

VQJCS/VQLCS

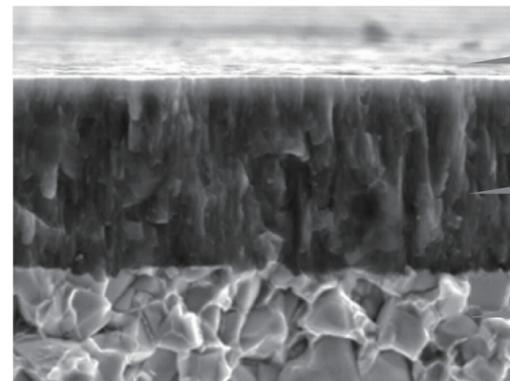
NEW SMART MIRACLE END MILL
WITH IRREGULAR PITCH FLUTES
AND CHIPBREAKER GEOMETRY
FOR DIFFICULT-TO-CUT-MATERIALS



SMART MIRACLE

SMART MIRACLE Coating

SMART MIRACLE end mills have been treated with a (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. These coated end mills deliver long tool life when machining stainless steels and other difficult-to-cut materials.



Smoothed Surface
"ZERO- μ Surface"

(Al, Cr)N Group Coating

Super-fine-particle,
Super-hard Base Material



New Line-up

End mill, 5 flute, Irregular pitch flutes, Chip breaker

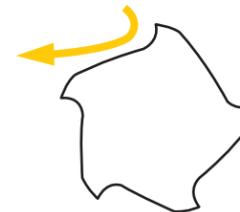
VQJCS/VQLCS

Chip Breaker Function

Prevents chip problems by combining great chip breaking capabilities and fracture resistance.

Chip Pocket Geometry for High Efficiency Machining

The rigid cross-sectional geometry with excellent chip evacuation properties is ideal for high efficiency machining such as trochoidal milling.



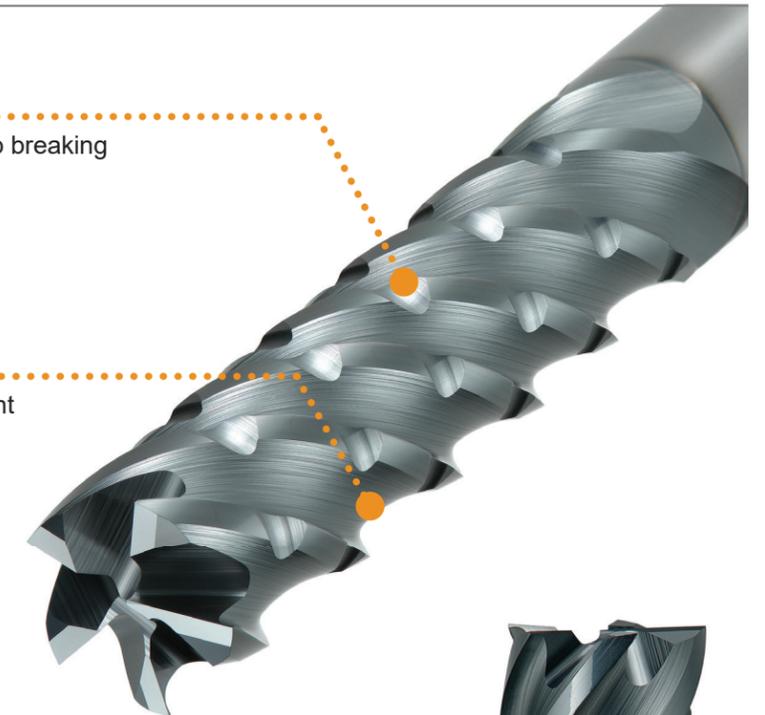
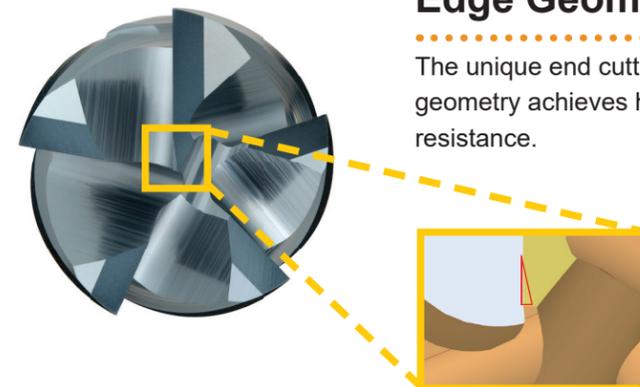
Ideal chip pocket geometry

Irregular Pitch Flutes and Micro Clearance Angle of the Peripheral Cutting Edge

Due to its excellent vibration damping properties, chatter and vibration are suppressed making stable machining possible.

Unique End Cutting Edge Geometry

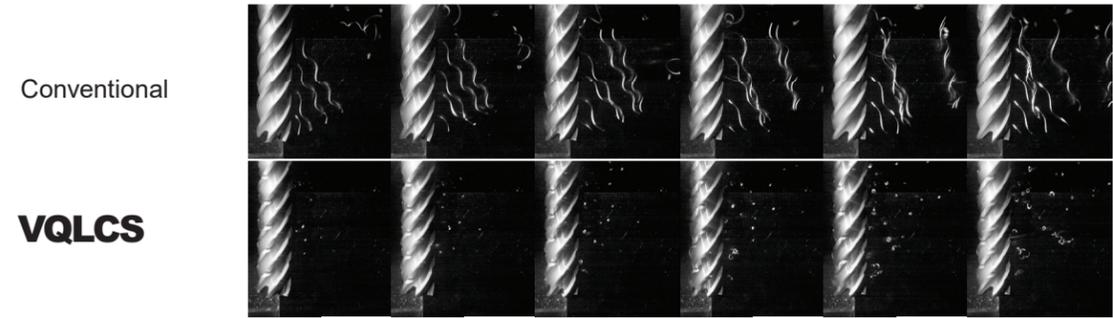
The unique end cutting edge geometry achieves high chipping resistance.



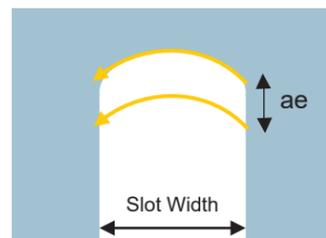
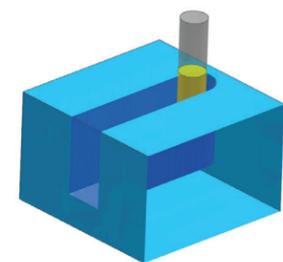
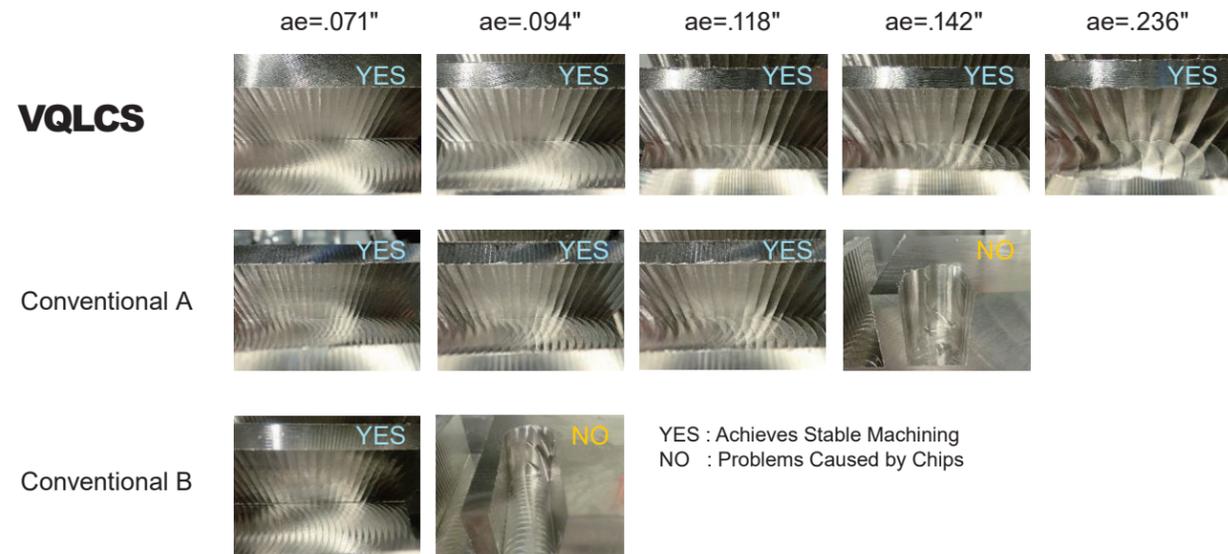
SMART MIRACLE End Mill Series for Difficult-to-Cut Materials

Chip Breaker Function : High-Speed Camera Comparison

The excellent chip breaking properties reduce chip clogging and remove chips efficiently; while also effectively suppressing chip pilling on the machine.



Evaluation of Trochoidal Milling



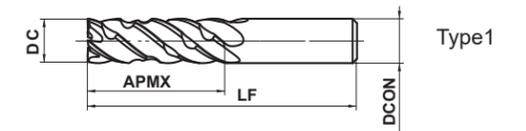
<Cutting Conditions>
 Work Material : AISI 304
 Tool : DC=Ø12 mm, .472 inch
 Cutting Speed : vc=330 SFM
 Feed Rate : ft=.002 IPT
 Depth of Cut : ap=.945 inch, DCx2
 ae(Pitch)=.071 - .236 inch
 Slot Width=.709 inch (DCx1.5)
 Overhang Length : 2.362 inch (DCx5)
 Cutting Mode : Trochoidal Milling
 External Coolant(Emulsion)

VQJCS NEW

End mill, Semi long cut length, 5 flute, Irregular pitch flutes, Chip breaker



Carbon Steel, Alloy Steel, Cast Iron (<30HRC)	Tool Steel, Pre-hardened Steel, Hardened Steel (<=45HRC)	Hardened Steel (<=55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminum Alloy
⊙	⊙			⊙	⊙	○	



⊙	DC≤12	DC>12		
	0 - 0.030	0 - 0.040		
h6	DCON=6	8≤DCON≤10	12≤DCON≤16	DCON=20
	0 - 0.008	0 - 0.009	0 - 0.011	0 - 0.013

- Chip breaker type end mill for efficient chip breaking capabilities that also provides good surface finishes.
- A high rigidity Smart Miracle vibration damping end mill for high efficiency trochoidal milling.

Order Number	DC	APMX	LF	DCON	*1 No.F	Stock	Type
VQJCS0600	6	18	70	6	5	●	1
VQJCS0800	8	24	80	8	5	●	1
VQJCS1000	10	30	90	10	5	●	1
VQJCS1200	12	36	100	12	5	●	1
VQJCS1600	16	48	110	16	5	●	1
VQJCS2000	20	60	125	20	5	●	1

*1 Number of Flutes

Note 1) SMART MIRACLE coating has very low electrical conductivity; therefore, an electrical contact type of tool setter may not work. When measuring the tool length, please use a mechanical contact type or a laser tool setter.

● : USA Stock

DC = Cutting dia.
 APMX = Depth of cut max.

LF = Functional length
 DCON = Connection dia.

SMART MIRACLE End Mill Series for Difficult-to-Cut Materials

VQJCS

End mill, Semi long cut length, 5 flute, Irregular pitch flutes, Chip breaker

RECOMMENDED CUTTING CONDITIONS

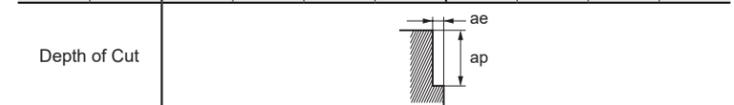
Side milling

(inch)

Workpiece Material	Carbon Steel, Alloy Steel, Mild Steel				Pre-hardened Steel, Carbon Steel, Alloy Steel, Alloy Tool Steel				Austenitic, Ferritic and Martensitic Stainless Steels, Titanium Alloys				Hardened Stainless Steels, Cobalt Chromium Alloys			
	Revolution (min ⁻¹)	Feed rate (IPM)	Depth of cut ap	Depth of cut ae	Revolution (min ⁻¹)	Feed rate (IPM)	Depth of cut ap	Depth of cut ae	Revolution (min ⁻¹)	Feed rate (IPM)	Depth of cut ap	Depth of cut ae	Revolution (min ⁻¹)	Feed rate (IPM)	Depth of cut ap	Depth of cut ae
6 .236	10600	70.9	.709	.035	9500	59.1	.709	.035	6400	39.4	.709	.018	5300	31.5	.709	.018
8 .315	8000	70.9	.945	.047	7200	59.1	.945	.047	4800	39.4	.945	.024	4000	31.5	.945	.024
10 .394	6400	66.9	1.181	.059	5700	55.1	1.181	.059	3800	35.4	1.181	.030	3200	31.5	1.181	.030
12 .472	5300	66.9	1.417	.071	4800	55.1	1.417	.071	3200	31.5	1.417	.035	2700	27.6	1.417	.035
16 .630	4000	55.1	1.890	.094	3600	47.2	1.890	.094	2400	27.6	1.890	.047	2000	23.6	1.890	.047
20 .787	3200	47.2	2.362	.118	2900	39.4	2.362	.118	1900	23.6	2.362	.059	1600	19.7	2.362	.059



Workpiece Material	Copper, Copper Alloys				Heat Resistant Alloys			
	Revolution (min ⁻¹)	Feed rate (IPM)	Depth of cut ap	Depth of cut ae	Revolution (min ⁻¹)	Feed rate (IPM)	Depth of cut ap	Depth of cut ae
6 .236	11700	82.7	.709	.035	2100	7.9	.709	.007
8 .315	8800	82.7	.945	.047	1600	7.9	.945	.009
10 .394	7000	70.9	1.181	.059	1300	7.9	1.181	.012
12 .472	5800	70.9	1.417	.071	1100	3.9	1.417	.014
16 .630	4400	59.1	1.890	.094	800	3.9	1.890	.019
20 .787	3500	55.1	2.362	.118	600	3.9	2.362	.024



Note 1) SMART MIRACLE coating has very low electrical conductivity; therefore, an electrical contact type of tool setter may not work. When measuring the tool length, please use a mechanical contact type or a laser tool setter.

Note 2) The irregular pitch 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 sounds can occur. In that case, please adjust the revolution, feed rate and depth of cut.

Note 3) The revolution and feed rate can be increased with a smaller depth of cut.

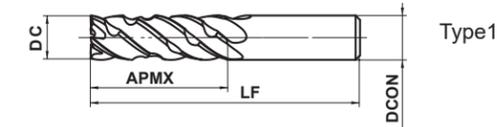
Note 4) For stainless steel, titanium alloys and heat resistant alloys, the use of water-soluble coolant is effective.

VQLCS NEW

End mill, Long cut length, 5 flute, Irregular pitch flutes, Chip breaker



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



DC			
0			
-0.030			
DCON=6	8 ≤ DCON ≤ 10	DCON=12	
0	0	0	
-0.008	-0.009	-0.011	

● Chip breaker type end mill for efficient chip breaking capabilities that also provides good surface finishes.

● A high rigidity Smart Miracle vibration damping end mill for high efficiency trochoidal milling.

(mm)

Order Number	DC	APMX	LF	DCON	*1 No.F	Stock	Type
VQLCSD0600	6	24	70	6	5	●	1
VQLCSD0800	8	32	90	8	5	●	1
VQLCSD1000	10	40	100	10	5	●	1
VQLCSD1200	12	48	110	12	5	●	1

*1 Number of Flutes

Note 1) SMART MIRACLE coating has very low electrical conductivity; therefore, an electrical contact type of tool setter may not work. When measuring the tool length, please use a mechanical contact type or a laser tool setter.

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● : USA Stock

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AND EDUCATION CENTER

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- Advanced Turning
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MITSUBISHI MATERIALS U.S.A. CORPORATION

California Office (Headquarters)

3535 Hyland Avenue, Suite 200
Costa Mesa, CA 92626
Customer Service: 800.523.0800
Technical Service: 800.486.2341

Chicago Office (Engineering)

300 N. Martingale Road, Suite 500
Schaumburg, IL 60173
Main: 847.252.6300
Fax: 847.519.1732

MMC Metal de Mexico, S.A. DE C.V.

Av. La Cañada No.16,
Parque Industrial Bernardo
Quintana, El Marques,
Queretaro C.P. 76246 MEXICO
Main: +52.442.221.61.36
Fax: +52.442.221.61.34

North Carolina-MTEC (Marketing & Technical Center)

105 Corporate Center Drive, Suite A
Mooresville, NC 28117
Main: 980.312.3100
Fax: 704.746.9292

Toronto Office (Canada Branch)

600 Matheson Blvd. Unit 5 (Office)
Mississauga, ON L5R 4C1
Main: 905.814.0240
Fax: 905.814.0245

Detroit Office (Moldino CS)

41700 Gardenbrook Road, Suite 120
Novi, MI 48375
Main: 248.308.2620
Fax: 248.308.2627

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.

B197A-G-US-2022.10