transmitted) may not work.

When measuring the tool length, please use an internal contact type (non-electricity type) or a laser tool setter.

Note 2) When cutting titanium alloys, the use of water-soluble cutting fluid is effective.

Note 3) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills.

However, if the rigidity of the machine or the workpiece material installation is poor, vibration or abnormal sound can occur.

In this case, please reduce the revolution and the feed rate proportionately, or set a lower depth of cut.

Note 4) If the depth of cut is smaller, the revolution and the feed rate can be increased.

Slot Milling

(inch)

Workpiece Material		Carbon Steels(-30HRC)					Alloy Steels, Pre-hardened Steels				
DC		High Speed Cutting		General Purpose Cutting		Depth of Cut ap	High Speed Cutting		General Purpose Cutting		Depth of Cut ap
mm	inch	Revolution n (min ⁻¹)	Feed Rate vf (IPM)	Revolution n (min ⁻¹)	Feed Rate vf (IPM)		Revolution n (min ⁻¹)	Feed Rate vf (IPM)	Revolution n (min ⁻¹)	Feed Rate vf (IPM)	
6.350	.2500	7500	55.1	5000	37.4	.250	6000	31.5	4000	19.7	.250
7.938	.3125	6000	55.1	4000	35.4	.312	4800	31.5	3200	19.7	.312
9.525	.3750	5000	51.2	3300	33.5	.375	4000	28.3	2700	17.7	.375
12.700	.5000	3800	39.4	2500	25.6	.500	3000	23.2	2000	13.8	.500

The diagram illustrates a cross-section of a slot milled into a workpiece. A horizontal arrow labeled 'DC' indicates the width of the slot. A vertical arrow labeled 'ap' indicates the depth of the slot.

Workpiece Material		Austenitic Stainless Steels, Titanium Alloys					Precipitation Hardening Stainless Steels				
DC		High Speed Cutting		General Purpose Cutting		Depth of Cut ap	High Speed Cutting		General Purpose Cutting		Depth of Cut ap
mm	inch	Revolution n (min ⁻¹)	Feed Rate vf (IPM)	Revolution n (min ⁻¹)	Feed Rate vf (IPM)		Revolution n (min ⁻¹)	Feed Rate vf (IPM)	Revolution n (min ⁻¹)	Feed Rate vf (IPM)	
6.350	.2500	5000	34.3	3000	13.8	.250	3000	23.6	2500	11.8	.250
7.938	.3125	4000	39.4	2400	15.7	.312	2400	23.6	2000	11.8	.312
9.525	.3750	3300	37.8	2000	17.7	.375	2000	21.7	1700	9.8	.375
12.700	.5000	2500	31.5	1500	13.8	.500	1500	17.7	1300	7.9	.500

The diagram illustrates a cross-section of a slot milled into a workpiece. A horizontal arrow labeled 'DC' indicates the width of the slot. A vertical arrow labeled 'ap' indicates the depth of the slot.

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VQ5MHV/MHV RB

For your safety

●Don't handle inserts and chips without gloves. ●Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage. ●Please use safety covers and wear safety glasses. ●When using compounded cutting oils, please take fire precautions. ●When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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