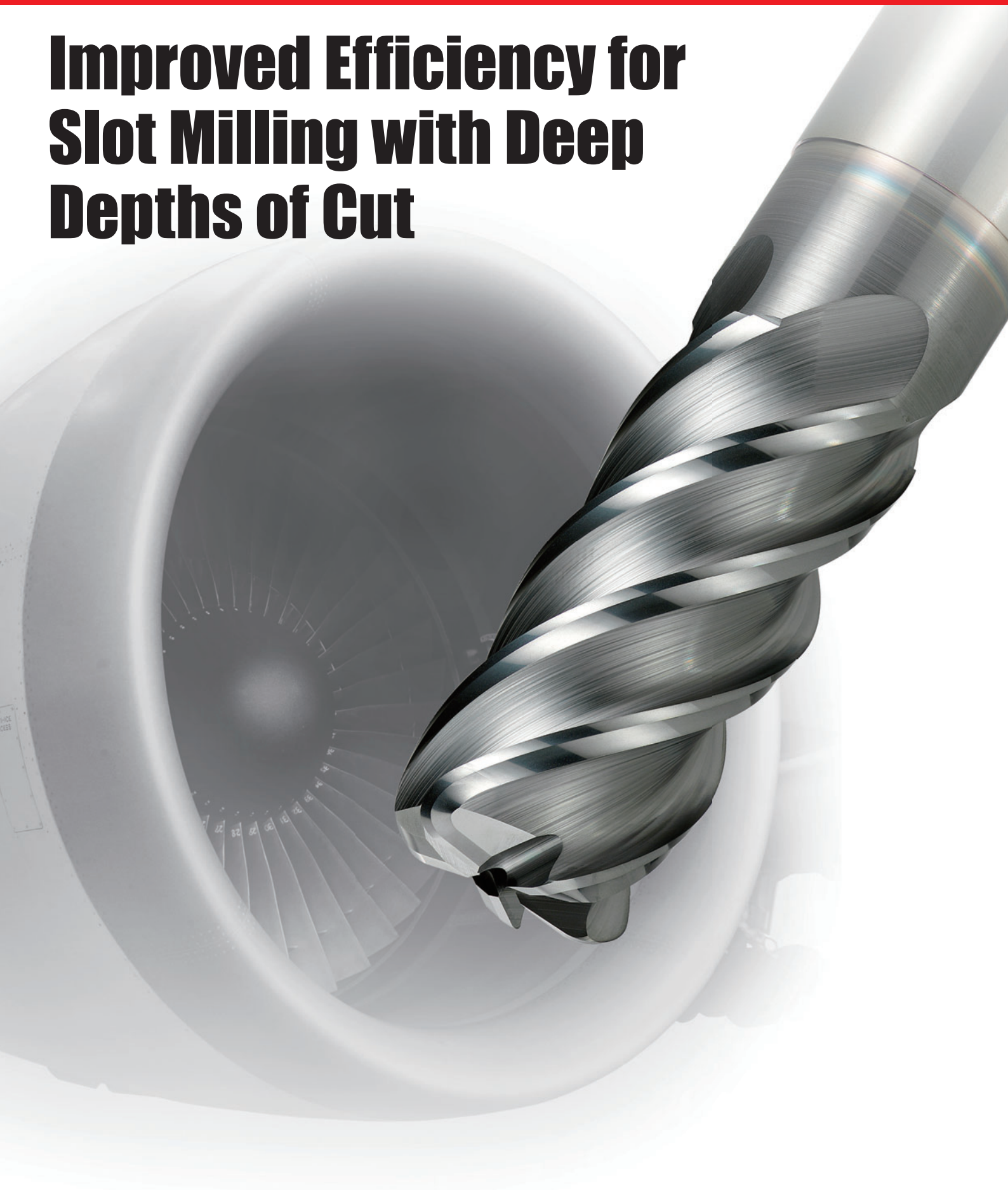
MITSUBISHI MATERIALS
TOOLS NEWS B230B

Corner Radius End Mill for High Efficiency Titanium Alloy Machining

VQT5MVRB

New Product

Improved Efficiency for Slot Milling with Deep Depths of Cut



Corner Radius End Mill for High Efficiency Titanium Alloy Machining

VQT5MVRB

The combination of 5 flutes and a coolant hole enables rough cutting of titanium alloys with high efficiency.

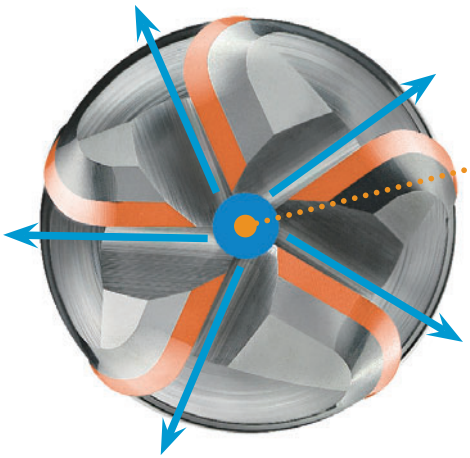
Corner Radius (Emphasis on Sharpness)

The seamlessness between the corner radius and peripheral cutting edges suppresses abnormal wear and provides stable tool life.

(Non-standard corner sizes are available by special orders.)

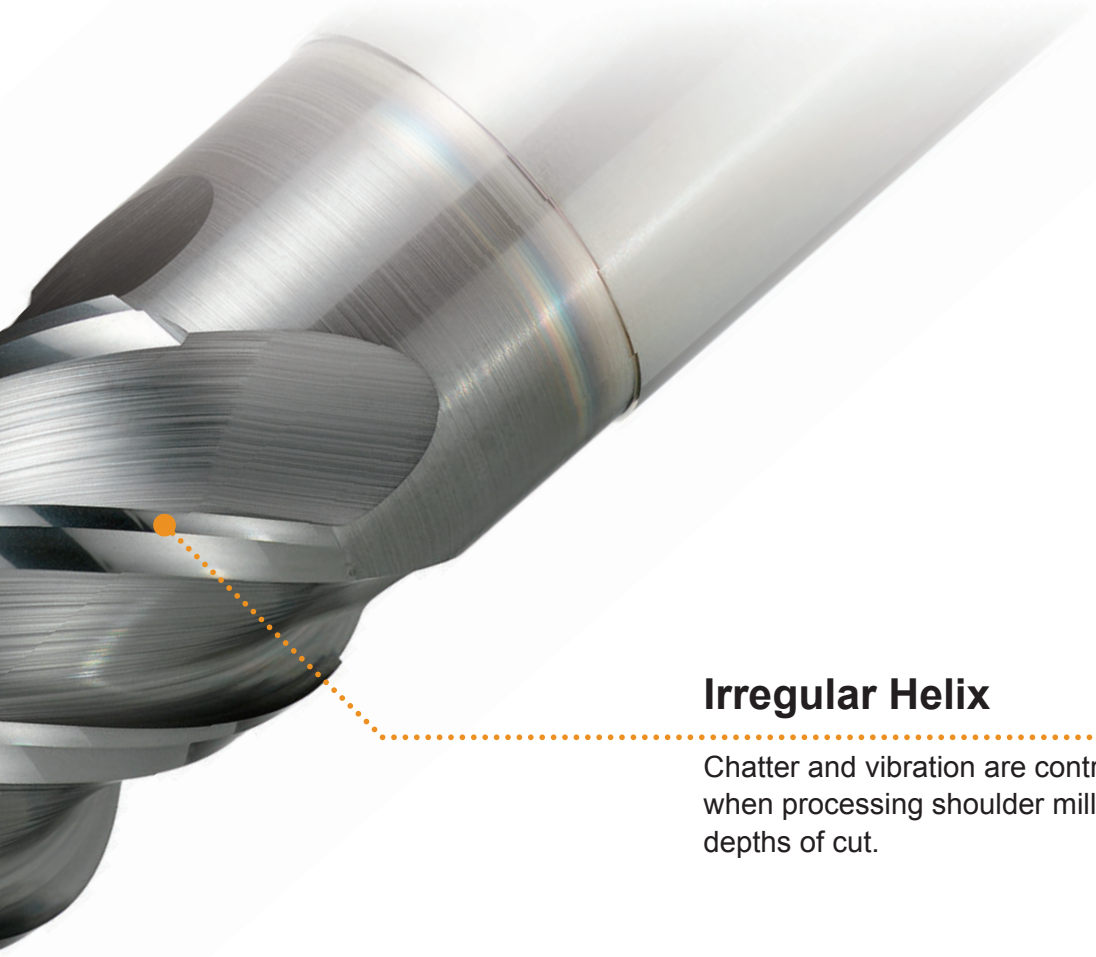
5 Flutes

Optimization of the shape improves chip evacuation, and is ideal for slot milling with deep depths of cut.



Center Through Coolant Hole

Ample cutting fluid is supplied to cool the cutting edges and make chip discharge smoother.



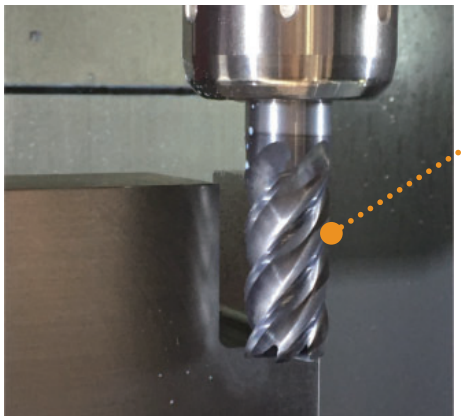
Irregular Helix

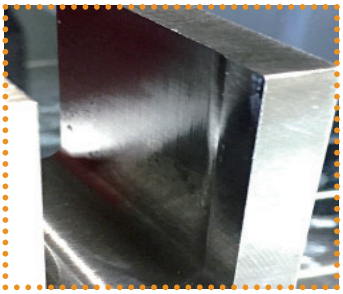
Chatter and vibration are controled even when processing shoulder milling with deep depths of cut.

Application Example

MRR (Removal Volume per Minute) : 250cc/min Can be achieved

Deep depths of cut can shorten machining time.
Irregular helix flutes allow surfaces to be finished with excellent quality.





Machined Surface

<Cutting Conditions>

Workpiece	: Ti-6Al-4V
Tool	: VQT5MVRB250R400N075C
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)

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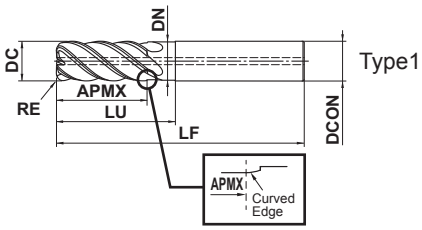
Corner radius, Medium cut length, 5 flute, Irregular helix flutes, With coolant hole

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	Aluminum Alloy
					◎		



Type1

R	RE				
	±0.02				
	DC≤16	20≤DC≤25			
	0 - 0.03	0 - 0.04			
h6	DCON = 16	20≤DCON≤25			
	0 - 0.011	0 - 0.013			

- Flute geometry suitable for slot milling.
- The sharp corner R edges provide long tool life in machining of titanium alloys.

(mm)

Order Number	DC	RE	APMX	LU	DN	LF	DCON	No.F *	Stock	Type
VQT5MVRB160R300N048C	16	3	34	48	15.5	100	16	5	●	1
VQT5MVRB200R400N060C	20	4	44	60	19.5	120	20	5	●	1
VQT5MVRB250R400N075C	25	4	54	75	24.5	140	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.
(Note 2) Non-standard corner R sizes are available by special orders. Contact us for details.
* Number of Flutes

Special Corner R Size Range

(mm)

DC	RE
16	1–5
20, 25	1–6

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

Identification Code

End Mills

End Mill Names	
VQT	SMART MIRACLE End Mill for Titanium Alloys

Features	
V	Irregular Spiral Helix Angle

Dia.	
160	DC = 16mm
200	DC = 20mm
250	DC = 25mm

Neck Length	
N048	LU = 48mm
N060	LU = 60mm
N075	LU = 75mm

VQT **5** **M** **V** **RB** **250** **R400** **N075** **C**

No. of Flutes	
5	5 flute

Flute Length	
M	Medium

End Cutting Edge	
RB	Raduis

Corner Radius	
R300	3mm
R400	4mm

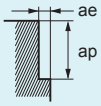
Coolant Hole	
C	Center Through

● : Inventory maintained in Japan.

Recommended Cutting Conditions

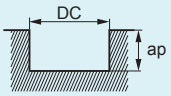
Shoulder Milling

Overhang Length DC×3 (DC=Dia.) (mm)

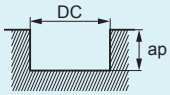
Work Material	Titanium Alloys Ti-6Al-4V etc.				
DC	**vc** (m/min)	**n** (min-1)	**vf** (mm/min)	**ap**	**ae**
16	70	1400	700	32	2.4
20	70	1100	550	40	3
25	70	890	440	50	3.8
Depth of Cut					

Slot Milling

Depth of Cut DC×1 (mm)

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

Depth of Cut DC×2 (mm)

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

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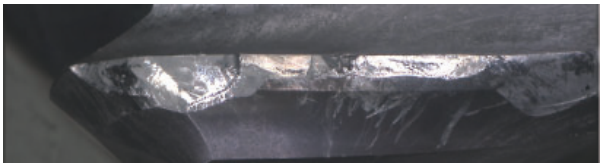
When measuring the tool length, please use an internal contact type (non-electricity type) or a laser tool setter.
(Note 2) When cutting titanium alloys, the use of water-soluble cutting fluid is effective.
(Note 3) The irregular helix flute end mill has a larger effect on controlling vibration when 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) For slot milling, use a chuck with high clamping force.

Cutting Performance

Slot Milling with Deep Depths of Cut in Titanium Alloy

The seamlessness of the corner radius achieves stable tool life.

Conventional



Fractures (After 6 slots)

<Cutting Conditions>
Workpiece : Ti-6Al-4V
Tool : VQT5MVRB160R300N048C
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)

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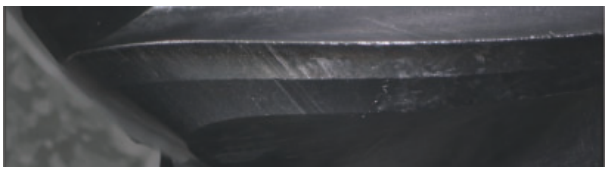
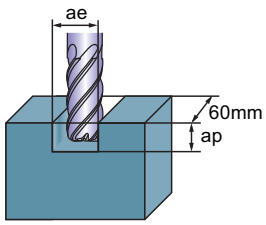


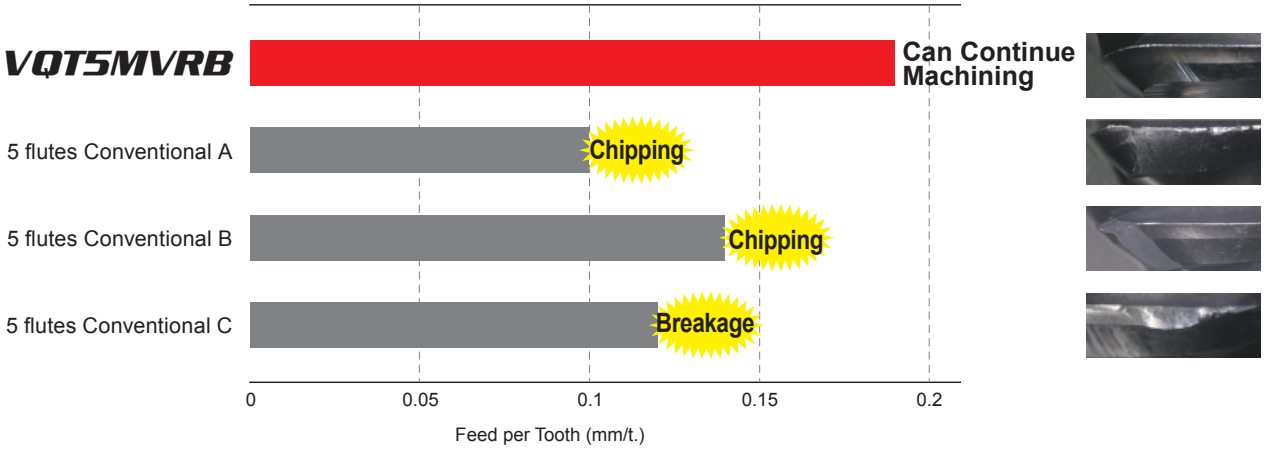
After 17 slots

Triple Tool Life



Comparison of Maximum Cutting Feed for Titanium Alloy Slot Milling

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



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Memo

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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.

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(Tools specifications subject to change without notice.)

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