MITSUBISHI MATERIALS

VQ CoolStar

VIBRATION CONTROL END MILLS WITH MULTIPLE THRU-COOLANT HOLES FOR DIFFICULT-TO-CUT MATERIALS





TOOL NEWS **B247A**

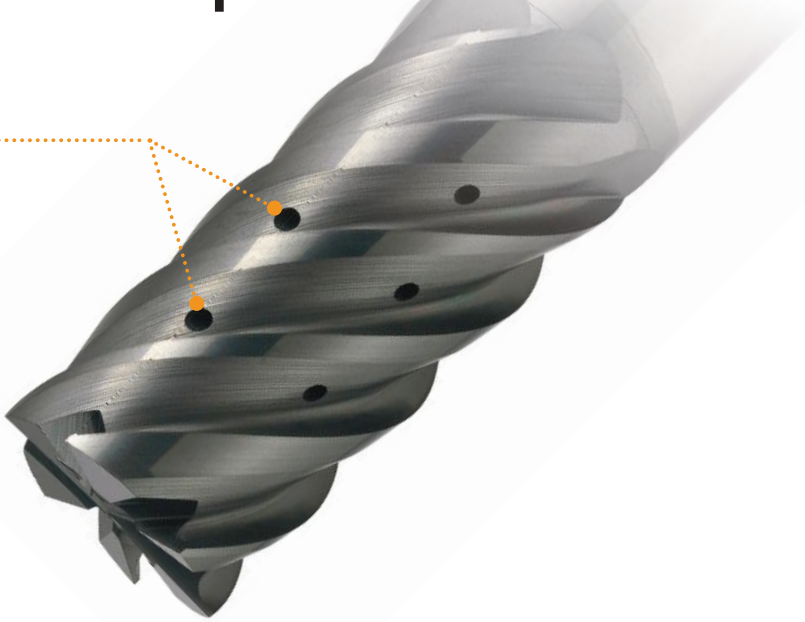
Vibration Control End Mills with Multiple Thru-Coolant Holes for Difficult-to-Cut Materials

CoolStar Series

Highly effective machining of titanium and stainless steel aerospace components.

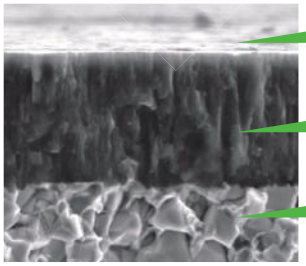
Multiple Thru-Coolant Holes

The multiple thru-coolant hole system and spiral arrangement of the coolant holes greatly improves welding resistance and allows for a wide-range of machining applications while the vibration control design provides excellent stability making it especially suited for machining of difficult-to-cut materials.



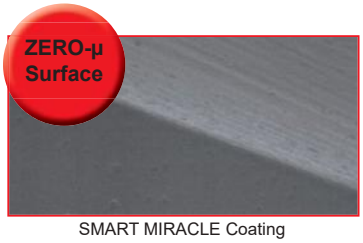
SMART MIRACLE Coating

Smart Miracle end mills have been treated with a newly developed (Al,Cr)N group coating which delivers substantially better wear resistance. The surface of the coating has been given a smoothening treatment resulting in better machined surfaces, reduced cutting resistance and improved chip discharge. This is the next generation of coated end mills that delivers long tool life when machining stainless steels and other difficult-to-cut materials.

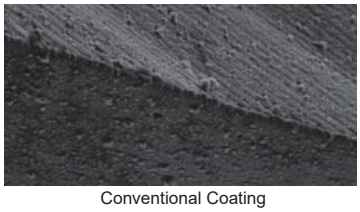


ZERO-μ Surface

With the unique ZERO-μ Surface, the cutting edge retains its sharpness. While previous technologies often resulted in diminished sharpness, the ZERO-μ Surface achieves both smoothness and sharpness, as well as longer tool life.

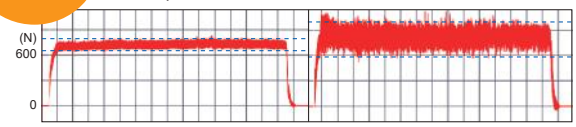


SMART MIRACLE Coating


Conventional Coating

Cutting Resistance Reduced by more than 20%

Comparison of Cutting Resistance



<Cutting Conditions>

Workpiece Material	: AISI 304	Depth of Cut	: ap=.236 inch
Tool	: VQMHVD0600 (DC=6mm)	Overhang Length	: .787 inch
		Cutting Mode	: Down(Climb) Cut
Revolution	: n=2650min^{-1}		Internal Coolant (Emulsion)
Cutting Speed	: vc=165 SFM		
Table Feed	: vf=12.6 IPM (.001 IPT)	Machine	: Vertical MC(BT50)

VQ6MHVCH

4 Sizes (DC=10mm, 12mm, 16mm, 20mm)

End mill, Medium cut length,
6 flute, Irregular helix flutes,
with multiple thru-coolant holes



VQ6MHVRBCH

10 Sizes (DC=10mm, 12mm, 16mm, 20mm)

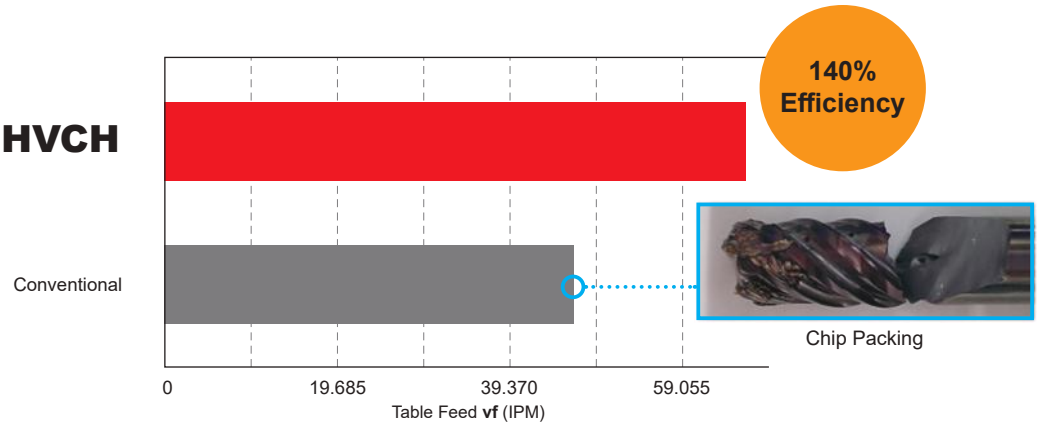
Corner radius, Medium cut length,
6 flute, Irregular helix flutes,
with multiple thru-coolant holes

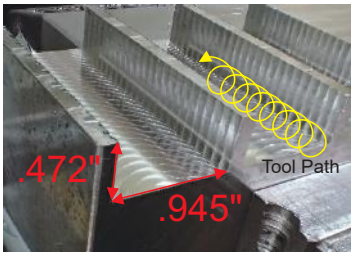


Cutting Performance

AISI 304 Efficiency Comparison in Trochoid Milling

VQ6MHVCH achieves machine 140% more efficiently compared to conventional.





<Cutting Conditions>
Workpiece Material : AISI 304
Tool : VQ6MHVCHD1600 (DC=16mm)
Revolution : n=2000min^{-1} (330 SFM)
Depth of Cut : ap=.472 inch, ae (Trochoid Pitch)=.094 inch
Cutting Mode : Trochoid Milling, Down(Climb) Cut
Internal Coolant (Emulsion)
Machine : Vertical MC (BT50)

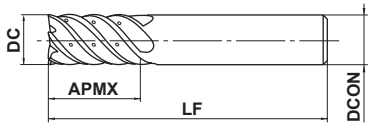
VQ6MHVCH

End mill, Medium cut length, 6 flute, Irregular helix flutes, With multiple thru-coolant holes

Carbon Steel, Alloy Steel (<30HRC)	Pre-hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
○	○			◎	◎	○	

CoolStar





Type1

DC≤12	DC>12			
0 - 0.020	0 - 0.030			
DCON=10	**DCON=12**	**DCON=16**	**DCON=20**	
0 - 0.009	0 - 0.011	0 - 0.011	0 - 0.013	

h6

● Vibration control end mill with multiple thru-coolant holes ensures stable machining on difficult-to-cut materials and applications requiring long overhangs.

(mm)

Order Number	DC	APMX	LF	DCON	* No.F	Stock	Type
VQ6MHVCHD1000	10	22	70	10	6	●	1
VQ6MHVCHD1200	12	26	75	12	6	●	1
VQ6MHVCHD1600	16	32	90	16	6	●	1
VQ6MHVCHD2000	20	38	100	20	6	●	1

* Number of Flutes

● : USA Stock

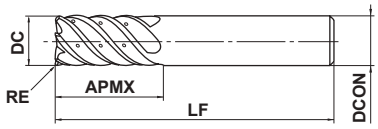
VQ6MHVRBCH

Corner radius, Medium cut length, 6 flute, Irregular helix flutes, With multiple thru-coolant holes

Carbon Steel, Alloy Steel (<30HRC)	Pre-hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
○	○			◎	◎	○	

CoolStar





Type1

R					
	0.5≤RE≤4				
	±0.015				
	DC≤12	DC>12			
	0 -0.020	0 -0.030			
h6	DCON=10	DCON=12	DCON=16	DCON=20	
	0 -0.009	0 -0.011	0 -0.011	0 -0.013	

● Vibration control corner radius end mill with multiple thru-coolant holes ensures stable machining on difficult-to-cut materials and applications requiring long overhangs.

(mm)

Order Number	DC	RE	APMX	LF	DCON	* No.F	Stock	Type
VQ6MHVRBCHD1000R050	10	0.5	22	70	10	6	●	1
VQ6MHVRBCHD1000R100	10	1	22	70	10	6	●	1
VQ6MHVRBCHD1200R050	12	0.5	26	75	12	6	●	1
VQ6MHVRBCHD1200R100	12	1	26	75	12	6	●	1
VQ6MHVRBCHD1600R100	16	1	32	90	16	6	●	1
VQ6MHVRBCHD1600R300	16	3	32	90	16	6	●	1
VQ6MHVRBCHD1600R400	16	4	32	90	16	6	●	1
VQ6MHVRBCHD2000R100	20	1	38	100	20	6	●	1
VQ6MHVRBCHD2000R300	20	3	38	100	20	6	●	1
VQ6MHVRBCHD2000R400	20	4	38	100	20	6	●	1

* Number of Flutes

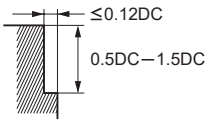
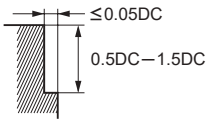
End mill, Medium cut length, 6 flute, Irregular helix flutes, With multiple thru-coolant holes **VQ6MHVCH**

Corner radius, Medium cut length, 6 flute, Irregular helix flutes, With multiple thru-coolant holes **VQ6MHVRBCH**

Recommended Cutting Conditions

■Shoulder Milling

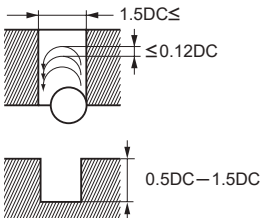
(inch)

Workpiece Material		Alloy Steels, Tool Steels, Pre-hardened Steels AISI H13, AISI W1-10, AISI P21		Austenitic Stainless Steels(≤200HB) Titanium Alloys AISI 304, AISI 316, Ti-6AL-4V		Copper, Copper Alloys		Heat Resistant Alloys Inconel 718	
DC		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)
(mm)	(inch)								
10	**.394**	—	—	4800	78.7	—	—	1300	10.2
12	**.472**	—	—	4000	78.7	—	—	1100	9.1
16	**.630**	4000	86.6	3000	63.0	2400	55.1	800	7.1
20	**.787**	3200	74.8	2400	55.1	1900	43.3	640	5.9
Depth of Cut									

DC = Dia.

■Trochoid Milling

(inch)

Workpiece Material		Alloy Steels, Tool Steels, Pre-hardened Steels AISI H13, AISI W1-10, AISI P21		Austenitic Stainless Steels(≤200HB) Titanium Alloys AISI 304, AISI 316, Ti-6AL-4V	
DC		Revolution **n** (min^{-1})	Feed Rate **vf** (IPM)	Revolution **n** (min^{-1})	Feed Rate **vf** (IPM)
(mm)	(inch)				
10	**.394**	—	—	4800	55.1
12	**.472**	—	—	4000	47.2
16	**.630**	4000	63.0	3000	43.3
20	**.787**	3200	55.1	2400	35.4
Depth of Cut					

DC = Dia.

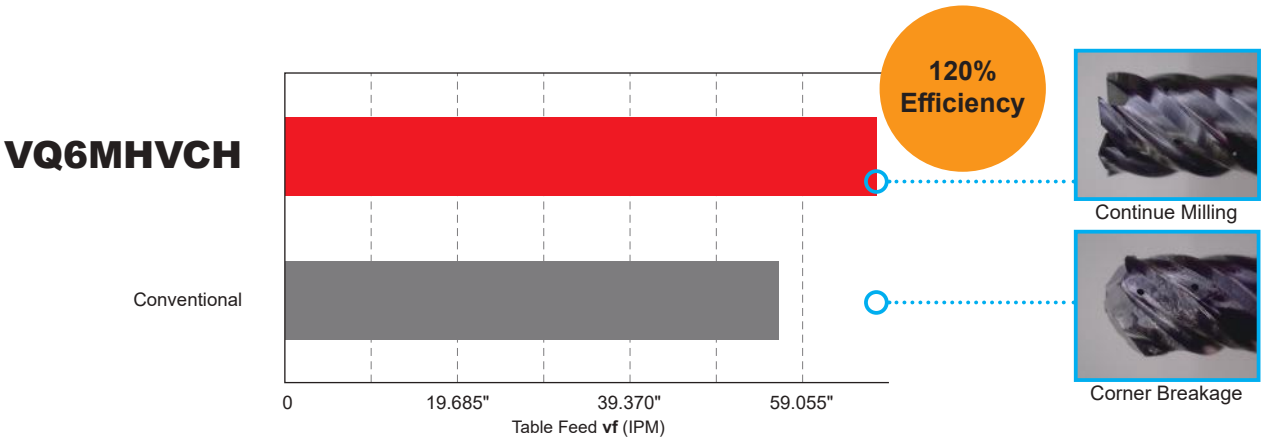
Note 1) If the depth of cut is smaller, the revolution and the feed rate can be increased.

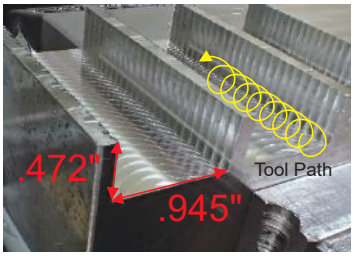
Note 2) The irregular helix flute end mill has a larger effect on controlling vibration when compared to standard end mills. However, if the rigidity of the machine or the work material installation is very low, then vibration can occur. In this case, please reduce the revolution and the feed rate proportionately, or set a lower depth of cut.

Cutting Performance

Ti-6Al-4V Efficiency Comparison in Trochoid Milling

VQ6MHVCH achieves machine 120% more efficiently compared to conventional.





<Cutting Conditions>
Workpiece Material : Ti-6Al-4V
Tool : VQ6MHVCHD1600 (DC=16mm)
Revolution : n=2000min^{-1} (330 SFM)
Depth of Cut : ap=.472 inch, ae (Trochoid Pitch)=.094 inch
Cutting Mode : Trochoid Milling, Down(Climb) Cut
Internal Coolant (Emulsion)
Machine : Vertical MC (BT50)

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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 attaching inserts or spare parts, please use only the correct wrench or driver.
- When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

www.mmc-carbide.com/us

Tools specifications subject to change without notice.

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