

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

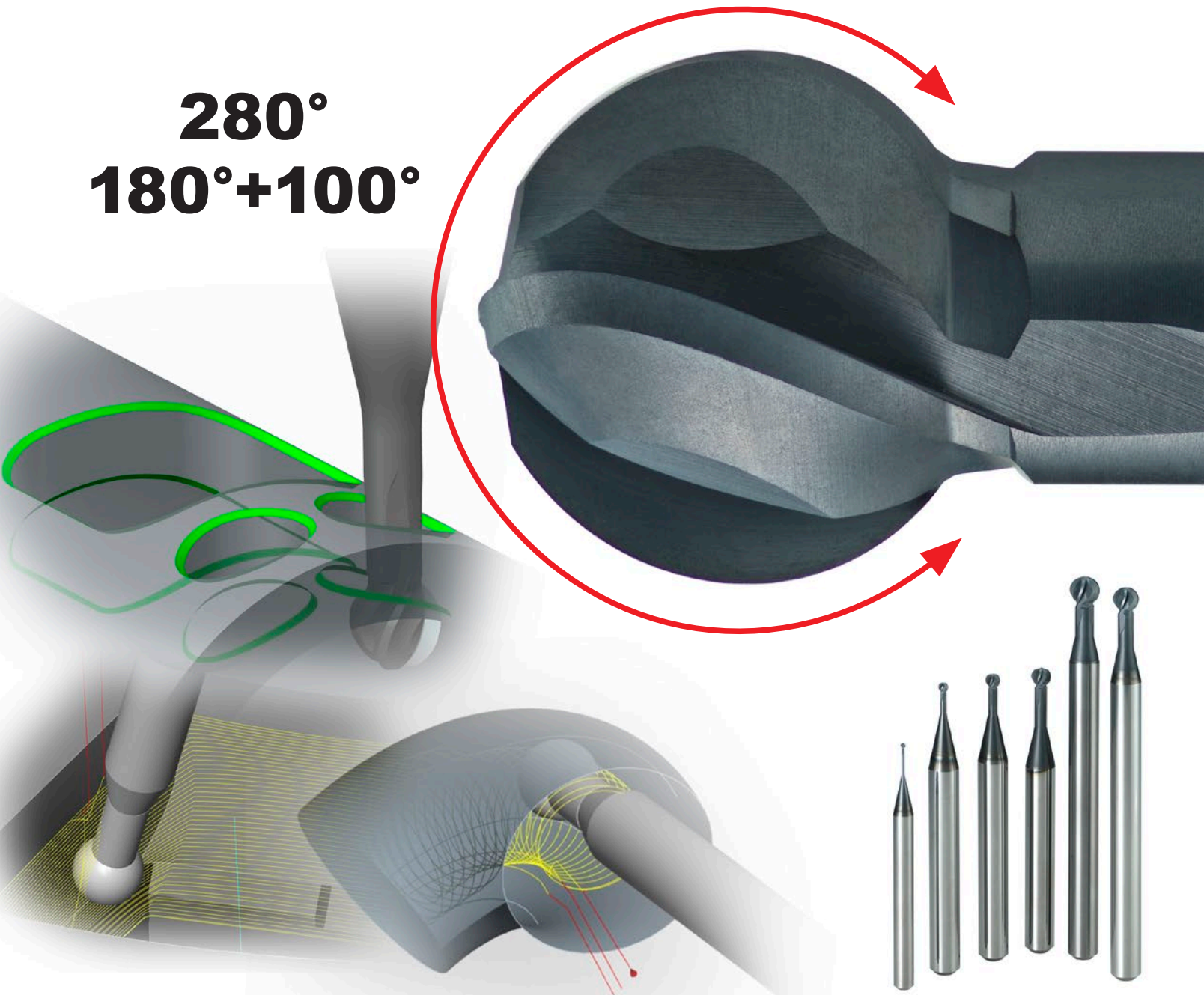
SMART MIRACLE End Mill Series

VQ4WB

NEW

280° Extended Cutting Edge Enables a Wide Range of Applications

280°
180°+100°

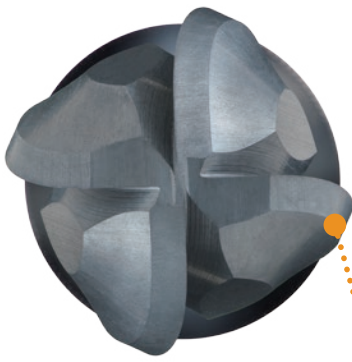


Lollipop End Mill for Multi-Functional Difficult-to-Cut Machining

SMART MIRACLE End Mill Series

VQ4WB

280° 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.



Multiple-Applications

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

High Efficiency

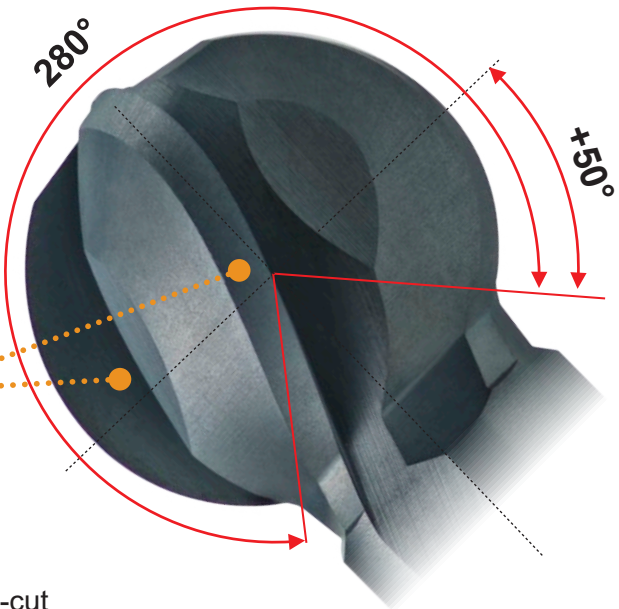
4 flutes, extended cutting edge, specialized geometry and long tool life make for a highly efficient tool.

Low Cutting Resistance

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

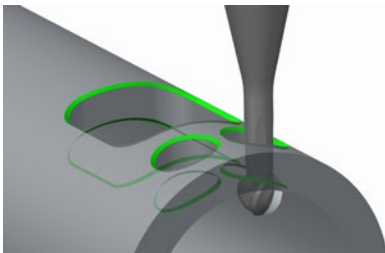
Long Tool Life

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

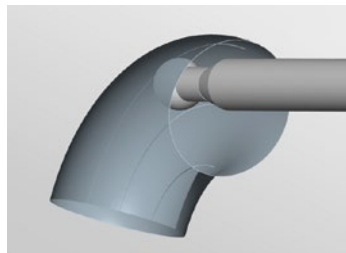


Multiple Applications

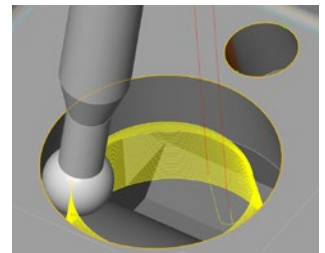
Deburring (Chamfering)



Internal Profile Milling



Undercut Machining



Application Example

① Rounded Shape Slotting



② Deburring (Top & Back Face)



Internal Profile

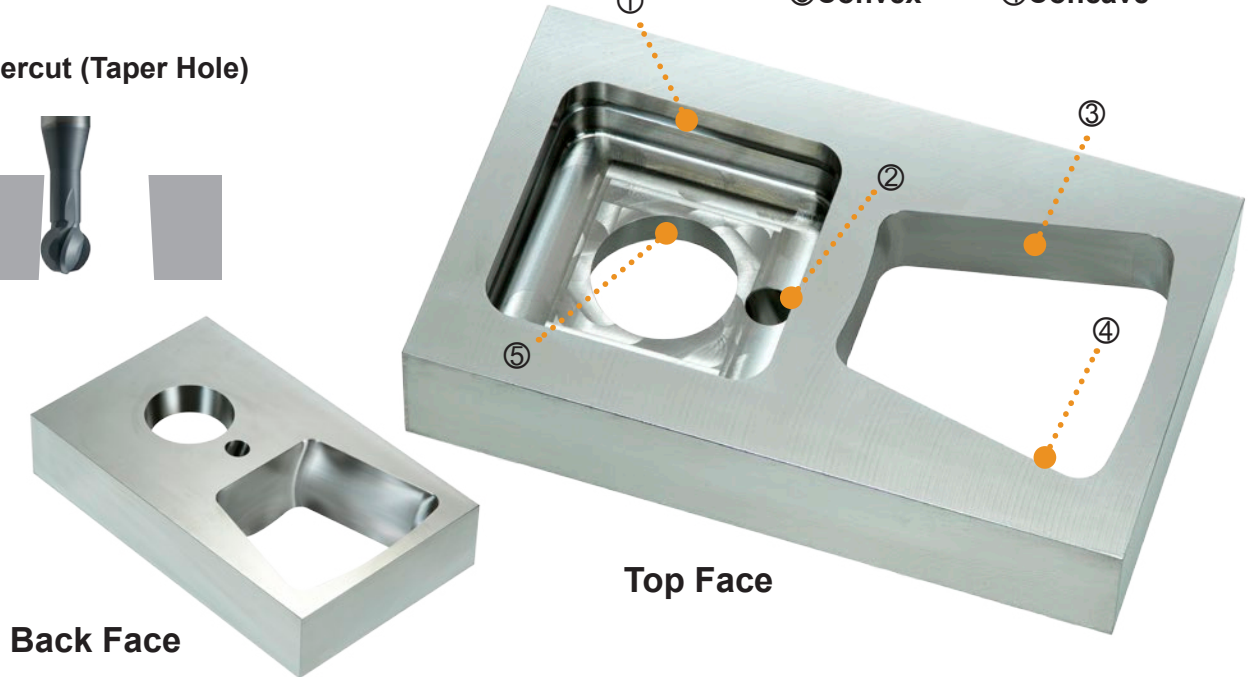


③ Convex



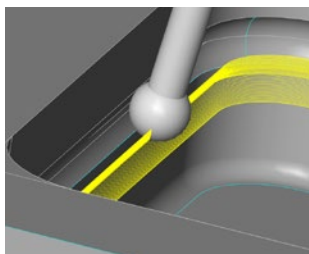
④ Concave

⑤ Undercut (Taper Hole)

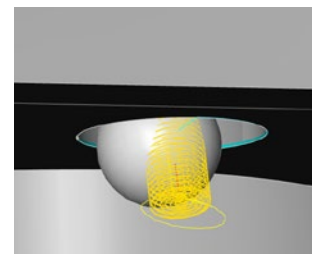
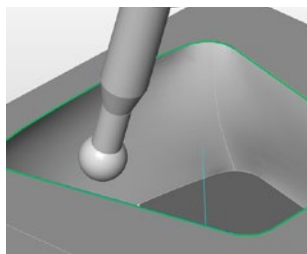


Multiple Applications

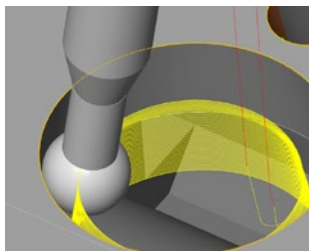
Rounded Shape Slotting



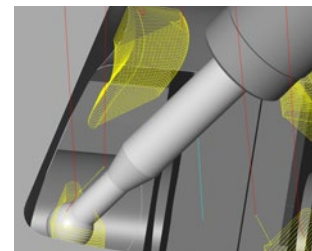
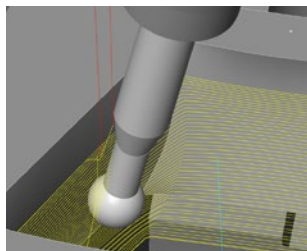
Deburring and Chamfering



Under Cut (Taper Hole)



Internal Profile Milling



Cutting Performance

Comparison of Back Deburring in AISI S17400

Significantly less burrs than Competing Lollipop End Mills

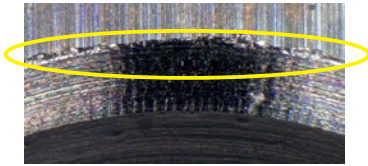
VQ4WB

Excellent Finish with No Burrs



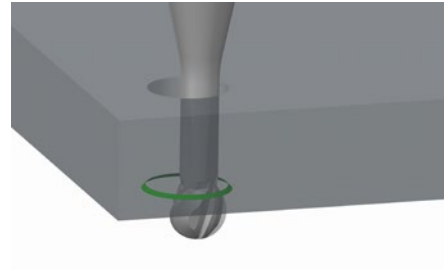
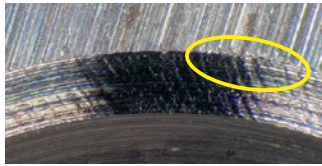
Competitor A

Heavy Burring Remains



Competitor B

Visible Burrs Persist



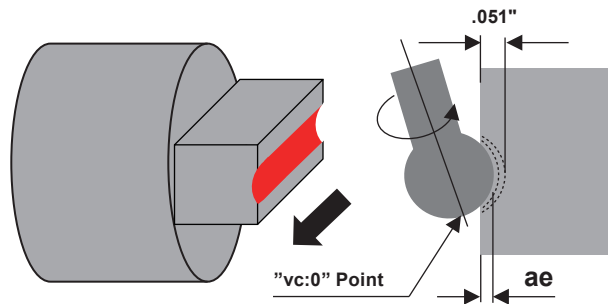
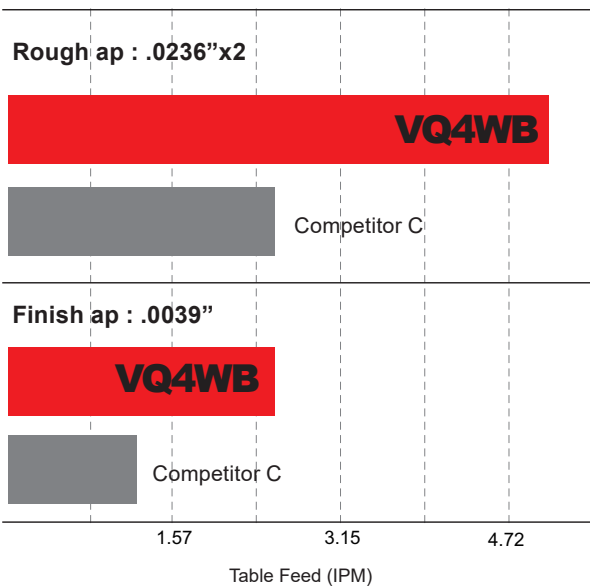
<Cutting Conditions>

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

Recommended Cutting Conditions

■ Chamfering (Debarring)

(inch)

Workpiece Material				Mild Steels, Carbon Steels, Copper Alloys, Pre-hardened Steels AISI 1045, 4140, 1010, P20, P21, 4340, ASTM A36 etc.			Austenitic, 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)
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		
	<p style="text-align: right;">RE : Radius</p>	

■ Internal Profile / Undercut

(inch)

Workpiece Material				Mild Steels, Carbon Steels, Copper Alloys, Pre-hardened Steels AISI 1045, 4140, 1010, P20, P21, 4340, ASTM A36 etc.			Austenitic, 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)
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		
	<p style="text-align: right;">RE : Radius</p>	

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				Mild Steels, Carbon Steels, Copper Alloys, Pre-hardened Steels				Austenitic, Ferritic and Martensitic Stainless Steels, Precipitation Hardening Stainless Steels, Cobalt Chrome Alloys, Titanium Alloys			
				AISI 1045, 4140, 1010, P20, P21, 4340, ASTM A36 etc.				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	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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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 using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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