DIA EDGE

VQJCS/VQLCS

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

ABOUT OUR BRAND

Your manufacturing success is our success.

It's simple. We want to provide high-quality cutting tool products that help deliver unparalleled performance and control for you to manufacture precisely perfect products every day.

Our long heritage of building partnerships through cutting tool solutions to metal working manufacturers, like yours, has given Mitsubishi Materials USA a solid reputation as an industry leader. We understand the importance of getting it right the first time by delivering high-quality cutting tool product brands to help overcome machining challenges to improve machining processes.

Your success is our success and is the driving force behind our innovative products. Our product brands, DIAEDGE and MOLDINO, are trusted globally in the metal manufacturing and die & mold industries for delivering expertly-designed manufactured tools of the trade for highly specialized industries like yours.

With the acquisition of MOLDINO Tool Engineering, Ltd, our traditional Mitsubishi Materials USA cutting tool product line is now sold under the DIAEDGE product brand name.

Brands you can trust:

MITSUBISHI MATERIALS U.S.A.

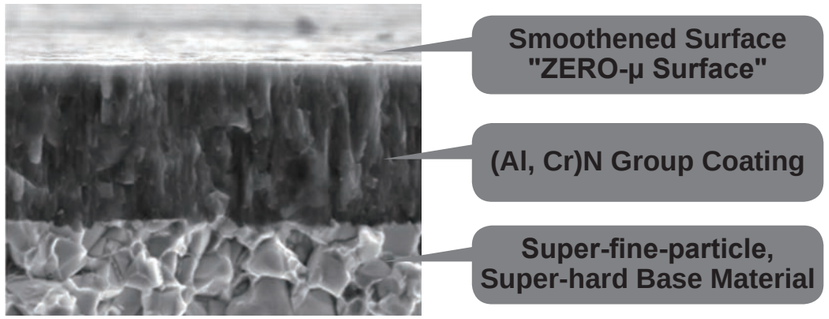
TRUSTED PRODUCT BRANDS

DIAEDGE MOLDINO

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 smoothening 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.



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.

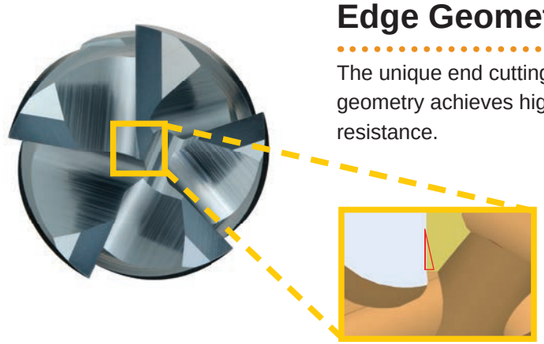
Ideal chip pocket geometry

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.

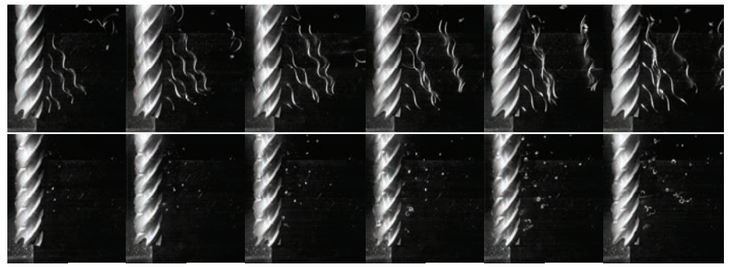


Chip Breaker Function : High-Speed Camera Comparison

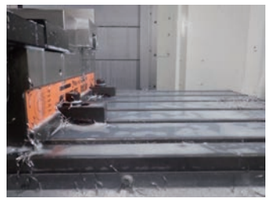
The excellent chip breaking properties reduce chip clogging and remove chips efficiently; while also effectively suppressing chip pilling on the machine.

Conventional

VQLCS



After Machining with Conventional



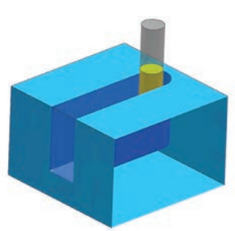
After Machining with VQLCS

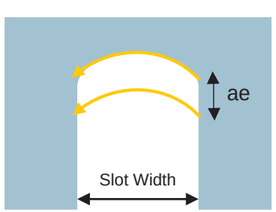
YouTube

Evaluation of Trochoidal Milling

	ae=.071"	ae=.094"	ae=.118"	ae=.142"	ae=.236"
VQLCS	YES	YES	YES	YES	YES
Conventional A	YES	YES	YES	NO	
Conventional B	YES	NO			

YES : Achieves Stable Machining
NO : Problems Caused by Chips





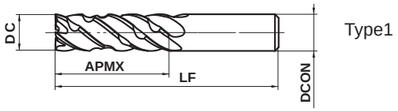
<Cutting Conditions>
Work Material : AISI 304
Tool : DC=Ø12 mm, .472 inch
Cutting Speed : vc=330 SFM
Feed Rate : ft=.002 IPT
Depth of Cut : ap=.945 inch, DCx2
ae(Pitch)=.071 - .236 inch
Slot Width=.709 inch (DCx1.5)
Overhang Length : 2.362 inch (DCx5)
Cutting Mode : Trochoidal Milling
External Coolant(Emulsion)

VQJCS NEW

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

UWC | VQ | γ 40°

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
◎	◎			◎	◎	○	



Type1

DC≤12	DC>12			
0 -0.030	0 -0.040			

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.

(mm)

Order Number	DC	APMX	LF	DCON	*1 No.F	Stock	Type
VQJCSD0600	6	18	70	6	5	●	1
VQJCSD0800	8	24	80	8	5	●	1
VQJCSD1000	10	30	90	10	5	●	1
VQJCSD1200	12	36	100	12	5	●	1
VQJCSD1600	16	48	110	16	5	●	1
VQJCSD2000	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.

DC = Cutting dia. **LF** = Functional length
APMX = Depth of cut max. **DCON** = Connection dia.

● : USA Stock

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, Cobaly Chromium Alloys			
Dia. **DC**		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
(mm)	(inch)																
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
Depth of Cut																	

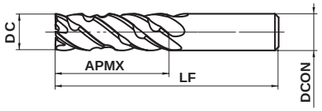
Workpiece Material		Copper, Copper Alloys				Heat Resistant Alloys			
Dia. **DC**		Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap	Depth of cut ae	Revolution (min^{-1})	Feed rate (IPM)	Depth of cut ap	Depth of cut ae
(mm)	(inch)								
6	.236	11700	82.7	.709	.035	2100	7.9	.709	.007
8	.315	8800	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
Depth of Cut									

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
◎	◎			◎	◎	○	



Type1

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

DC = Cutting dia. **LF** = Functional length
APMX = Depth of cut max. **DCON** = Connection dia.

● : USA Stock

VQLCS

End mill, 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, Cobaly Chromium Alloys			
Dia. **DC**		Revolution	Feed rate	Depth of cut	Depth of cut	Revolution	Feed rate	Depth of cut	Depth of cut	Revolution	Feed rate	Depth of cut	Depth of cut	Revolution	Feed rate	Depth of cut	Depth of cut
(mm)	(inch)	(min^{-1})	(IPM)	ap	ae	(min^{-1})	(IPM)	ap	ae	(min^{-1})	(IPM)	ap	ae	(min^{-1})	(IPM)	ap	ae
6	.236	9500	63.0	.945	.024	8500	47.2	.945	.024	5300	31.5	.945	.012	4800	27.6	.945	.012
8	.315	7200	63.0	1.260	.031	6400	51.2	1.260	.031	4000	31.5	1.260	.016	3600	27.6	1.260	.016
10	.394	5700	59.1	1.575	.039	5100	47.2	1.575	.039	3200	27.6	1.575	.020	2900	27.6	1.575	.020
12	.472	4800	59.1	1.890	.047	4200	47.2	1.890	.047	2700	27.6	1.890	.024	2400	23.6	1.890	.024
Depth of Cut																	

Workpiece Material		Copper, Copper Alloys				Heat Resistant Alloys			
Dia. **DC**		Revolution	Feed rate	Depth of cut	Depth of cut	Revolution	Feed rate	Depth of cut	Depth of cut
(mm)	(inch)	(min^{-1})	(IPM)	ap	ae	(min^{-1})	(IPM)	ap	ae
6	.236	10600	70.9	.945	.024	1600	3.9	.945	.005
8	.315	8000	70.9	1.260	.031	1200	3.9	1.260	.006
10	.394	6400	63.0	1.575	.039	1000	3.9	1.575	.008
12	.472	5300	63.0	1.890	.047	800	3.9	1.890	.009
Depth of Cut									

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.

Memo

DIA EDGE

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

North Carolina-MTEC (Marketing & Technical Center)

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

Chicago Office (Engineering)

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

Toronto Office (Canada Branch)

3535 Laird Road, Units 15 & 16
Mississauga, Ontario, Canada L5L 5Y7
Main: 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 C.P. 76246 MEXICO
Main: +52.442.221.61.36
Fax: +52.442.221.61.34

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.

MITSUBISHI MATERIALS U.S.A.

Product Brands Crafted by Mitsubishi Materials U.S.A.

DIA EDGE MOLDINO

www.diaedgetools.com
www.mmus-carbide.com

Tools specifications subject to change without notice.

B197A-G-US-2022.10