Operating Guidelines

Series 45B, 45C, 45D, 45J, 45M, 45N, 45P, 45R, 45U, 45V, 45X, 46B, 46C, 46D, 46J, 47B, 47C, 47D, 47J, 47N, 47Z, 48C, 48D, 48J, 48N, 48U, 49D, 49J

Workpiece Material		Cutting speed vc ft/min				Feed rate per tooth fz in/min			
		Ball nose mill		End mill		Ball nose mill		End mill	
	DC in	Roughing copy milling	Finishing copy milling	Full slot	Shoulder	Roughing copy milling	Finishing copy milling	Full slot	Shoulder
Unalloyed steel P	.125-.250	525-725	725-975	300-600	450-800	.0015 - .0030	.0007 - .0020	.0006 - .0010	.0018 - .0030
	.312-.500	450-650	725-975	300-600	450-800	.0060 - .0080	.0040 - .0060	.0025 -.0040	.0040 - .0055
	.625-1.00	450-650	725-975	300-600	450-800	.0080 - .0100	.0060 - .0080	.0030 - .0040	.0060 - .0090
High Carbon steel P	.125-.250	400-600	325-600	250-500	325-725	.0013 - .0030	.0007 - .0020	.0006 - .0018	.0007 - .0025
	.312-.500	400-600	600-850	300-600	400-650	.0040 - .0070	.0030 - .0040	.0020 -.0030	.0030 - .0040
	.625-1.00	400-600	600-850	300-600	400-650	.0065 - .0090	.0040 - .0080	.0025 - .0040	.0040 - .0080
Alloyed / Tool steel P	.125-.250	325-525	500-800	250-450	325-525	.0018 - .0030	.0007 - .0020	.0006 - .0018	.0007 - .0020
	.312-.500	325-525	500-800	250-450	325-600	.0030 - .0055	.0028 - .0040	.0015 -.0028	.0028 - .0040
	.625-1.00	325-525	500-800	250-450	325-600	.0055 - .0080	.0040 - .0070	.0020 - .0030	.0040 - .0070
Stainless steel M	.125-.250	250-450	300-600	165-300	250-450	.0007 - .0015	.0007 - .0015	.0040 - .0007	.0040 - .0013
	.312-.500	250-450	300-600	165-300	250-450	.0030 - .0040	.0030 - .0040	.0015 - .0025	.0028 - .0040
	.625-1.00	250-450	300-600	165-300	250-450	.0040 - .0080	.0040 - .0080	.0025 - .0040	.0040 - .0080
Gray cast iron K	.125-.250	500-750	700-950	325-525	500-975	.0015 - .0030	.0007 - .0020	.0006 - .0010	.0018 - .0030
	.312-.500	500-750	700-950	325-525	500-900	.0060 - .0080	.0040 - .0060	.0025 -.0040	.0040 - .0055
	.625-1.00	500-750	700-950	250-550	500-900	.0080 - .0100	.0060 - .0080	.0030 - .0040	.0060 - .0090
Nodular K	.125-.250	400-650	600-850	250-550	400-650	.0013 - .0030	.0007 - .0020	.0006 - .0018	.0007 - .0025
	.312-.500	400-650	600-850	600-850	400-650	.0040 - .0070	.0030 - .0040	.0020 -.0030	.0030 - .0040
	.625-1.00	400-650	600-850	250-550	400-650	.0065 - .0090	.0040 - .0080	.0025 - .0040	.0040 - .0080
Aluminum N	.125-.250	825-2500	825-2500	825-2500	825-2500	.0015 - .0030	.0010 - .0025	.0007 - .0015	.0010 - .0030
	.312-.500	2500-3500	3000-5000	2500-3500	3000-5000	.0040 - .0070	.0040 - .0070	.0035 - .0040	.0040 - .0070
	.625-1.00	2500-3500	3000-5000	2500-3500	5000-6500	.0080 - .0100	.0060 - .0090	.0060 - .0070	.0070 - .0090
Plastics N	.125-.250	500-975	650-1300	400-650	650-1300	.0007 - .0015	.0007 - .0015	.0040 - .0018	.0070 - .0015
	.312-.500	500-975	650-1300	400-650	650-1300	.0030 - .0040	.0030 - .0040	.0020 - .0030	.0028 - .0040
	.625-1.00	500-975	650-1300	400-650	650-1300	.0040 - .0080	.0040 - .0080	.0028 - .0040	.0040 - .0080
Super alloys S	.125-.250	65-165	100-225	65-165	100-200	.0006 - .0010	.0007 - .0015	.0040 - .0006	.0040 - .0010
	.312-.500	65-165	100-225	65-165	100-200	.0020 - .0030	.0030 - .0040	.0010 - .0020	.0020 - .0040
	.625-1.00	65-165	100-225	65-165	100-200	.0030 - .0060	.0040 - .0080	.0020 - .0030	.0040 - .0070
Hardened steel 48 - 54 HRC	.125-.250	130-225	250-650	130-325	200-400	.0018 - .0030	.0007 - .0020	.0006 - .0018	.0007 - .0020
	.312-.500	130-225	250-650	130-325	200-400	.0030 - .0055	.0028 - .0040	.0015 -.0028	.0028 - .0040
	.625-1.00	130-225	250-650	130-325	200-400	.0055 - .0080	.0040 - .0070	.0020 - .0030	.0040 - .0070
Hardened steel 54 - 63 HRC	.125-.250	100-165	250-650	65-165	150-250	.0007 - .0025	.0007 - .0015	.0040 - .0007	.0040 - .0015
	.312-.500	100-165	250-650	65-200	150-250	.0025 - .0040	.0025 - .0030	.0010 -.0020	.0020 - .0030
	.625-1.00	100-165	250-650	65-200	150-250	.0040 - .0070	.0030 - .0040	.0015 - .0028	.0030 - .0060
Hardened steel > 63 HRC	.125-.250	65-165	100-350	65-100	100-200	.0006 - .0015	.0007 - .0010	.0040 - .0040	.0040 - .0010
	.312-.500	65-165	100-350	65-130	100-200	.0015 - .0040	.0015 - .0028	.0007 -.0015	.0015 - .0025
	.625-1.00	65-165	100-350	65-130	100-200	.0040 - .0060	.0028 - .0040	.0010 - .0025	.0025 - .0060

Workpiece Material		Semifinish Cutting depth ap recomm. for		Cutting width			
	DC in	Ball nose mill in	End mill in	Recommended ae %			
Unalloyed steel P	.125-.250	.1 x D	1.2 x D	40%			
	.312-.500	.1 x D	1.2 x D	40%			

P	.312-.500	.1 x D	1.2 x D	40%			
	.625-1.00	.1 x D	1.2 x D	40%			
High Carbon steel P	.125-.250	.08 x D	.8 x D	30%			
	.312-.500	.08 x D	.8 x D	30%			
	.625-1.00	.08 x D	.8 x D	30%			
Alloyed / Tool steel P	.125-.250	.06 x D	.8 x D	25%			
	.312-.500	.06 x D	.8 x D	25%			
	.625-1.00	.06 x D	.8 x D	25%			
Stainless steel M	.125-.250	.08 x D	.8 x D	30%			
	.312-.500	.08 x D	.8 x D	30%			
	.625-1.00	.08 x D	.8 x D	30%			
Gray cast iron K	.125-.250	.08 x D	.8 x D	40%			
	.312-.500	.08 x D	.8 x D	40%			
	.625-1.00	.08 x D	.8 x D	40%			
Nodular K	.125-.250	.08 x D	.8 x D	30%			
	.312-.500	.08 x D	.8 x D	30%			
	.625-1.00	.08 x D	.8 x D	30%			
Aluminum N	.125-.250	.4 x D	.3 x D	30%			
	.312-.500	.4 x D	.3 x D	30%			
	.625-1.00	.4 x D	.3 x D	30%			
Plastics N	.125-.250	.4 x D	1.0 x D	10%			
	.312-.500	.4 x D	1.0 x D	10%			
	.625-1.00	.4 x D	1.0 x D	10%			
Super alloys S	.125-.250	.4 x D	.5 x D	10%			
	.312-.500	.4 x D	.5 x D	10%			
	.625-1.00	.4 x D	.5 x D	10%			
Hardened steel 48 - 54 HRC	.125-.250	.06 x D	.8 x D	25%			
	.312-.500	.06 x D	.8 x D	25%			
	.625-1.00	.06 x D	.8 x D	25%			
Hardened steel 54 - 63 HRC	.125-.250	.05 x D	.7 x D	20%			
	.312-.500	.05 x D	.7 x D	20%			
	.625-1.00	.05 x D	.7 x D	20%			
Hardened steel > 63 HRC	.125-.250	.05 x D	.6 x D	10%			
	.312-.500	.05 x D	.6 x D	10%			
	.625-1.00	.05 x D	.6 x D	10%			

General Information:

Machining of aluminum and duroplastics with grade IN05S, any other materials with IN2005 / IN2006. Max. cutting depth of end mills is determined by cutting length.

Please consider the limitation of max. RPM of the machine.

Note: Feed and speed recommendations are starting operating parameters. They are only guidelines from which further optimization should take place. Operating parameters are influenced by many machining variables. These variables may cause for reductions in feeds and speed or dramatic increases. Additionally, DOC and WOC may need to be revised to optimize the tools performance.