



DOCUMENT:	MILLING GUIDES
PREPARED FOR:	ALIEN INSIDERS
CLASSIFICATION:	TOP SECRET

THEY?



MILLING STRATEGY GUIDELINES

In an effort to get the best results out of your AlienTools, we have provided some general guidelines to go by when developing your milling strategy. Obviously these are guidelines for users with open CAM systems who can change these parameters; for users with closed systems we have developed our tools to best match the parameters already given by the machine manufacturer.

Keep in mind that the guides below are recommended maximums, meaning that if you already have a strategy that works for you that is more conservative than this then there is nothing you need to change. If your current strategy is more aggressive than the following guidelines it does not mean that the tool will not work, just that you may not get the full lifespan that the tool can achieve. You should, however, pay close attention to the strategy on tools with considerably longer Reach Lengths than your current tools. Our tools are designed to deliver the best milled results by getting into those hard-to-reach areas, so for these tools your strategy should not be far off from our recommendations.

If you have any questions or feedback to these guides please let us know...and happy milling!

-XXXX



ZIRCONIA MILLING STRATEGY GUIDES

Every zirconia is slightly different and depending on the pre-sintering levels by the manufacturer it will affect the hardness of the material. The easiest way to see this is in the shrinkage factor...the higher the number the softer the material is. This is why we have two different recommendations for zirconia depending on the hardness.

GENERAL NOTES:

- Normal Milling Direction: INSIDE to OUTSIDE
 Milling Direction on Crown Cavity: OUTSIDE to INSIDE
- Milling Direction for 0.3 and 0.6 mm Tools on Occlusial Grooves and Margins: OUTSIDE TO INSIDE
 Optional for 1 mm Tools on Margins: 15 mm/sec Feed Rate, 0.05 Depth Step, Direction OUTISDE TO INSIDE

FOR HARD ZIRCONIA (SHRINKAGE FACTOR <1.235)

CUTTING DIAMETER	CUTTING GEOMETRY	NR. OF FLUTES	SPINDLE SPEED	FEED RATE	DEPTH STEP	SIDE STEP (OVERLAP %)	OFFSET
2.5 mm	BALL	2	20,000 rpm	25 mm/sec	0.5 mm	1.0 mm (60%)	0.05 mm
	YOUR ADJUSTE	D VALUES ->					
2.0 mm	BALL	2	22,000 rpm	25 mm/sec	0.5 mm	0.9 mm (55%)	0 mm
	YOUR ADJUSTE	D VALUES ->					
1.0 mm	BALL	2	25,000 rpm	20 mm/sec*	0.1-0.2 mm*	0.1 mm (90%)	0 mm
	YOUR ADJUSTE	D VALUES ->					
0.6 mm	BALL	2	27,000 rpm	15 mm/sec**	0.1 mm**	0.08 mm (87%)	0 mm
	YOUR ADJUSTE	D VALUES ->					
0.5 mm	BALL	2	27,000 rpm	15 mm/sec	0.08 mm	0.08 mm (84%)	0 mm
	YOUR ADJUSTE	D VALUES ->					
0.3 mm	BALL	2	29,000 rpm	10 mm/sec	0.05-0.07 mm	0.05 mm (83%)	0 mm

*For 1mm tools with the longer 20mm Reach Length (RL), reduce the Feed Rate and Depth Step approximately 20% to avoid tool breakage. **For 0.6mm tools with the longer 10mm Reach Length (RL), reduce the Feedrate and Depth Step approximately 10-15% to avoid tool breakage.



ZIRCONIA MILLING STRATEGY GUIDES

Every zirconia is slightly different and depending on the pre-sintering levels by the manufacturer it will affect the hardness of the material. The easiest way to see this is in the shrinkage factor...the higher the number the softer the material is. This is why we have two different recommendations for zirconia depending on the hardness.

GENERAL NOTES:

- Normal Milling Direction: INSIDE to OUTSIDE
 Milling Direction on Crown Cavity: OUTSIDE to INSIDE
- Milling Direction for 0.3 and 0.6 mm Tools on Occlusial Grooves and Margins: OUTSIDE TO INSIDE
 Optional for 1 mm Tools on Margins: 15 mm/sec Feed Rate, 0.05 Depth Step, Direction OUTISDE TO INSIDE

FOR SOFTER ZIRCONIA (SHRINKAGE FACTOR >1.235)

CUTTING	CUTTING	NR. OF	SPINDLE SPEED	FEED RATE	DEPTH STEP	SIDE STEP	OFFSET
DIAMETER	GEOMETRY	FLUTES				(OVERLAP %)	
2.5 mm	BALL	2	21,000 rpm	30 mm/sec	0.6 mm	1.1 mm (56%)	0.1 mm
	YOUR ADJUSTE	D VALUES ->					
2.0 mm	BALL	2	23,000 rpm	30 mm/sec	0.6 mm	0.95 mm (53%)	0 mm
1.0 mm	BALL	2	26,000 rpm	25 mm/sec*	0.1-0.2 mm*	0.1 mm (90%)	0 mm
0.6 mm	BALL	2	28,000 rpm	20 mm/sec**	0.1 mm**	0.08 mm (87%)	0 mm
0.5 mm	BALL	2	28,000 rpm	20 mm/sec	0.08 mm	0.08 mm (84%)	0 mm
0.3 mm	BALL	2	30,000 rpm	15 mm/sec	0.05-0.07 mm	0.05 mm (83%)	0 mm

*For 1mm tools with the longer 20mm Reach Length (RL), reduce the Feed Rate and Depth Step approximately 20% to avoid tool breakage. **For 0.6mm tools with the longer 10mm Reach Length (RL), reduce the Feedrate and Depth Step approximately 10-15% to avoid tool breakage.





CoCr MILLING STRATEGY GUIDES

GENERAL NOTES:

- Normal Milling Direction: INSIDE to OUTSIDE
 Milling Direction on Crown Cavity: OUTSIDE to INSIDE
 Milling Direction for 0.6 mm Tools on Occlusial Grooves and Margins: OUTSIDE TO INSIDE

WARNINGS:

- Values, especially by Feed Rate and Depth Step, rely heavily on the machine model
 Maximum values only to be used with machines that have very little vibration and strong spidles
 Especially by 'harder' CoCr blanks (tungsten > 3%) the Spindle Speed, Feed Rate, and Depth Step should all be reduced

CUTTING DIAMETER	INDICATION	CUTTING GEOMETRY	NR. OF FLUTES	SPINDLE SPEED	FEED RATE	DEPTH STEP	SIDE STEP (OVERLAP %)	OFFSET
3.0 mm	HI-SPEED ROUGHING	TORIC (BULL)	3	10,200 rpm	30 mm/sec	0.20-0.25 mm	1.2 mm (60%)	0.05 mm
3.0 mm	ROUGHING	BALL	2	13,700 rpm	20-25 mm/sec	0.12-0.24 mm	1.2 mm (60%)	0.05 mm
2.0 mm	HI-SPEED ROUGHING	TORIC (BULL)	3	14,500 rpm	28-30 mm/sec	0.12-0.20 mm	0.7 mm (65%)	0.03 mm
		YOUR ADJUSTE	D VALUES ->					
2.0 mm	ROUGHING	BALL	2	15,900 rpm	20-23 mm/sec	0.15-0.20 mm	0.9 mm (55%)	0.03 mm
		YOUR ADJUSTE	D VALUES ->					
2.0 mm	FINISHING	TORIC (BULL)	4	16,000 rpm	26-28 mm/sec	0.1-0.12 mm	0.7 mm (65%)	0.03 mm
		YOUR ADJUSTE	D VALUES ->					
1.5 mm	FINISHING	TORIC (BULL)	4	21,200 rpm	11 mm/sec	0.03 mm	0.3 mm (80%)	0 mm
1.5 mm	FINISHING	BALL	2	20,500 rpm	15-20 mm/sec	0.08-0.12 mm	0.15 mm (90%)	0 mm
1.0 mm	FINISHING	BALL	2	23,200 rpm	15-18 mm/sec	0.05-0.07 mm	0.05 mm (83%)	0 mm
		YOUR ADJUSTE	D VALUES ->					
0.6 mm	FINISHING	BALL	2	25,000 rpm	15-16 mm/sec	0.05 mm	0.04 mm (93%)	0 mm
		YOUR ADJUSTE	D VALUES ->					

NOTES:

COBALT CHROME



TITANIUM MILLING STRATEGY GUIDES

GENERAL NOTES:

- Normal Milling Direction: INSIDE to OUTSIDE
 Milling Direction on Crown Cavity: OUTSIDE to INSIDE
 Milling Direction for 0.6 mm Tools on Occlusial Grooves and Margins: OUTSIDE TO INSIDE

WARNINGS:

- Values, especially by Feed Rate and Depth Step, rely heavily on the machine model
 Maximum values only to be used with machines that have very little vibration and strong spidles

CUTTING DIAMETER	INDICATION	CUTTING GEOMETRY	NR. OF FLUTES	SPINDLE SPEED	FEED RATE	DEPTH STEP	SIDE STEP (OVERLAP %)	OFFSET
3.0 mm	ROUGHING	BALL	2	15,500 rpm	15 mm/sec	0.25 mm	0.7 mm (77%)	0.1 mm
2.0 mm	ROUGHING	BALL	2	17,500 rpm	11 mm/sec	0.15 mm	0.45 mm (78%)	0.05 mm
1.0 mm	FINISHING	BALL	2	20,000 rpm	6 mm/sec	0.05 mm	0.05 mm (83%)	0 mm

NOTES:

TITANIUM



PMMA MILLING STRATEGY GUIDES

GENERAL NOTES:

Normal Milling Direction: INSIDE to OUTSIDE
 Milling Direction on Crown Cavity: OUTSIDE to INSIDE
 Milling Direction for 0.5mm and 0.6 mm Tools on Occlusial Grooves and Margins: OUTSIDE TO INSIDE

CUTTING DIAMETER	CUTTING GEOMETRY	NR. OF FLUTES	SPINDLE SPEED	FEED RATE	DEPTH STEP	SIDE STEP (OVERLAP %)	OFFSET
4.0 mm	FLAT	1	16,000 rpm	25 mm/sec	1.5 mm	2.5 mm (38%)	0.1 mm
	YOUR ADJUSTE	D VALUES ->					
2.5 mm	BALL	2	12,000 rpm	32 mm/sec	1 mm	1 mm (60%)	0.1 mm
2.0 mm	BALL	2	13,000 rpm	30 mm/sec	1 mm	0.8 mm (60%)	0.05 mm
	YOUR ADJUSTE	D VALUES ->					
1.0 mm	BALL	2	17,000 rpm	25 mm/sec	0.10-0.15 mm	0.1 mm (90%)	0 mm
0.6 mm	BALL	2	18,000 rpm	20 mm/sec	0.08 mm	0.08 mm (87%)	0 mm
0.5 mm	BALL	2	18,000 rpm	20 mm/sec	0.08 mm	0.08 mm (84%)	0 mm



PEEK MILLING STRATEGY GUIDES

GENERAL NOTES:

- Normal Milling Direction: INSIDE to OUTSIDE - Milling Direction on Crown Cavity: OUTSIDE to INSIDE - Milling Direction for 0.5mm and 0.6 mm Tools on Occlusial Grooves and Margins: OUTSIDE TO INSIDE

CUTTING DIAMETER	CUTTING GEOMETRY	NR. OF FLUTES	SPINDLE SPEED	FEED RATE	DEPTH STEP	SIDE STEP (OVERLAP %)	OFFSET
4.0 mm	FLAT	1	16,000 rpm	25 mm/sec	1.5 mm	2.5 mm (38%)	0.1 mm
2.5 mm	BALL	2	13,000 rpm	32 mm/sec	1 mm	0.9 mm (64%)	0.05 mm
2.0 mm	BALL	2	16,000 rpm	30 mm/sec	0.5 mm	0.7 mm (65%)	0.05 mm
1.0 mm	BALL	2	22,000 rpm	25 mm/sec	0.07-0.1 mm	0.07 mm (93%)	0 mm
0.6 mm	BALL	2	23,000 rpm	20 mm/sec	0.05 mm	0.05 mm (92%)	0 mm
0.5 mm	BALL	2	23,000 rpm	20 mm/sec	0.05 mm	0.05 mm (90%)	0 mm
	YOUR ADJUSTE	D VALUES ->					



The following pages are where you can add any custom strategies that you've worked out. Have fun exploring and always MillMoreUnits.

MATERIAL:

ARTICLE NUMBER	INDICATION	CUTTING	CUTTING	IR. OF SPINDLE SPEED	FEED RATE
		CUTTING DIAMETER	CUTTING N GEOMETRY F	IR. OF SPINDLE SPEED LUTES	
NOTES:					



DEPTH STEP	SIDE STEP

OFFSET

ALIENTOOLS MILLING STRATEGY GUIDES MSGEN02 PAGE 19 OF 28

MATERIAL:

ARTICLE NUMBER	INDICATION	CUTTING DIAMETER	CUTTING GEOMETRY	NR. OF FLUTES	SPINDLE SPEED	FEED RATE
		DIAMETER	GEOMETRI	FLOTES		
NOTES:						



SIDE STEP (OVERLAP %) DEPTH STEP OFFSET

ALIENTOOLS MILLING STRATEGY GUIDES MSGEN02 PAGE 21 OF 28

MATERIAL:

ARTICLE NUMBER	INDICATION	CUTTING DIAMETER	CUTTING GEOMETRY	NR. OF FLUTES	SPINDLE SPEED	FEED RATE
		DIAMETER	GEOMETRI	FLOTES		
NOTES:						



SIDE STEP (OVERLAP %) DEPTH STEP OFFSET

ALIENTOOLS MILLING STRATEGY GUIDES MSGEN02 PAGE 23 OF 28

MATERIAL:

Į							
	ARTICLE NUMBER	INDICATION	CUTTING DIAMETER	CUTTING GEOMETRY	NR. OF FLUTES	SPINDLE SPEED	FEED RATE
	NOTES:						

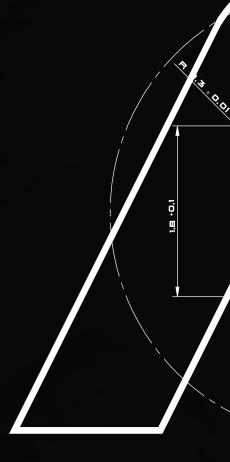


OFFSET

SIDE STEP (OVERLAP %) DEPTH STEP

ALIENTOOLS MILLING STRATEGY GUIDES MSGEN02 PAGE 25 OF 28







ALIEN TOOLS GMBH PLAUENER STR. 163-165 GEB. 5, AUFG. E, 3. OG 13053, BERLIN, GERMANY PHONE: +49 30 549 09787 INFO@ALIEN-TOOLS.COM ALIEN-TOOLS.COM



