DIA EDGE

TOOL NEWS B262G

Multi-functional Lollipop End Mill for Difficult-to-Cut Materials

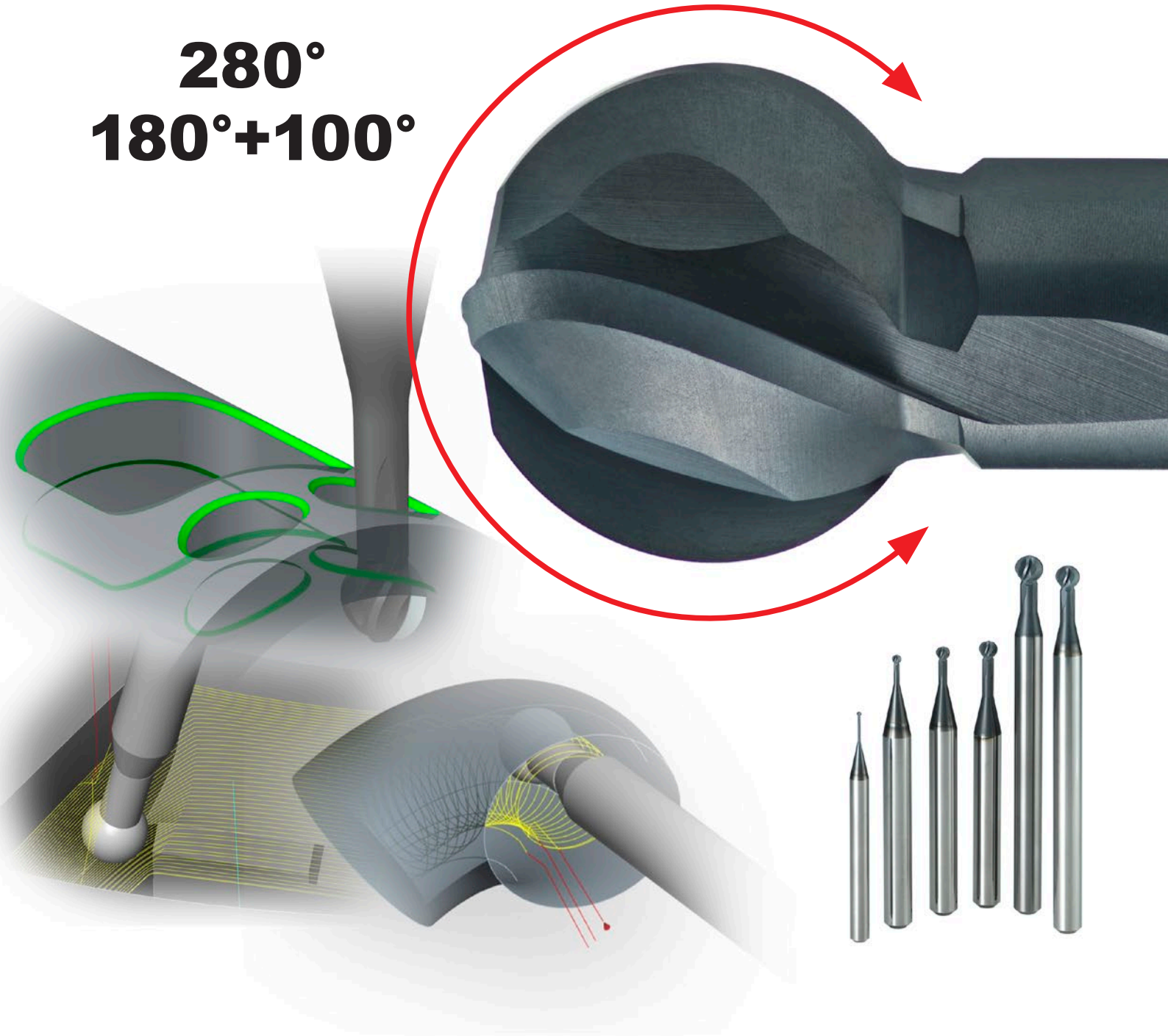
SMART MIRACLE End Mill Series

VQ4WB

NEW

280° Extended Cutting Edge Enables a Wide Range of Applications

280°
180°+100°



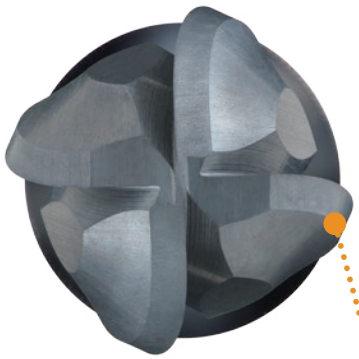
MITSUBISHI MATERIALS CORPORATION

Multi-functional Lollipop End Mill for Difficult-to-Cut Materials

VQ4WB

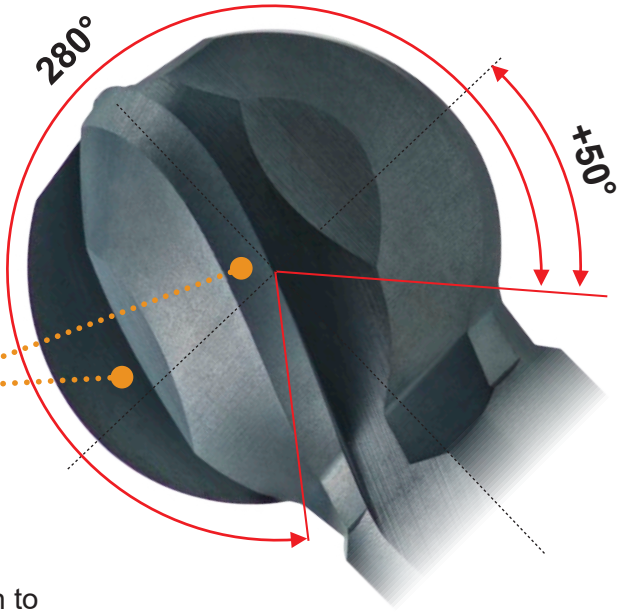
SMART MIRACLE End Mill Series

280º extended cutting edge and special geometry of the cutting edge & rake face realizes multi-functional machining and a wide range of applications. Optimal choice for machining undercut and complex shapes when using a 5-axis machine.



Multiple-Applications

True round ball cutting edge over the full 280º achieves stable cutting even during undercut machining.



High Efficiency

4 flutes, extended cutting edge, specialized geometry and long tool life make for a highly efficient tool.

Low Cutting Resistance

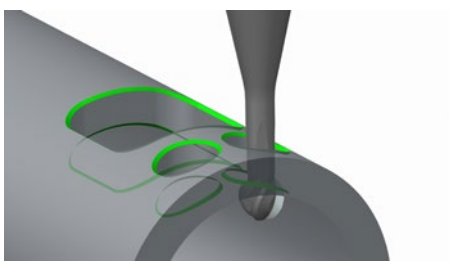
Constant edge and rake geometry helps to prevent burrs and chattering.

Long Tool Life

Long tool life when machining carbon steels through to difficult-to-cut materials enabled by the (Al,Cr)N based SMART MIRACLE coating.

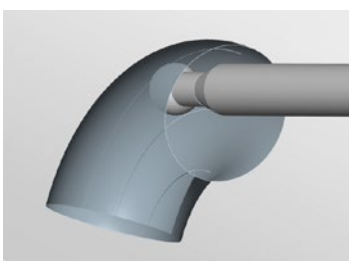
Multiple Applications

Deburring (Chamfering)

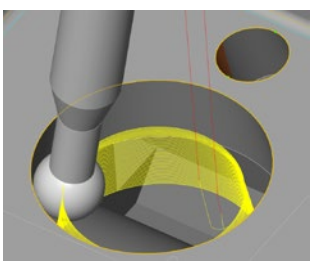


Size suitable for deburring.
DC = 1.3, 1.8, 2.8, 3.8 and 4.8 mm

Internal Profile Milling



Undercut Machining



Application Example

①Rounded Shape Slotting

②Deburring
(Top & Back Face)

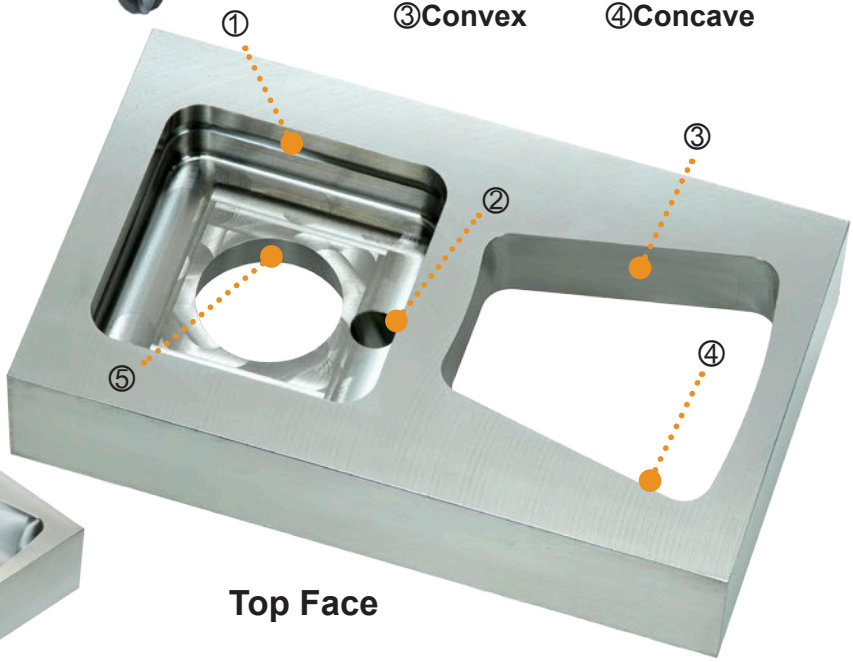
Internal Profile

③Convex

④Concave

⑤Undercut (Taper Hole)

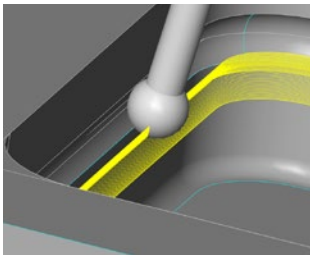
Back Face



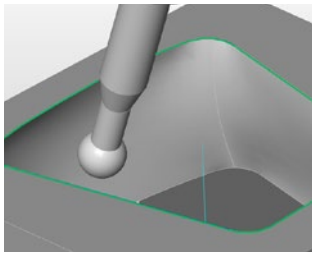
Top Face

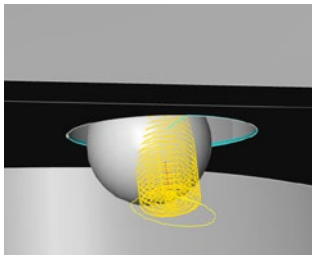
Multiple Applications

Rounded Shape Slotting

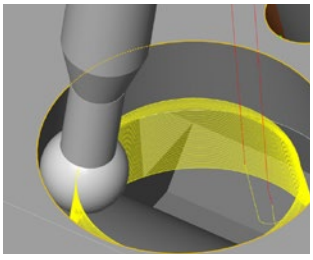


Deburring and Chamfering

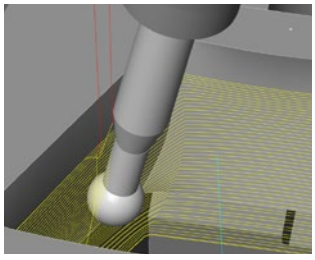


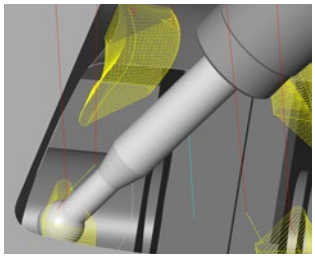


Under Cut (Taper Hole)



Internal Profile Milling





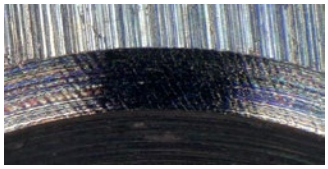
Cutting Performance

Comparison of Back Deburring on JIS SUS630

Significantly less burrs than the conventional lollipop end mills.

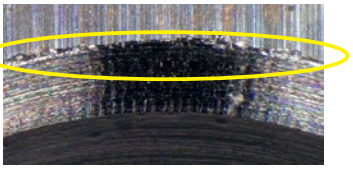
VQ4WB

Excellent Finish with No Burrs



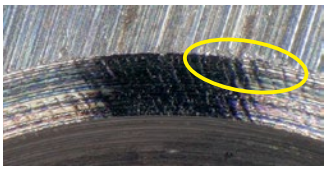
Conventional A

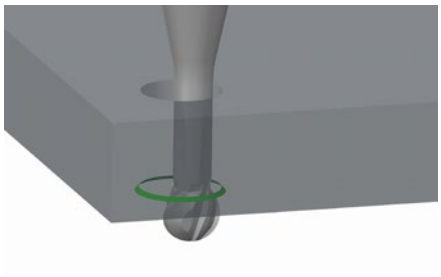
Heavy Burring Remains



Conventional B

Visible Burrs Persist



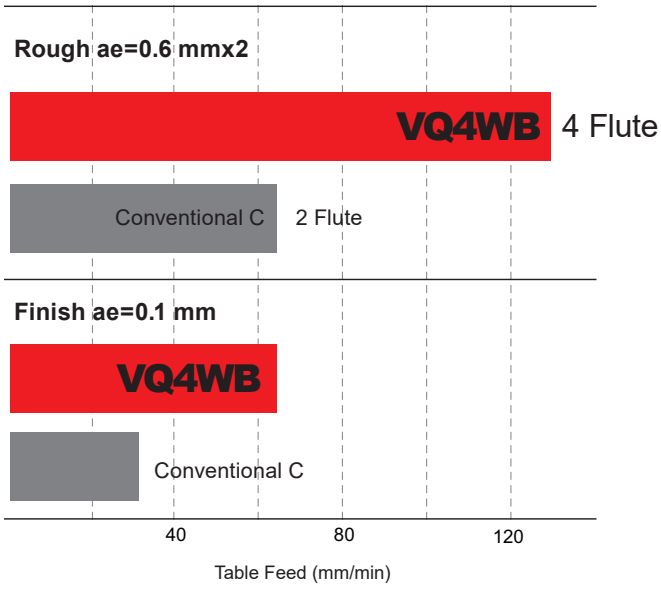


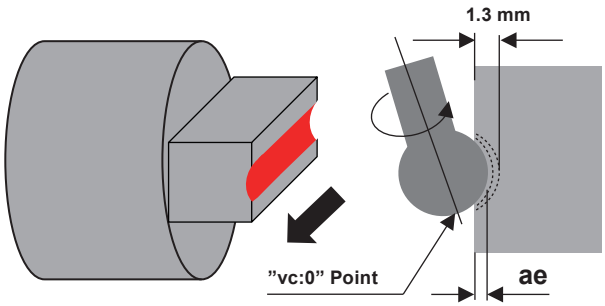
<Cutting Conditions>
Workpiece Material : JIS SUS630
Tool : VQ4WBR0150N08E280
DC = ø3.0 mm (RE 1.5)
Revolution : n = 3200 min^{-1}
Cutting Speed : vc = 30 m/min
Feed Rate : vf = 55 mm/min, fz = 0.04 mm/t.
Chamfer Width : cf = 0.2 mm
Cutting Mode : Hole Size 4.0 mm
External Coolant (Emulsion)
Machine : Vertical M/C (HSK-E25)

Rounded Shape Slotting in Ti-6Al-4V ELI

VQ4WB (4 flute) doubles efficiency compared to conventional 2 flute lollipop end mills.

After the same number of rough and finish machining cycles when a competitors tool was worn, the VQ4WB could continue machining.





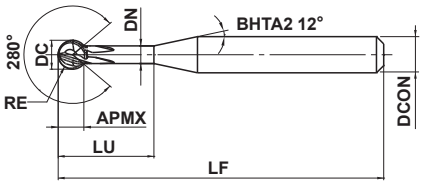
<Cutting Conditions>
Workpiece Material : Ti-6Al-4V ELI
Tool : VQ4WBR0300N12E280
DC = ø6.0 mm (RE 3.0)
Revolution : n = 800 min^{-1}
Cutting Speed : vc = 15 m/min
Cutting Mode : External Coolant (Oil)
Machine : Multi-task Lathe

Multi-functional Lollipop End Mill for Difficult-to-Cut Materials

VQ4WB NEW

Multi-functional Lollipop, Short cut length, 4 flute

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	Aluminium Alloy
◎	◎			◎	◎	○	



0.5≤RE≤3	
±0.01	
4≤DCON≤6	
0 - 0.008	

- Multi-function ball end mill with a lollipop shape for 5-axis machining.
- Optimal for back deburring undercutting, and inner curved surface machining.

(mm)

Order Number	RE	DC	APMX	LU	DN	LF	DCON	* No.F	Stock
VQ4WBR0050N06E280	0.5	1.0	0.88	6	0.61	50	4	4	●
VQ4WBR0065N08E280	0.65	1.3	1.14	8	0.80	50	4	4	●
VQ4WBR0090N06E280	0.9	1.8	1.58	6	1.11	50	4	4	●
VQ4WBR0100N06E280	1.0	2.0	1.76	6	1.24	60	6	4	●
VQ4WBR0140N16E280	1.4	2.8	2.47	16	1.74	60	6	4	●
VQ4WBR0150N08E280	1.5	3.0	2.64	8	1.87	60	6	4	●
VQ4WBR0190N12E280	1.9	3.8	3.35	12	2.37	60	6	4	●
VQ4WBR0200N12E280	2.0	4.0	3.53	12	2.50	60	6	4	●
VQ4WBR0240N16E280	2.4	4.8	4.23	16	3.00	70	6	4	●
VQ4WBR0250N12E280	2.5	5.0	4.41	12	3.13	80	6	4	●
VQ4WBR0300N12E280	3.0	6.0	5.29	12	3.76	80	6	4	●

Note 1) SMART MIRACLE coating has very low electrical conductivity; therefore, an external contact type of tool setter (electrically transmitted) may not work.

* Number of Flutes

<Special Orders>

For non standard products not shown above, please contact our sales department.

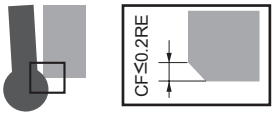
DC = Dia.
RE = Radius
APMX = Length of Cut
LU = Neck Length
DN = Neck Dia.
LF = Overall Length
DCON = Shank Dia.

● : **Inventory maintained in Japan.**

Recommended Cutting Conditions

■ Chamfering (Debarring)

(mm)

Workpiece Material		Mild Steels, Carbon Steels, Copper Alloys, Pre-hardened Steels (–45HRC) SS400, S10C, S45C, SCM440, SNCM439 NAK, SKD etc.			Austenitic, Ferritic and Martensitic Stainless Steels, Precipitation Hardening Stainless Steels, Cobalt Chromium Alloys, Titanium Alloys SUS304, SUS316L, SUS420J, SUS630、SU631, Ti-6Al-4V, CCM etc.		
DC	**RE**	Revolution **n** (min^{-1})	Feed Rate **vf** (mm/min)	Depth of Cut **Max.CF**	Revolution **n** (min^{-1})	Feed Rate **vf** (mm/min)	Depth of Cut **Max.CF**
1.0	**0.5**	19000	300	0.10	14000	220	0.10
1.3	**0.65**	15000	420	0.13	11000	310	0.13
1.8	**0.9**	11000	570	0.18	8000	420	0.18
2.0	**1.0**	9500	610	0.20	7200	460	0.20
2.8	**1.4**	6800	760	0.28	5100	570	0.28
3.0	**1.5**	6400	770	0.30	4800	580	0.30
3.8	**1.9**	5000	840	0.38	3800	640	0.38
4.0	**2.0**	4800	880	0.40	3600	660	0.40
4.8	**2.4**	4000	960	0.48	3000	720	0.48
5.0	**2.5**	3800	970	0.50	2900	740	0.50
6.0	**3.0**	3200	1000	0.60	2400	770	0.60
Depth of Cut		 RE : Radius					

■ Internal Profile / Undercut

(mm)

Workpiece Material		Mild Steels, Carbon Steels, Copper Alloys, Pre-hardened Steels (–45HRC) SS400, S10C, S45C, SCM440, SNCM439 NAK, SKD etc.			Austenitic, Ferritic and Martensitic Stainless Steels, Precipitation Hardening Stainless Steels, Cobalt Chromium Alloys, Titanium Alloys SUS304, SUS316L, SUS420J, SUS630、SU631, Ti-6Al-4V, CCM etc.		
DC	**RE**	Revolution **n** (min^{-1})	Feed Rate **vf** (mm/min)	Depth of Cut **ae**	Revolution **n** (min^{-1})	Feed Rate **vf** (mm/min)	Depth of Cut **ae**
2.0	**1.0**	9500	460	0.03	7200	290	0.03
3.0	**1.5**	6400	560	0.10	4800	350	0.10
4.0	**2.0**	4800	650	0.14	3600	390	0.14
5.0	**2.5**	3800	730	0.18	2900	440	0.18
6.0	**3.0**	3200	770	0.22	2400	460	0.22
Depth of Cut		 RE : Radius					

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

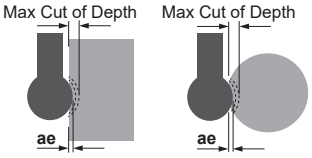
Note 2) If the depth of cut is smaller than this table, feed rate can be increased.

Note 3) If the rigidity of the machine or the workpiece material installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

Note 4) For sizes RE 0.5, 0.65, 0.9, 1.4, 1.9 and RE 2.4 which have long neck lengths, internal profile milling and round shape slotting are not recommended.

■ Radiused Shape Slotting

(mm)

Workpiece Material		Mild Steels, Carbon Steels, Copper Alloys, Pre-hardened Steels (–45HRC) SS400, S10C, S45C, SCM440, SNCM439 NAK, SKD etc.				Austenitic, Ferritic and Martensitic Stainless Steels, Precipitation Hardening Stainless Steels, Cobalt Chromium Alloys, Titanium Alloys SUS304, SUS316L, SUS420J, SUS630、SU631, Ti-6Al-4V, CCM etc.			
DC	**RE**	Revolution **n** (min^{-1})	Feed Rate **vf** (mm/min)	Depth of Cut **ae**	Depth of Cut **Max ae**	Revolution **n** (min^{-1})	Feed Rate **vf** (mm/min)	Depth of Cut **ae**	Depth of Cut **Max ae**
2.0	**1.0**	9500	300	0.03	0.06	7200	140	0.03	0.06
3.0	**1.5**	6400	380	0.10	0.20	4800	190	0.10	0.20
4.0	**2.0**	4800	440	0.14	0.28	3600	230	0.14	0.28
5.0	**2.5**	3800	490	0.18	0.54	2900	260	0.18	0.54
6.0	**3.0**	3200	510	0.22	0.88	2400	270	0.22	0.88
Depth of Cut									

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Note 2) If the depth of cut is smaller than this table, feed rate can be increased.

Note 3) If the rigidity of the machine or the workpiece material installation is very low, or chattering is generated, please reduce the revolution and the feed rate proportionately.

Note 4) For sizes RE 0.5, 0.65, 0.9, 1.4, 1.9 and RE 2.4 which have long neck lengths, internal profile milling and round shape slotting are not recommended.

Note 5) The maximum allowed depth of cut (Max ae) avoids interference between the workpiece and tool shank. It is recommended to machine up to the Max ae in 2-4 passes.

Multi-functional Lollipop End Mill for Difficult-to-Cut Materials

VQ4WB

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 CORPORATION

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

EXP-20-E007
2020.9.(-)