Cutter Manufacturer, Type, and Part Number		Job type, owner, date, etc.		New spindle tests with Aluminum, @Julien, 2019-07-??	
Kennametal, ABDF MaxiMet, ABDF0500J2ARC		Spindle Manufacturer, Type, and Part Number		CNC Machine	Shapeoko with HDZ
Imperial/Inch Cutter Information		**G-Penny Machine, H_2O Cooled, BST2.2-80-24K**		**Router**	
Cutter Material (Carbide, HSS, or Cobalt)	Carbide	**Constant Torque Type HF Spindle (Most Chinese)**		Rated Input Voltage (Volts)	
Cutter Diameter (D)	0.5	Rated kW (@ Max. Speed)	2.2	Rated Input Current (Amps)	6.5
Cutter Length	1.25	Rated (Maximum) Speed (RPM)	24000	Rated Input Power (Watts)	
# of Cutter Flutes/Teeth	2	Max Power (HP) (**FROM SFM**)	1.54	Efficiency	50%
Shank Diameter	0.5	Max Power (HP) (**FROM RPM**)	2.95	Rated Output Power (HP)	
Overall Stickout	1.3			Rated (Maximum?) Speed (RPM)	30000
Required Inches Per Tooth - IPT @ WOC	0.00100	**Material (from K Factor Sheets)**	**Use This K Factor**	Max Power (HP) (**FROM SFM**)?	
IPT for Feed Rate Calculation (@WOC=1/2 D)	0.0013	Material / K Factor		Max Power (HP) (**FROM RPM**)?	
Young's Modulus	8.70E+07	6061-T6 Aluminum / 3.34	3.34		
Maximum Acceptable Deflection (in)	0.0010	**CNC Machine Rigidity or Feed Drive Limited Maximum Machine Force (lbf)**			18

Milling Spindle Speeds (RPM) & Feed Rates (IPM) - From IPT @ WOC or *Manual IPM* Entry

SFM Input Option		***OR***	***RPM* Input Option**	
SFM	1,640	Don't exceed cutter maximum RPM/SFM! Feed Rate and Allowable Force are Limited by Machine and Workpiece Holding Techniques	SFM	3,142
Spindle RPM	12,529		*Spindle RPM*	24,000
IPT Feed Rate (IPM)	31.3		IPT Feed Rate (IPM)	60.0
Manual IPM			Manual IPM	
IPT at Feed Rate (IPM)	0.0013		IPT at Feed Rate (IPM)	0.0013

Use climb milling to minimize reduce rubbing. "Think thick to thin."

Higher speeds (RPMs) reduces force and cutter deflection, but requires higher feed rates (IPMs) to maintain Required Inches Per Tooth (IPT) chiploads. Using cutters with fewer flutes increases IPTs.

Speeds & Feeds: Depth of Cut, Width of Cut

	Minimum	Maximum	Fusion Adaptive	As Percentage of Diameter	Minimum	Maximum	Fusion Adaptive	In Inches	*Use these values*
Depth of Cut (DOC)	0%	300%	100%		0	1.5	0.5		*0.500*
Width of Cut (WOC)	5%	100%	20%		0.025	0.5	0.1		*0.100*

Material Removal Rate, Horsepower, Torque, Force, and Cutter Deflection Estimates

Feed Rate Value from IPT or Manual	*IPM*	DOC (in)	WOC (in)	MRR (in^3/min))	Power (HP_c)	Cutter Torque (in-lbf)	% Max Deflection	% Maximum Machine Force	% Spindle/Router Power Rating (HP)
For SFM Input Option	31.3	0.50	0.100	1.57	0.47	2.36	0.14%	52%	30%
For *RPM* Input Option	60.0			3.00	0.90	2.36	0.14%	52%	30%

Deflection can be reduced without decreasing MRR by increasing RPM and/or reducing cutter stickout, using a carbide cutter, increasing diameter of cutter/shank

Deflection, Force, and **Power** can be reduced at the expense of MRR by decreasing WOC, DOC, and/or IPM (at the expense of IPT)