

CUTTING PARAMETERS - GETTING STARTED REFERENCE GUIDE

LANGMUIR SYSTEMS MR-1 CNC MILLING MACHINE (REV. 11/30/2022)

NON-FERROUS MATERIAL <i>Includes: Aluminum, Brass, Bronze, Copper, Plastics Excludes: Titanium Alloys</i>								
Cutting Tool Size	Cutting Tool Spec. (Recommended)	Spindle Speed (RPM)	Cutting Direction	Width of Cut [a.k.a Step Over or Optimal Load] (in, Maximum)	Depth of Cut (in, Maximum) [2]	Feed Rate (Inches per Minute [IPM]) [3]	Plunging	
Adaptive Clearing, Pocketing, Countouring, Boring, General Roughing	1/8 End Mill	2 Flutes, Carbide, High Helix Angle (45°), Variable Flute, Variable Pitch, DLC or ZRN Coated [1]	8000	CLIMB OR CONVENTIONAL	0.030	0.125	15-30	Helical Ramp, 1.8°, 40 IPM
	1/4 End Mill		8000		0.050	0.250	30-50	
	3/8 End Mill		8000		0.050	0.375	60-100	
	1/2 End Mill		8000		0.050	0.500	60-100	
Facing (Roughing)	1/8 End Mill	2 Flutes, Carbide, High Helix Angle (45°), Variable Flute, Variable Pitch, DLC or ZRN Coated [1]	8000	BOTH WAYS	0.070	0.030	15-30	N/A
	1/4 End Mill		8000		0.200	0.050	30-50	
	3/8 End Mill		8000		0.320	0.060	60-90	
	1/2 End Mill		8000		0.450	0.060	60-90	
	Langmuir Fly Cutter	Aluminum Cutting Inserts, Set to Smallest Diameter (-2.2")	1500	N/A	2.000	0.020	10-20	
Chamfering	Any 1/4 to 1/2 Chamfer Mill	2 Flute or 4 Flute Carbide	8000	CLIMB	0.005 to 0.060 Chamfer Size		10-20	N/A
Finishing Pass (Facing, Floors, and Side Walls)	1/4 End Mill	2 Flutes, High Helix Angle (45°), Variable Flute, Variable Pitch, DLC or ZRN Coated [1]	8000	CLIMB	Leave a maximum of 0.005" stock on floors and side walls for finishing. Finish side walls in one pass at full part depth if possible.		35	N/A
	3/8 End Mill		8000				35	
	1/2 End Mill		8000				35	
	Langmuir Fly Cutter	Set to Smallest Diameter (-2.2")	1500	N/A			10-15	
SOFTER FERROUS MATERIAL <i>Includes: Mild Steel, Tool Steel (annealed), Cast Iron Excludes: Stainless Alloys, Alloy Steel, Hardened Steel</i>								
Cutting Tool Size	Cutting Tool Spec. (Recommended)	Spindle Speed (RPM)	Cutting Direction	Width of Cut [a.k.a Step Over or Optimal Load] (in, Maximum)	Depth of Cut (in, Maximum) [2]	Feed Rate (Inches per Minute [IPM]) [3]	Plunging	
Adaptive Clearing, Pocketing, Countouring, Boring, General Roughing	1/8 End Mill	4 Flutes, Carbide, Variable Flute, Variable Pitch, TiAlN Coated [4]	8000	CLIMB	0.020	0.075	15-30	Helical Ramp, 1.8°, 20 IPM
	1/4 End Mill		8000		0.030	0.150	20-50	
	3/8 End Mill		7200		0.050	0.200	30-70	
	1/2 End Mill		5300		0.050	0.250	25-50	
Facing (Roughing)	1/8 End Mill	4 Flutes, Carbide, Variable Flute, Variable Pitch, TiAlN Coated [4]	8000	BOTH WAYS	0.070	0.015	15-30	N/A
	1/4 End Mill		8000		0.200	0.025	20-50	
	3/8 End Mill		7200		0.320	0.030	30-70	
	1/2 End Mill		5300		0.450	0.030	25-50	
Chamfering	Any 1/4 to 1/2 Chamfer Mill	2 Flute or 4 Flute Carbide	8000	CLIMB	0.005 to 0.060 Chamfer Size		10-20	N/A
Finishing Pass (Facing, Floors and Side Walls)	1/4 End Mill	4 Flutes, Carbide, Variable Flute, Variable Pitch, TiAlN Coated [4]	8000	CLIMB	Leave a maximum of 0.005" stock on floors and side walls for finishing. Finish side walls in one pass at full part depth if possible.		30	N/A
	3/8 End Mill		7200				30	
	1/2 End Mill		5300				30	
HARD MATERIALS <i>Includes: Stainless Alloys, Alloy Steel, Hardened Steel, Titanium Alloys</i>								
Cutting Tool Size	Cutting Tool Spec. (Recommended)	Spindle Speed (RPM)	Cutting Direction	Width of Cut [a.k.a Step Over or Optimal Load] (in, Maximum)	Depth of Cut (in, Maximum) [2]	Feed Rate (Inches per Minute [IPM]) [3]	Plunging	
Adaptive Clearing, Pocketing, Countouring, Boring, General Roughing	1/8 End Mill	4 Flutes, Carbide, Variable Flute, Variable Pitch, TiAlN Coated [4]	8000	CLIMB	0.020	0.050	10-20	Helical Ramp, 1.8°, 10 IPM
	1/4 End Mill		5000		0.030	0.070	10-20	
	3/8 End Mill		3700		0.040	0.100	10-30	
Facing (Roughing)	1/8 End Mill	4 Flutes, Carbide, Variable Flute, Variable Pitch, TiAlN Coated [4]	8000	CLIMB	0.070	0.010	10-20	N/A
	1/4 End Mill		5000		0.200	0.015	10-20	
	3/8 End Mill		7200		0.320	0.020	10-30	
Chamfering	Any 1/4 to 1/2 Chamfer Mill	2 Flute or 4 Flute Carbide	8000	CLIMB	0.005 to 0.060 Chamfer Size		10-15	N/A
Finishing Pass (Facing, Floors, and Side Walls)	1/8 End Mill	4 Flutes, Carbide, Variable Flute, Variable Pitch, TiAlN Coated [4]	8000	CLIMB	Leave a maximum of 0.005" stock on floors and side walls for finishing. Finish side walls in one pass at full part depth if possible.		10	N/A
	1/4 End Mill		5000				15	
	3/8 End Mill		3700				15	

[1] We STRONGLY recommend using this type of tooling on MR-1 for best cutting results. Some examples of this approved tooling includes Langmuir Systems 2 Flute End Mills, Lakeshore Carbide (Part #'s 320014X, 320038X, 320012X, etc.), Shars Tool Company (Part #'s 415-0193, 415-0195, 415-0196, etc.), YG-1 ALU Power End Mill Series (3 Flute), McMaster Carr (Part #'s 8829A19, 8829A31, etc.), or appropriate equivalents.

[2] For best results, we recommend not exceeding the listed Depth of Cut for a given roughing pass. If you need to cut deeper, use the 'Multiple Depths' feature in your CAM programming software to limit the maximum roughing pass depth to the max value listed in this table. It will then use multiple roughing depths to achieve the cutting depth needed.

[3] If you encounter tool chatter when using a slower feed rate, we recommend using the Overrides Menu in CutControl to increase the feed rate and/or decrease the Spindle Speed RPM until the chatter subsides.

[4] We STRONGLY recommend using this type of tooling on MR-1 for best cutting results. Some examples of this approved tooling includes Langmuir Systems 4 Flute End Mills and Roughing End Mills, Lakeshore Carbide (Part #'s 18MTMX, 14MTMX, 38MTMX, 12MTMX, etc.), Shars Tool Company (Part #'s 416-2930, 416-2928, 416-2931, etc.), McMaster Carr (Part #'s 8745A23, 8745A11, 8745A648, 8745A14 etc.), or appropriate equivalents.

DRILLING PARAMETERS - GETTING STARTED REFERENCE GUIDE

2 Flute High Speed Steel (HSS) Twist Drill

NON-FERROUS MATERIAL <i>Includes: Aluminum, Brass, Bronze, Copper, Plastics Excludes: Titanium Alloys</i>						
Drill Diameter (in)	Spindle RPM	Plunge Feed Rate (IPM)	Drill Depth up to 3X Diameter Cycle: Chip Breaking - Partial Retract		Depth Greater Than 3X Diameter Cycle: Deep Drilling - Full Retract	
			Pecking Depth (in)	Accumulated Pecking Depth (in)	Pecking Depth (in)	
0.063	8000	8.00	0.03	0.25	0.03	
0.078	8000	8.00	0.03	0.25	0.03	
0.094	8000	8.00	0.03	0.25	0.03	
0.109	8000	8.00	0.03	0.25	0.03	
0.125	8000	10.50	0.03	0.35	0.03	
0.141	8000	10.50	0.03	0.35	0.03	
0.156	7325	9.50	0.03	0.35	0.03	
0.172	6675	8.75	0.03	0.35	0.03	
0.188	6100	8.00	0.04	0.50	0.04	

0.203	5650	8.50	0.04	0.50	0.04
0.219	5225	7.75	0.04	0.50	0.04
0.234	4900	7.25	0.04	0.50	0.04
0.250	4575	6.75	0.05	0.50	0.05
0.266	3950	6.75	0.05	0.50	0.05
0.281	3725	6.25	0.05	0.50	0.05
0.297	3550	6.00	0.05	0.50	0.05
0.313	3050	6.00	0.06	0.50	0.06
0.328	2900	5.75	0.06	0.50	0.06
0.344	2725	5.50	0.06	0.50	0.06
0.359	2500	5.00	0.06	0.50	0.06
0.375	2300	4.50	0.05	0.50	0.05
0.391	1950	4.50	0.05	0.25	0.05
0.406	1400	3.25	0.05	0.25	0.05
0.422	1175	2.75	0.05	0.25	0.05
0.438	875	2.00	0.04	0.25	0.04
0.453	850	2.00	0.04	0.25	0.04
0.469	825	2.00	0.04	0.25	0.04
0.484	800	2.00	0.04	0.25	0.04
0.500	775	2.00	0.04	0.25	0.04

SOFTER FERROUS MATERIAL Includes: Mild Steel, Tool Steel (annealed), Cast Iron Excludes: Stainless Alloys, Alloy Steel, Hardened Steel					
Drill Diameter (in)	Spindle RPM	Plunge Feed Rate (IPM)	Drill Depth up to 3X Diameter Cycle: Chip Breaking - Partial Retract		Drill Depth Beyond 3X Diameter Cycle: Deep Drilling - Full Retract
			Pecking Depth (in)	Accumulated Pecking Depth (in)	Pecking Depth (in)
0.063	6100	4.25	0.03	0.25	0.03
0.078	4900	3.50	0.03	0.25	0.03
0.094	4075	2.75	0.03	0.25	0.03
0.109	3500	2.50	0.03	0.25	0.03
0.125	3050	3.00	0.03	0.35	0.03
0.141	2725	3.75	0.03	0.35	0.03
0.156	2450	4.00	0.03	0.35	0.03
0.172	2225	4.00	0.03	0.35	0.03
0.188	2025	4.00	0.04	0.50	0.04
0.203	1875	4.25	0.04	0.50	0.04
0.219	1750	4.25	0.04	0.50	0.04
0.234	1625	4.25	0.04	0.50	0.04
0.250	1525	4.50	0.04	0.50	0.04
0.266	1450	4.25	0.04	0.50	0.04
0.281	1225	3.75	0.04	0.50	0.04
0.297	1150	3.50	0.04	0.50	0.04
0.313	1100	3.25	0.04	0.50	0.04
0.328	1000	3.00	0.04	0.50	0.04
0.344	775	2.50	0.04	0.50	0.04
0.359	650	2.00	0.04	0.50	0.04
0.375	500	1.75	0.04	0.50	0.04
0.391	500	1.50	0.03	0.25	0.03
0.406	475	1.50	0.03	0.25	0.03
0.422	450	1.25	0.03	0.25	0.03
0.438	425	1.00	0.03	0.25	0.03
0.453	425	1.00	0.03	0.25	0.03
0.469	400	1.00	0.03	0.25	0.03
0.484	400	1.00	0.03	0.25	0.03
0.500	375	1.00	0.03	0.25	0.03