MITSUBISHI MATERIALS

VQ4WB

Smart Miracle End Mill Series

LOLLIPOP END MILL FOR MULTI-FUNCTIONAL DIFFICULT-TO-CUT MACHINING





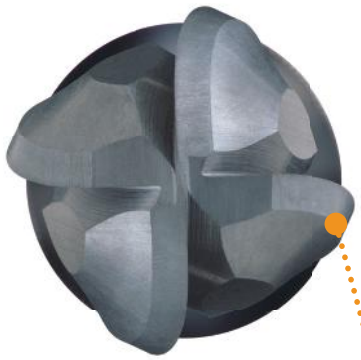
TOOL NEWS **B262A**

Lollipop End Mill for Multi-Functional Difficult-to-Cut Machining

SMART MIRACLE End Mill Series

VQ4WB

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



High Efficiency

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

Low Cutting Resistance

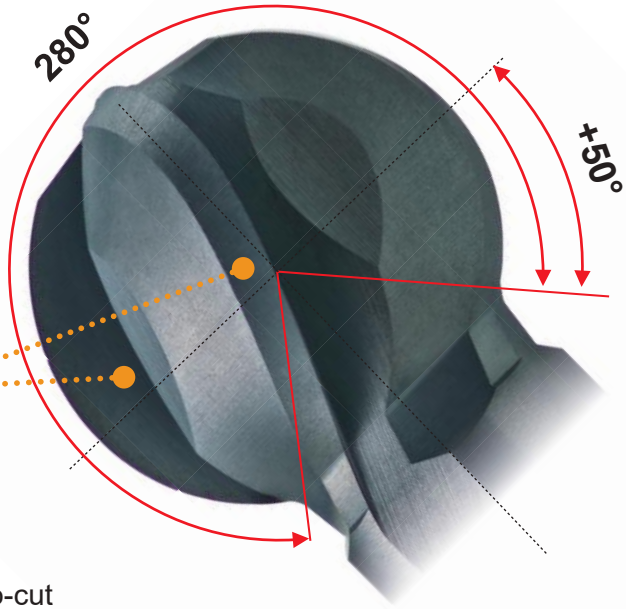
Constant edge and rake geometry helps to prevent burrs and chattering.

Long Tool Life

Long life when machining carbon steel to difficult-to-cut materials by (Al,Cr)N based SMART MIRACLE coating.

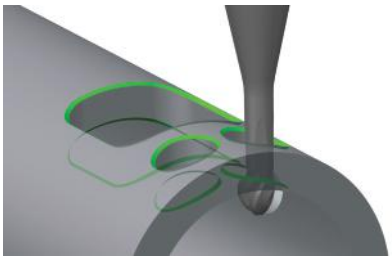
Multiple-Applications

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

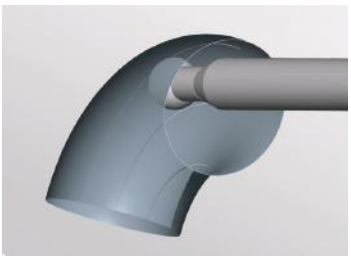


Multiple Applications

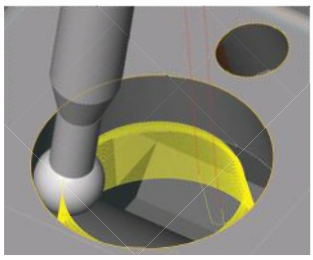
Deburring (Chamfering)



Internal Profile Milling



Undercut Machining



Application Example

①Rounded Shape Slotting



②Deburring
(Top & Back Face)



Internal Profile



③Convex



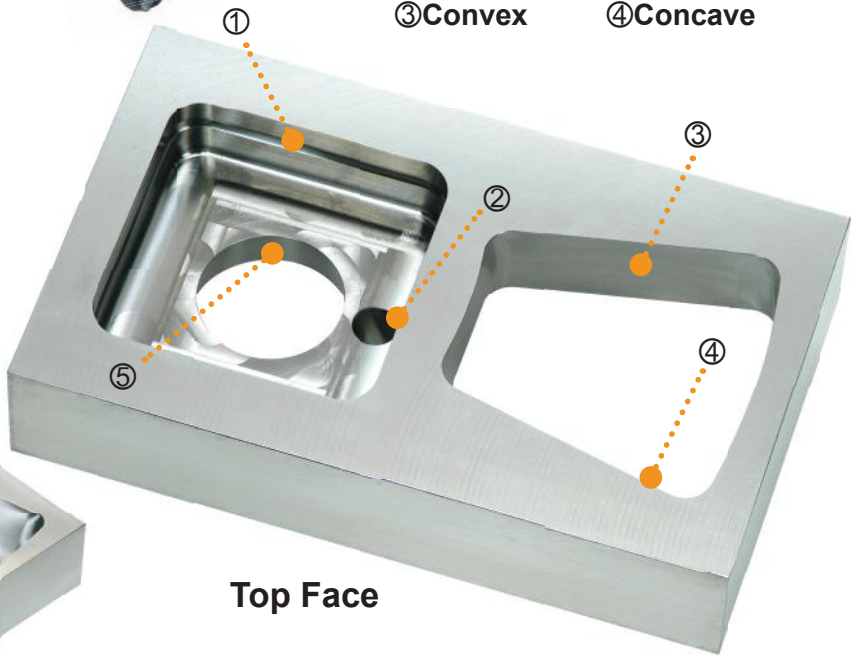
④Concave

⑤Undercut (Taper Hole)





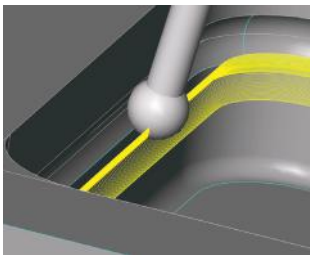
Back Face



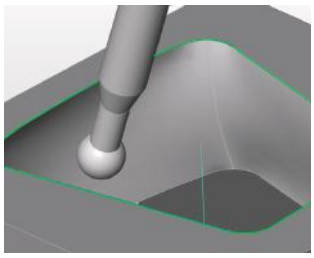
Top Face

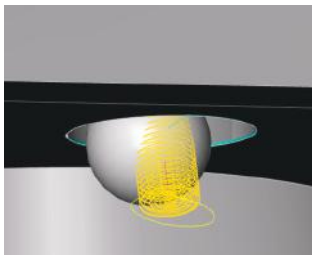
Multiple Applications

Rounded Shape Slotting

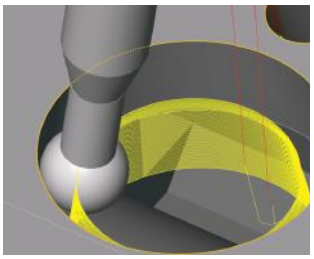


Deburring and Chamfering

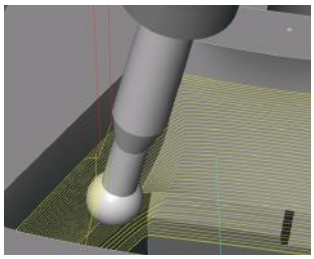


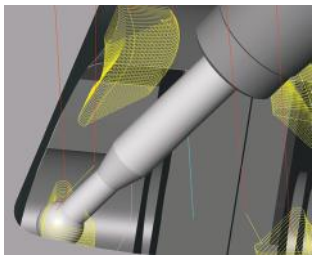


Under Cut (Taper Hole)



Internal Profile Milling





Cutting Performance

Comparison of Back Deburring in AISI S17400

Significantly less burrs than Competing Lollipop End Mills

VQ4WB

Excellent Finish with No Burrs



Competitor A

Heavy Burring Remains

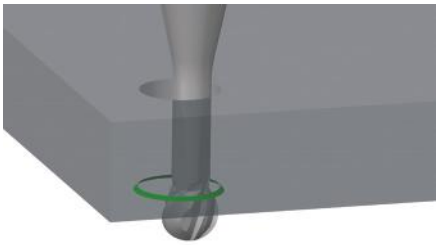


Competitor B

Visible Burrs Persist



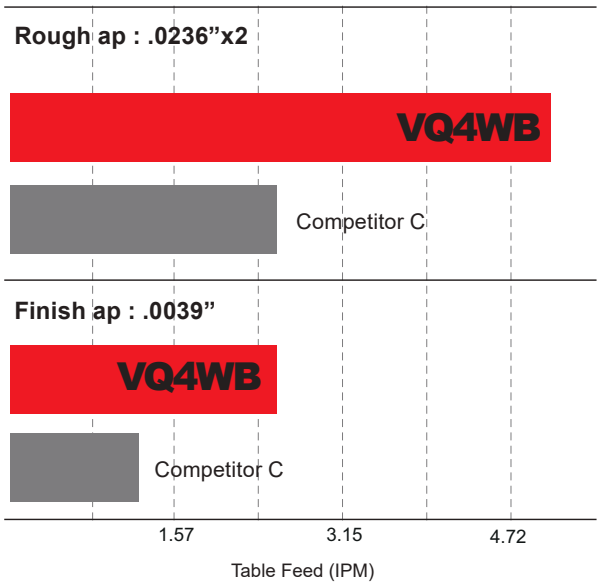


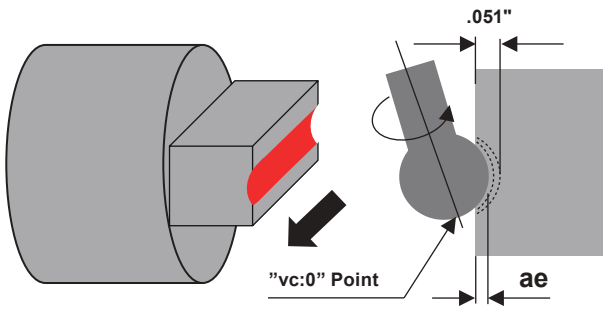


<Cutting Conditions>
Workpiece Material : AISI S17400
Tool : VQ4WBR0150N08E280
DC = .1181”
Revolution : n = 3200 min^{-1}
Cutting Speed : vc = 98.5 SFM
Feed Rate : vf = 2.16 IPM, fz = .0002 IPT
Chamfer Width : .0394”
Cutting Mode : Hole Size .1575”
External Coolant (Emulsion)
Machine : Vertical M/C (HSK-E25)

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

VQ4WB (4 flute) achieves double machining efficiency compared to conventional lollipop end mill (2 flute).
Even after the same number of machining (rough + finish) as competitor tool, wear is minimal and VQ4WB can continue machining.





<Cutting Conditions>
Workpiece Material : Ti-6Al-4V ELI
Tool : VQ4WBR0300N12E280
DC = .2362”
Revolution : n = 800 min^{-1}
Cutting Speed : vc = 49.0 SFM
Cutting Mode : External Coolant (Oil)
Machine : Multi-task Lathe

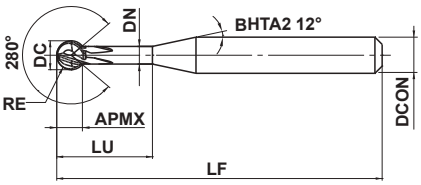
Lollipop End Mill for Multi-Functional Difficult-to-Cut Machining

VQ4WB NEW

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	Aluminum 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 (electric transmitted) may not work.

* Number of Flutes

<Order for Special Product>

For special products other than the above tool specifications, please contact our sales department.

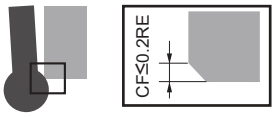
DC = Dia.
RE = Radius
APMX = Length of Cut
LU = Neck Length
DN = Neck Dia.
LF = Overall Length
DCON = Shank Dia.

● : **USA Stock**

Recommended Cutting Conditions

■ Chamfering (Debarring)

(inch)

Workpiece Material				Milld Steels, Carbon Steels, Copper Alloys, Pre-hardened Steels AISI 1045, 4140, 1010, P20, P21, 4340, ASTM A36 etc.			Austentic, Ferritic and Martensitic Stainless Steels, Precipitation Hardening Stainless Steels, Cobalt Chrome Alloys, Titanium Alloys AISI 304, 316, 630, 631, 431, 420, Ti-6Al-4V, 15-5PH, 17-4PH etc.		
DC		RE		Revolution **n** (min^{-1})	Feed Rate **vf** (IPM)	Depth of Cut **Max.CF**	Revolution **n** (min^{-1})	Feed Rate **vf** (IPM)	Depth of Cut **Max.CF**
mm	inch	mm	inch						
1.0	**.039**	**0.5**	**.020**	19000	11.8	.004	14000	8.7	.004
1.3	**.051**	**0.65**	**.026**	15000	16.5	.005	11000	12.2	.005
1.8	**.071**	**0.9**	**.035**	11000	22.4	.007	8000	16.5	.007
2.0	**.079**	**1.0**	**.039**	9500	24.0	.008	7200	18.1	.008
2.8	**.110**	**1.4**	**.055**	6800	29.9	.011	5100	22.4	.011
3.0	**.118**	**1.5**	**.059**	6400	30.3	.012	4800	22.8	.012
3.8	**.150**	**1.9**	**.075**	5000	33.1	.015	3800	25.2	.015
4.0	**.157**	**2.0**	**.079**	4800	34.6	.016	3600	26.0	.016
4.8	**.189**	**2.4**	**.094**	4000	37.8	.019	3000	28.3	.019
5.0	**.197**	**2.5**	**.098**	3800	38.2	.020	2900	29.1	.020
6.0	**.236**	**3.0**	**.118**	3200	39.4	.024	2400	30.3	.024
Depth of Cut				 RE : Radius					

■ Internal Profile / Undercut

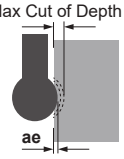
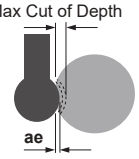
(inch)

Workpiece Material				Milld Steels, Carbon Steels, Copper Alloys, Pre-hardened Steels AISI 1045, 4140, 1010, P20, P21, 4340, ASTM A36 etc.			Austentic, Ferritic and Martensitic Stainless Steels, Precipitation Hardening Stainless Steels, Cobalt Chrome Alloys, Titanium Alloys AISI 304, 316, 630, 631, 431, 420, Ti-6Al-4V, 15-5PH, 17-4PH etc.		
DC		RE		Revolution **n** (min^{-1})	Feed Rate **vf** (IPM)	Depth of Cut **ae**	Revolution **n** (min^{-1})	Feed Rate **vf** (IPM)	Depth of Cut **ae**
mm	inch	mm	inch						
2.0	**.079**	**1.0**	**.039**	9500	18.1	.001	7200	11.4	.001
3.0	**.118**	**1.5**	**.059**	6400	22.0	.004	4800	13.8	.004
4.0	**.157**	**2.0**	**.079**	4800	25.6	.006	3600	15.4	.006
5.0	**.197**	**2.5**	**.098**	3800	28.7	.007	2900	17.3	.007
6.0	**.236**	**3.0**	**.118**	3200	30.3	.009	2400	18.1	.009
Depth of Cut				 RE : Radius					

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) 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

(inch)

Workpiece Material				Milld Steels, Carbon Steels, Copper Alloys, Pre-hardened Steels AISI 1045, 4140, 1010, P20, P21, 4340, ASTM A36 etc.				Austentic, Ferritic and Martensitic Stainless Steels, Precipitation Hardening Stainless Steels, Cobalt Chrome Alloys, Titanium Alloys AISI 304, 316, 630, 631, 431, 420, Ti-6Al-4V, 15-5PH, 17-4PH etc.			
DC		**RE**		Revolution **n** (min^{-1})	Feed Rate **vf** (IPM)	Depth of Cut		Revolution **n** (min^{-1})	Feed Rate **vf** (IPM)	Depth of Cut	
mm	inch	mm	inch			**ae**	**Max. ae**			**ae**	**Max. ae**
2.0	**.079**	**1.0**	**.039**	9500	11.8	.001	.002	7200	5.5	.001	.002
3.0	**.118**	**1.5**	**.059**	6400	15.0	.004	.008	4800	7.5	.004	.008
4.0	**.157**	**2.0**	**.079**	4800	17.3	.006	.011	3600	9.1	.006	.011
5.0	**.197**	**2.5**	**.098**	3800	19.3	.007	.021	2900	10.2	.007	.021
6.0	**.236**	**3.0**	**.118**	3200	20.1	.009	.035	2400	10.6	.009	.035
Depth of Cut				Max Cut of Depth  ae				Max Cut of Depth  ae			

RE : Radius

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) 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) Though max ae means stably machinable cutting condition, maximum depth of calculated by effective cutting edge angle is 0.3 times RE. (In that case please reduce the revolution and feed rate than this table.)

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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.

www.mmc-carbide.com/us

Tools specifications subject to change without notice.

B262A-US-2020.9