DIA EDGE

TOOL NEWS

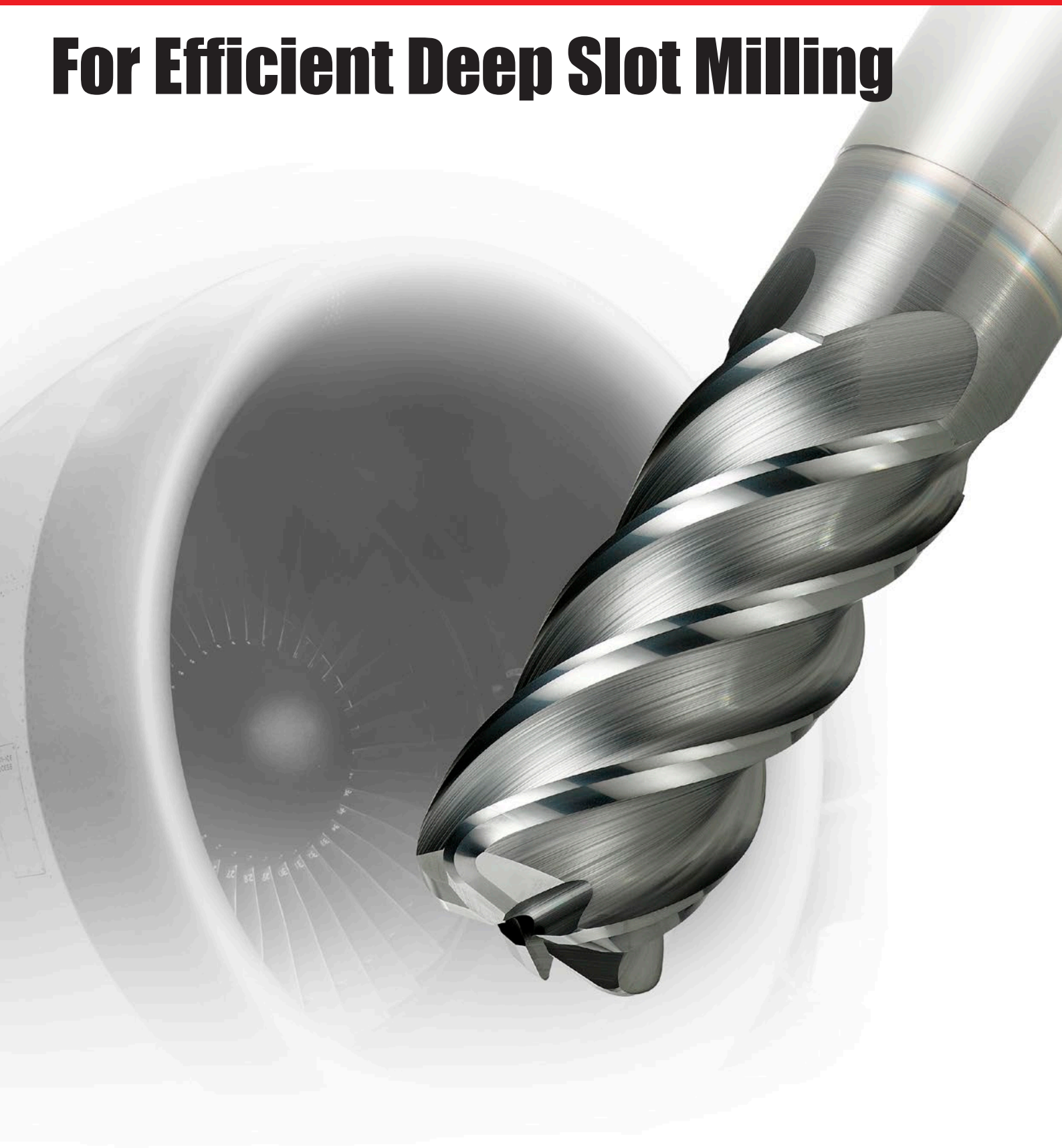
2020.3 Update
B230G

Corner Radius End Mill for High Efficiency Titanium Alloys Machining

VQT5MVRB

Renewal

For Efficient Deep Slot Milling



MITSUBISHI MATERIALS CORPORATION

Corner Radius End Mill for High Efficiency Titanium Alloys Machining

VQT5MVRB

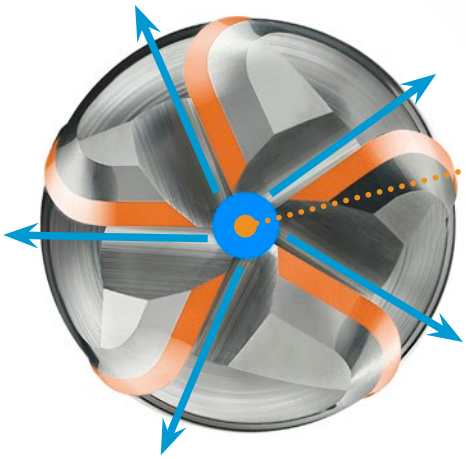
Combining 5 flutes and a through coolant hole enables high efficiency rough machining of titanium alloys.

Corner Radius (Emphasis on Sharpness)

A unique rake angle improves cutting resistance and chip discharge.
The seamless blend between the corner radius and peripheral cutting edge suppresses abnormal wear and provides a stable tool life.

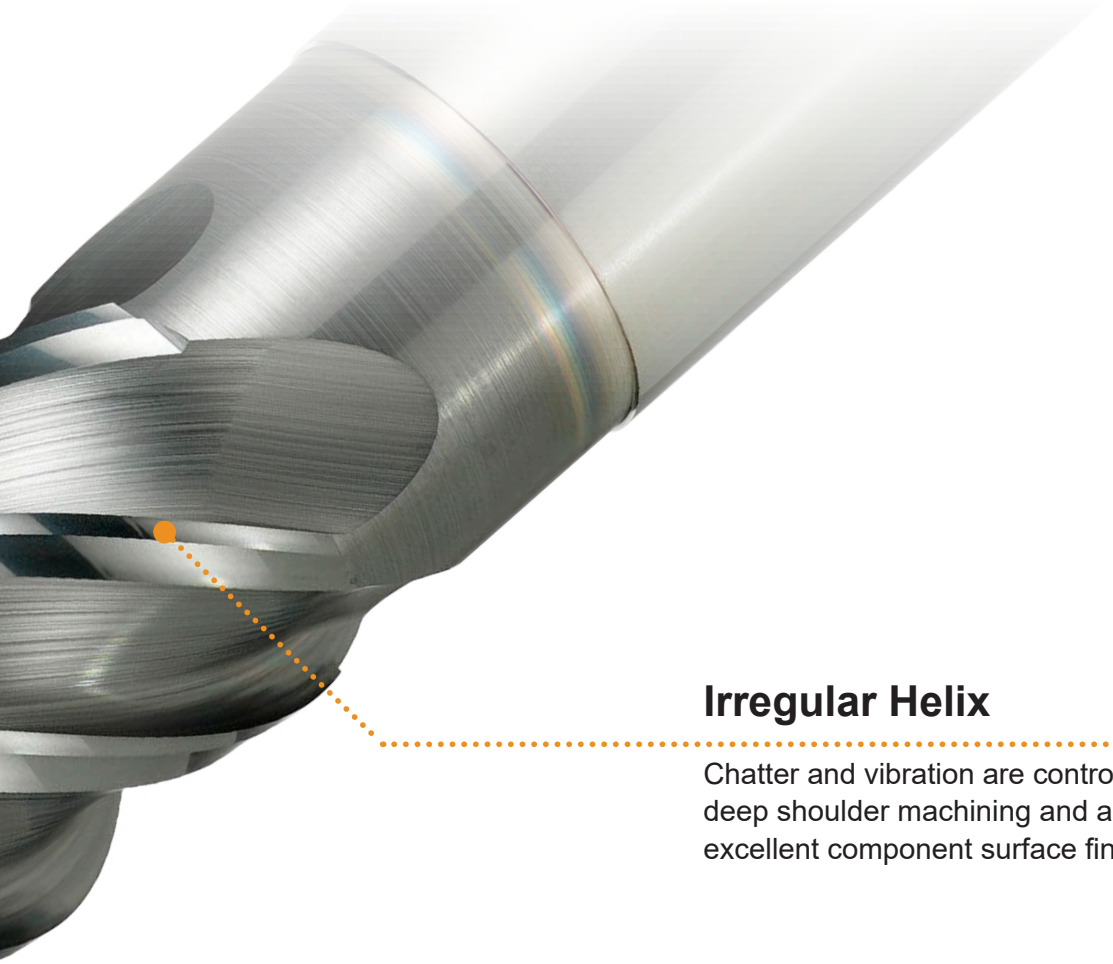
5 Flutes

Having the same chip evacuation properties of a 4 flute type enables deep slot milling.
The additional flute and deep cutting capability reduces the number of passes.



Coolant Hole

The centre coolant provides a stable supply of cutting fluid and dramatically improves chip evacuation.
This also cools the cutting edge and prevents chip biting.



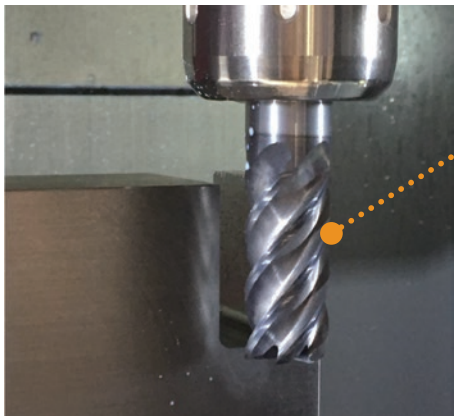
Irregular Helix

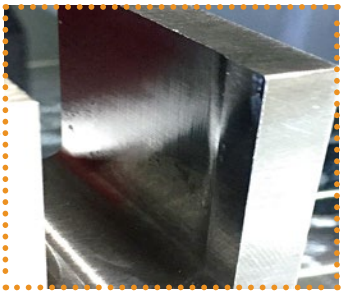
Chatter and vibration are controlled even during deep shoulder machining and also provides excellent component surface finishes.

Application Example

Material removal rate : 250cc/min achieved!

Large depths of cut when slotting (DC x 2) in titanium alloy dramatically shortens rough machining times.





Machined Surface

<Cutting Conditions>

Workpiece	: Ti-6Al-4V
Tool	: VQT5MVRB250R400N75C
Revolution	: n=636min-1
Table Feed	: vf=206mm/min
Depth of Cut	: ap=50mm (DC×2)
Width of Cut	: ae=25mm (Slot)
Overhang Length	: 75mm (DC×3)
Cutting Mode	: Slot Milling Internal Coolant + External Coolant (Emulsion)
Machine	: Vertical MC (BT50)

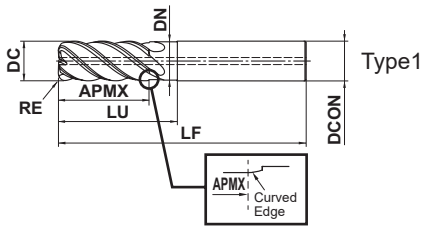
Corner Radius End Mill for High Efficiency Titanium Alloys Machining

VQT5MVRB NEW

Corner radius, Medium cut length, 5 flute, Irregular helix flutes, With coolant hole

UWC VQ 40° 41.5° 43°

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	Copper Alloy	Aluminium Alloy
				◎	◎		



Type1

RE				
±0.02				
DC≤16	20≤DC≤25			
0 - 0.03	0 - 0.04			
DCON = 16	20≤DCON≤25			
0 - 0.011	0 - 0.013			

- Flute geometry suitable for deep slotting and effective chip evacuation.
- Sharp cutting edges provide long tool life when machining titanium alloys.

(mm)

Order Number	DC	RE	APMX	LU	DN	LF	DCON	* No.F	Stock	Type
VQT5MVRB160R100N48C	16	1	34	48	15.5	120	16	5	●	1
VQT5MVRB160R300N48C	16	3	34	48	15.5	120	16	5	●	1
VQT5MVRB160R400N48C	16	4	34	48	15.5	120	16	5	●	1
VQT5MVRB200R100N60C	20	1	44	60	19.5	135	20	5	●	1
VQT5MVRB200R300N60C	20	3	44	60	19.5	135	20	5	●	1
VQT5MVRB200R400N60C	20	4	44	60	19.5	135	20	5	●	1
VQT5MVRB200R600N60C	20	6	44	60	19.5	135	20	5	●	1
VQT5MVRB250R100N75C	25	1	54	75	24.5	155	25	5	●	1
VQT5MVRB250R300N75C	25	3	54	75	24.5	155	25	5	●	1
VQT5MVRB250R400N75C	25	4	54	75	24.5	155	25	5	●	1
VQT5MVRB250R600N75C	25	6	54	75	24.5	155	25	5	●	1

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.

* Number of Flutes

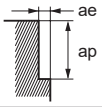
DC = Dia.
RE = Corner Radius
APMX = Length of Cut
LU = Neck Length
DN = Neck Dia.
LF = Overall Length
DCON = Shank Dia.

● : **Inventory maintained in Japan.**

Recommended Cutting Conditions

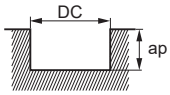
■Shoulder Milling

Overhang Length DC×1 (DC=Dia.) (mm)

Workpiece Material	Titanium Alloys Ti-6Al-4V etc.					
DC	**RE**	**vc** (m/min)	**n** (min-1)	**vf** (mm/min)	**ap**	**ae**
16	1	80	1600	800	32	2.4
16	3	80	1600	800	32	2.4
16	4	80	1600	800	32	2.4
20	1	80	1300	650	40	3.0
20	3	80	1300	650	40	3.0
20	4	80	1300	650	40	3.0
20	6	80	1300	650	40	3.0
25	1	80	1000	500	50	3.8
25	3	80	1000	500	50	3.8
25	4	80	1000	500	50	3.8
25	6	80	1000	500	50	3.8
Depth of Cut						

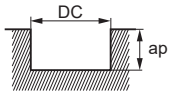
■Slot Milling

Depth of Cut DC×1 (mm)

Workpiece Material	Titanium Alloys Ti-6Al-4V etc.				
DC	**RE**	**vc** (m/min)	**n** (min-1)	**vf** (mm/min)	**ap**
16	1	60	1200	420	16
16	3	60	1200	420	16
16	4	60	1200	300	16
20	1	60	950	330	20
20	3	60	950	330	20
20	4	60	950	330	20
20	6	60	950	238	20
25	1	50	640	220	25
25	3	50	640	220	25
25	4	50	640	220	25
25	6	50	640	160	25
Depth of Cut					

DC=Dia.

Depth of Cut DC×2 (mm)

Workpiece Material	Titanium Alloys Ti-6Al-4V etc.				
DC	**RE**	**vc** (m/min)	**n** (min-1)	**vf** (mm/min)	**ap**
16	1	60	1200	240	32
16	3	60	1200	240	32
16	4	60	1200	180	32
20	1	60	950	190	40
20	3	60	950	190	40
20	4	60	950	190	40
20	6	60	950	143	40
25	1	50	640	130	50
25	3	50	640	130	50
25	4	50	640	130	50
25	6	50	640	96	50
Depth of Cut					

DC=Dia.

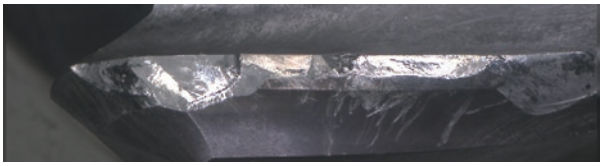
(Note 1) SMART MIRACLE coating has very low electrical conductivity; therefore, an external contact type of tool setter (electric transmitted) may not work.
When measuring the tool length, please use an internal contact type (non-electricity type) or a laser tool setter.
(Note 2) When cutting titanium 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 work 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.
(Note 5) When machining deep slots where the depth of cut exceeds the diameter DC, use a high strength holder or one equipped with a retaining mechanism.
Additionally ensure the clamping and workpiece material rigidity are sufficient.
Refer to page 6 for
(Note 6) When machining a deep slot exceeding 1D, use a holder with a high gripping strength or an anti slippage mechanism.
Also, make sure that the clamping force and rigidity are sufficient before use.

Cutting Performance

Machining Deep Slots at Large Depths of Cut in Titanium Alloy.

The seamless corner radii achieves stable tool life.

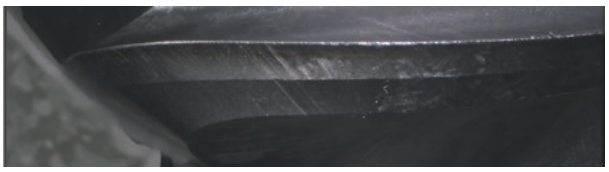
Conventional



Fractures (After 6 slots)

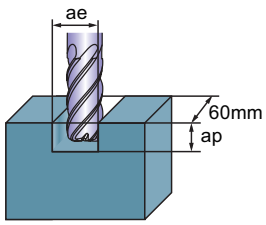
<Cutting Conditions>
Workpiece : Ti-6Al-4V
Tool : VQT5MVRB160R300N48C
Revolution : n=1200min^{-1}
Table Feed : vf=660mm/min
Depth of Cut : ap=16mm
Width of Cut : ae=16mm (Slot)
Cutting Length : 60mm (1 slot)
Overhang Length : 48mm (DC×3)
Cutting Mode : Slot Milling
Internal Coolant + External Coolant (Emulsion)
Machine : Vertical MC (BT50)

VQT5MVRB



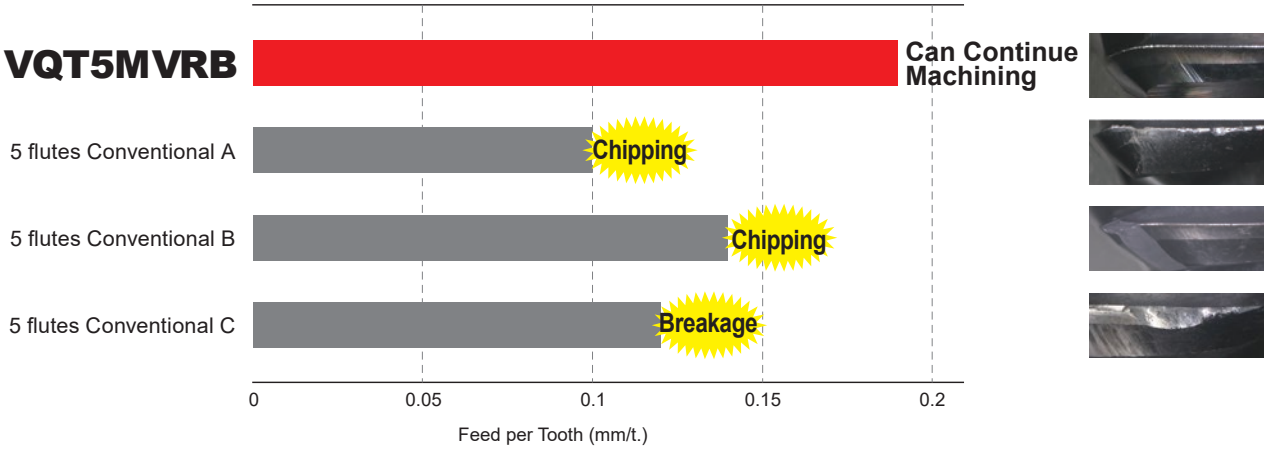
After 17 slots

Triple Tool Life



Comparison of Maximum Feed when Slot Milling Titanium Alloy.

When compared with conventional products, high efficiency milling can be achieved.



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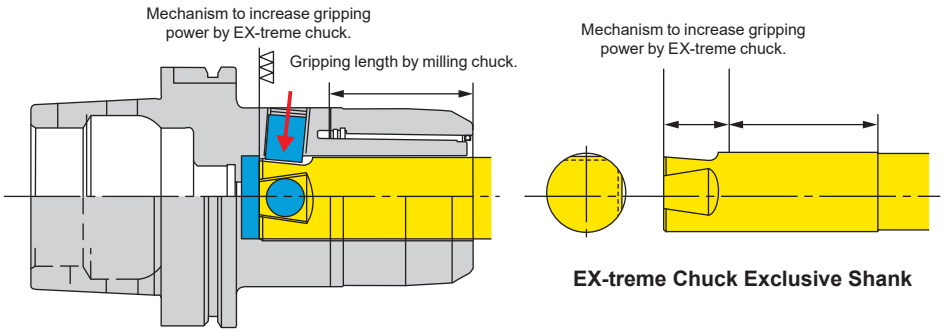
Key Point for High Efficiency Machining of Titanium Alloys

For high efficiency machining, it is recommended to use a precision, high strength holder to prevent pull out of the tool.
Some high strength holders require modification of the cutting tool shank.

NIKKEN

Never Pull Down
Great Reliability in the Aircraft Industry

X-Treme Shank
X-Treme Chuck



EX-treme Chuck

EX-treme Chuck Exclusive Shank

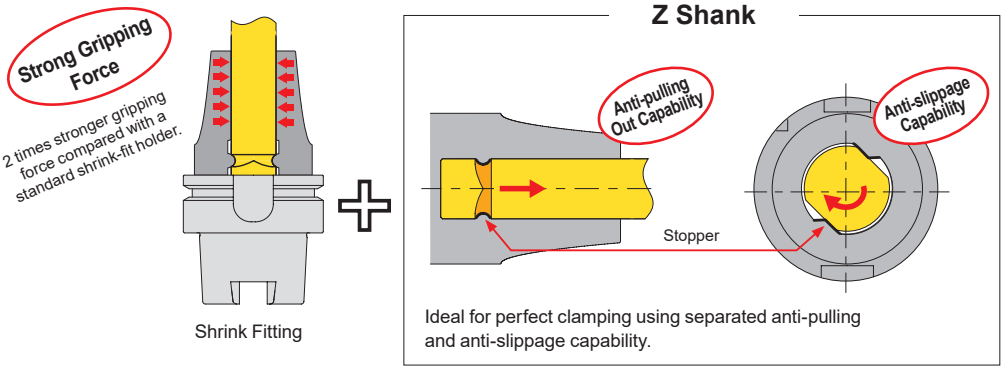
https://www.nikken-kosakusho.co.jp/en/

MST corporation

Superior Rigidity and Thick Body Design

Shrink-fit Holder with Anti Slippage Capability

SLIMLINE Z



http://www.mst-corp.co.jp/en/slimline/z/

Corner Radius End Mill for High Efficiency Titanium Alloy Machining

VQT5MVRB

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.

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http://www.mitsubishicarbide.com/en/
(Tools specifications subject to change without notice.)

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