

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

CoolStar Series

New
Product

High Efficiency Machining of Difficult-to-Cut Materials via Multiple Thru-Coolant Holes



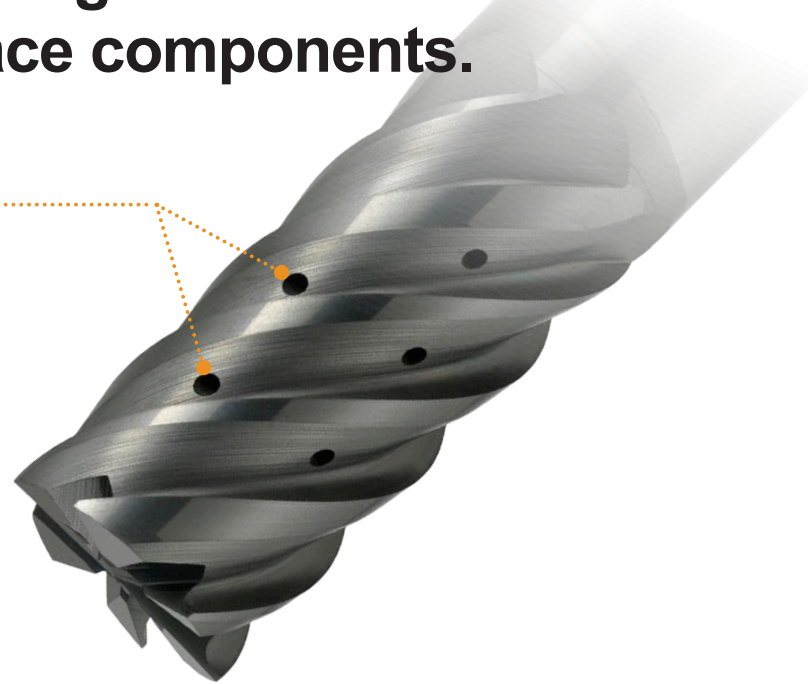
Vibration Control End Mills with Multiple Thru-Coolant Holes for Difficult-to-Cut Materials

CoolStar Series

Highly effective machining of titanium and stainless steel aerospace components.

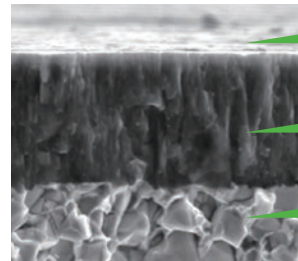
Multiple Thru-Coolant Holes

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 smoothing 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.



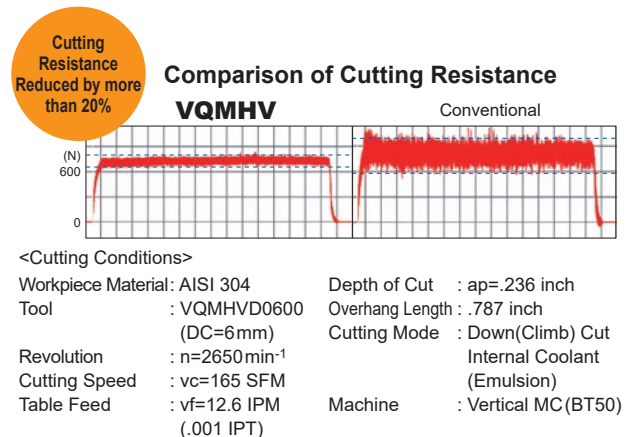
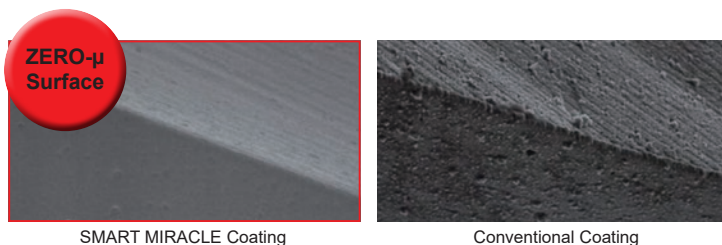
Smoothed Surface
"ZERO- μ Surface"

Newly Developed
(Al, Cr)N Group Coating

Super-fine-particle,
Super-hard Base Material

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.



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

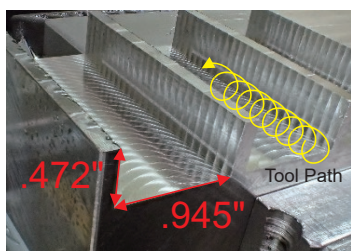
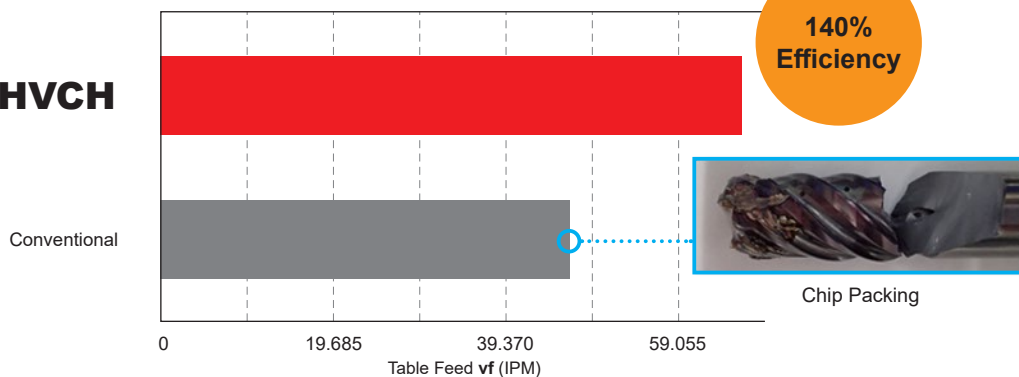


Cutting Performance

AISI 304 Efficiency Comparison in Trochoid Milling

VQ6MHVCH achieves machine 140% more efficiently compared to conventional.

VQ6MHVCH



<Cutting Conditions>

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

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

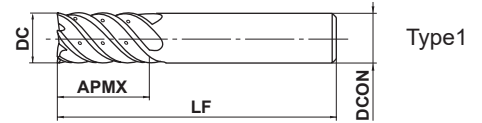
VQ6MHVCH

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
○	○			◎	◎	○	

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	DC ≤ 12	DC > 12		
	$\frac{0}{-0.020}$	$\frac{0}{-0.030}$		
	DCON = 10	DCON = 12	DCON = 16	DCON = 20
	$\frac{0}{-0.009}$	$\frac{0}{-0.011}$	$\frac{0}{-0.011}$	$\frac{0}{-0.013}$

- 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

● : Inventory maintained.

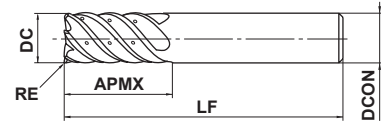
VQ6MHVRBCH

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	DC ≤ 12	DC > 12		
	$\begin{matrix} 0 \\ -0.020 \end{matrix}$	$\begin{matrix} 0 \\ -0.030 \end{matrix}$		
h6	DCON = 10	DCON = 12	DCON = 16	DCON = 20
	$\begin{matrix} 0 \\ -0.009 \end{matrix}$	$\begin{matrix} 0 \\ -0.011 \end{matrix}$	$\begin{matrix} 0 \\ -0.011 \end{matrix}$	$\begin{matrix} 0 \\ -0.013 \end{matrix}$

- 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

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

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)

DC		Alloy Steels, Tool Steels, Pre-hardened Steels		Austenitic Stainless Steels(≤200HB) Titanium Alloys		Copper, Copper Alloys		Heat Resistant Alloys	
		AISI H13, AISI W1-10, AISI P21		AISI 304, AISI 316, Ti-6AL-4V				Inconel 718	
(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)
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)

DC		Alloy Steels, Tool Steels, Pre-hardened Steels		Austenitic Stainless Steels(≤200HB) Titanium Alloys	
		AISI H13, AISI W1-10, AISI P21		AISI 304, AISI 316, Ti-6AL-4V	
(mm)	(inch)	Revolution n (min ⁻¹)	Feed Rate vf (IPM)	Revolution n (min ⁻¹)	Feed Rate vf (IPM)
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.

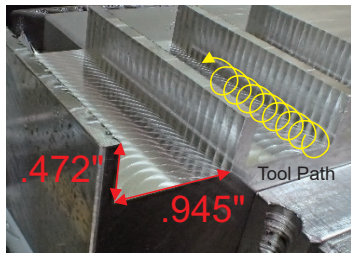
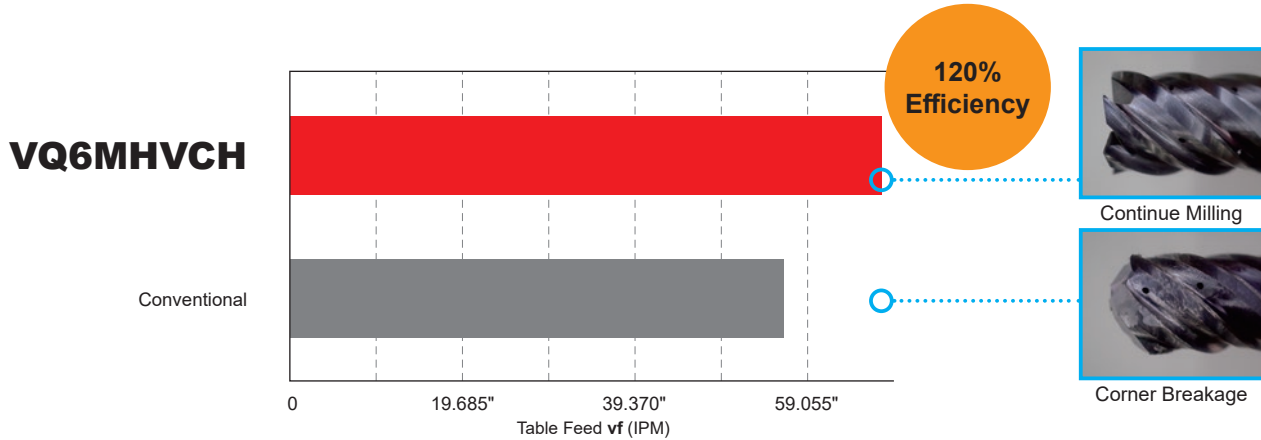
Note 1) If the depth of cut is smaller, the revolution and the feed rate can be increased.

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=16 mm)
 Revolution : $n=2000\text{min}^{-1}$ (330 SFM)
 Depth of Cut : $a_p=.472$ inch, a_e (Trochoid Pitch)=.094 inch
 Cutting Mode : Trochoid Milling, Down(Climb) Cut
 Internal Coolant (Emulsion)
 Machine : Vertical MC (BT50)



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CoolStar Series

For your safety

●Don't touch breakers and chips without gloves. ●Please machine within recommended application range, and exchange expired tools with new parts in advance. ●Please use safety cover and wear safety glasses. ●When using compounded cutting oils, please take fire prevention. ●When attaching inserts or spare parts, please use the attached wrench or driver. ●When using tools in revolution machining, please make a trial run to check run-out, vibration, abnormal sounds etc.

MITSUBISHI MATERIALS U.S.A. CORPORATION

Customer Service : 800-523-0800
Technical Service : 800-486-2341

LOS ANGELES HEAD OFFICE
11250 Slater Avenue, Fountain Valley, CA 92708
TEL : 714-352-6100 FAX : 714-668-1320

NORTH CAROLINA OFFICE
105 Corporate Center Drive Suite A, Mooresville, NC 28117
TEL : 980-312-3100 FAX : 704-746-9292

CHICAGO OFFICE
1314B North Plum Grove Road, Schaumburg, IL 60173
TEL : 847-252-6300 FAX : 847-519-1732

TORONTO OFFICE
3535 Laird Road, Units 15 & 16, Mississauga, Ontario, L5L 5Y7, Canada
TEL : 905-814-0240 FAX : 905-814-0245

MMC METAL DE MEXICO, S.A. DE C.V.
Av. La Cañada No.16, Parque Industrial Bernardo Quintana,
El Marques, Queretaro, CP76246, Mexico
TEL : +52-442-221-6136 FAX : +52-442-221-6134

URL : <http://www.mitsubishicarbide.com>
(Tool specifications subject to change without notice.)

EXP-17-E007
Printed in U.S.A. 7/19