

2018 GENERAL PURPOSE CATALOG



Premium Solid Carbide & Cobalt HSS End Mills, Drills, & Cutting Tools

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TECHNICAL INFORMATION

General Purpose Carbide End Mills

SERIES: General Purpose Carbide End Mills

MATERIAL		CONDITIONS		CUTTING DIAMETER							
				1/8"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
Under 32 HRC Over 32 HRC				CHIP PER TOOTH							
STAINLESS STEELS		ISO-M									
Precipitation 13-8, 15-5, 17-4PH	Slotting .5 x Dia.	110-200	80-115	0.0005	0.0010	0.0012	0.0014	0.0020	0.0025	0.0030	0.0040
	Profiling ≤ .5 x Dia.	110-200	80-115	0.0006	0.0012	0.0015	0.0018	0.0025	0.0031	0.0038	0.0050
Austenitic 302, 303, 304L, 316L	Slotting .5 x Dia.	150-275	80-180	0.0005	0.0011	0.0014	0.0016	0.0023	0.0029	0.0035	0.0046
	Profiling ≤ .5 x Dia.	150-275	80-180	0.0007	0.0014	0.0018	0.0021	0.0030	0.0038	0.0045	0.0060
Martensitic 403, 410, 416	Slotting .5 x Dia.	200-400	80-160	0.0005	0.0011	0.0014	0.0016	0.0023	0.0029	0.0035	0.0046
	Profiling ≤ .5 x Dia.	200-400	80-160	0.0007	0.0014	0.0018	0.0021	0.0030	0.0038	0.0045	0.0060
HIGH TEMP ALLOYS		ISO-S									
Cobalt Base Stellite, Haynes 25, 188, X-40, L-605	Slotting .5 x Dia.	60-125	60-125	0.0004	0.0007	0.0009	0.0011	0.0015	0.0019	0.0023	0.0030
	Profiling ≤ .5 x Dia.	60-125	60-125	0.0005	0.0010	0.0012	0.0014	0.0020	0.0025	0.0030	0.0040
Nickel Base Inconel 600, 625, 718, Nickel 200, 270, Invar, Monel 400, 405, K-Monel, PermaNickel 300, Incoly 600	Slotting .5 x Dia.	60-125	60-125	0.0004	0.0007	0.0009	0.0011	0.0015	0.0019	0.0023	0.0030
	Profiling ≤ .5 x Dia.	60-125	60-125	0.0005	0.0010	0.0012	0.0014	0.0020	0.0025	0.0030	0.0040
Iron Base Incoloy 800-802, Multimet N-155, Timken 16-26-6	Slotting .5 x Dia.	60-125	60-125	0.0004	0.0007	0.0009	0.0011	0.0015	0.0019	0.0023	0.0030
	Profiling ≤ .5 x Dia.	60-125	60-125	0.0005	0.0010	0.0012	0.0014	0.0020	0.0025	0.0030	0.0040
STEELS		ISO-P									
High Strength Steels 4140, 4340, 52100	Slotting .5 x Dia.	150-300	80-180	0.0005	0.0010	0.0012	0.0014	0.0020	0.0025	0.0030	0.004
	Profiling ≤ .5 x Dia.	150-300	80-180	0.0006	0.0010	0.0012	0.0018	0.0025	0.0031	0.0038	0.005
High Alloy Steels - Mold & Die A-2, P20, 01, 02, D2, H-13	Slotting .5 x Dia.	150-275	80-185	0.0005	0.0010	0.0012	0.0014	0.0020	0.0025	0.0030	0.004
	Profiling ≤ .5 x Dia.	150-275	80-185	0.0006	0.0010	0.0012	0.0018	0.0025	0.0031	0.0038	0.005
Medium Alloy Steels 200, 250, 300	Slotting .5 x Dia.	175-350	100-225	0.0005	0.0010	0.0012	0.0014	0.0020	0.0025	0.0030	0.004
	Profiling ≤ .5 x Dia.	175-350	100-225	0.0006	0.0010	0.0012	0.0018	0.0025	0.0031	0.0038	0.005
Low Alloy Steels-Maraging 10XX, 11XX, 13XX	Slotting .5 x Dia.	200-450	100-250	0.0006	0.0012	0.0015	0.0018	0.0025	0.0031	0.0038	0.005
	Profiling ≤ .5 x Dia.	200-450	100-250	0.0007	0.0014	0.0018	0.0021	0.0030	0.0038	0.0045	0.006
CAST IRONS		ISO-K									
Ductile Iron Ductile Cast Iron	Slotting .5 x Dia.	120-325	80-140	0.0005	0.0010	0.0012	0.0014	0.0020	0.0025	0.0030	0.0040
	Profiling ≤ .5 x Dia.	120-325	80-140	0.0006	0.0012	0.0015	0.0018	0.0025	0.0031	0.0038	0.0050
Cast Iron Grey Cast Iron	Slotting .5 x Dia.	250-425	125-285	0.0005	0.0010	0.0012	0.0014	0.0020	0.0025	0.0030	0.0040
	Profiling ≤ .5 x Dia.	250-425	125-285	0.0006	0.0012	0.0015	0.0018	0.0025	0.0031	0.0038	0.0050
TITANIUMS		ISO-S									
Titanium Alloys 6AL-4V, ASTM 1, 2, 3, 6AL-2S For 5553, decrease SFM and IPM by 25%	Slotting .5 x Dia.	140-200	90-145	0.0005	0.0010	0.0012	0.0014	0.0020	0.0025	0.0030	0.0040
	Profiling ≤ .5 x Dia.	140-200	90-145	0.0006	0.0012	0.0015	0.0018	0.0025	0.0031	0.0038	0.0050
ALUMINUM		ISO-N									
Aluminum Alloys 6061-T6, 7075	Slotting .5 x Dia.	600-1000	NA	0.0006	0.0012	0.0015	0.0018	0.003	0.005	0.006	0.0080
	Profiling ≤ .5 x Dia.	600-1000	NA	0.0007	0.0014	0.0018	0.0025	0.0035	0.006	0.0068	0.0100

All technical data provided are suggested starting points. They may be increased or decreased depending on machine condition, depth of cut, finish required, coolant, etc. Call our TECHNICAL SERVICE TEAM with questions.

TECHNICAL INFORMATION

Powdered Metal End Mills

SERIES: CCFPM, CCRPM, CCPM

MATERIAL	CONDITION	SFM		CUTTING DIAMETER						
				1/8-3/16"	1/4-3/8"	1/2-3/4"	7/8-1-1/8"	1-1/4-1-1/2"	1-5/8-2"	
		Uncoated	Coated	CHIP PER TOOTH						
STAINLESS STEELS ISO-M										
	Slotting	30-100	40-140	.0007- .0010	.0010- .0015	.0020- .0032	.0036-.0042	.0050-.0068	.0070- .0090	
	Heavy Profiling	30-100	40-140	.0008- .0013	.0015- .0020	.0022-.0032	.0034-.0047	.0052-.0072	.0073-.0097	
HIGH TEMP ALLOYS ISO-S										
	Slotting	15-50	20-65	.0005- .0007	.0008- .0011	.0015- .0019	.0019-.0027	.0030-.0040	.0043-.0054	
	Heavy Profiling	15-50	20-65	.0005- .0007	.0008- .0011	.0015-.0019	.0019-.0027	.0030-.0040	.0043-.0054	
STEELS ISO-P										
	Slotting	40-120	50-170	.0006-.0009	.0010- .0015	.0020- .0026	.0026-.0038	.0046-.0060	.0072-.0100	
	Heavy Profiling	40-120	50-170	.0007-.0013	.0013- .0019	.0023- .0030	.0032- .0042	.0048-.0062	.0076-.0120	
TITANIUM ISO-S										
	Slotting	40-85	50-115	.0007-.0010	.0013- .0019	.0025- .0037	.0039- .0042	.0043- .0050	.0052- .0060	
	Heavy Profiling	40-85	50-115	.0007-.0013	.0015- .0021	.0027- .0039	.0042- .0045	.0046- .0052	.0053- .0064	
ALUMINUM ISO-N										
	Slotting	450-650	550-775	.0010- .0020	.0024- .0038	.0042- .0070	.0072- .0110	.0115-.0190	.0195-.0220	
	Heavy Profiling	450-650	550-775	.0014- .0022	.0027- .0040	.0046- .0080	.0080- .0130	.0135- .021	.0220- .0300	

SERIES: VHPPM

MATERIAL	CONDITION	SFM	CUTTING DIAMETER					
			3/8"	1/2"	5/8"	3/4"	1"	1-1/4"
			CHIP PER TOOTH					
STAINLESS STEELS		ISO-M						
	Slotting	40-150	0.0016	0.0022	0.0026	0.0033	0.0046	0.0057
	Heavy Profiling	40-150	0.0020	0.0026	0.0031	0.0037	0.0052	0.0063
HIGH TEMP ALLOYS		ISO-S						
	Slotting	20-80	0.0011	0.0017	0.0019	0.0021	0.0028	0.0037
	Heavy Profiling	20-80	0.0011	0.0017	0.002	0.0022	0.0032	0.0041
STEELS		ISO-P						
	Slotting	50-200	0.0015	0.0021	0.0024	0.0027	0.0037	0.0047
	Heavy Profiling	50-200	0.0015	0.0021	0.0026	0.0030	0.0040	0.0052
TITANIUM		ISO-S						
	Slotting	50-115	0.0016	0.0021	0.0025	0.0030	0.0042	0.0054
	Heavy Profiling	50-115	0.0018	0.0024	0.0029	0.0034	0.0047	0.0059

All technical data provided are suggested starting points. They may be increased or decreased depending on machine condition, depth of cut, finish required, coolant, etc. Call our TECHNICAL SERVICE TEAM with questions.

SPEED & FEED INFORMATION

Roughing End Mills

SERIES: Cobalt/HSS Roughing End Mills

MATERIAL		CONDITIONS	START- ING SFM	START- ING SFM	CUTTING DIAMETER						
				1/4"	1/2"	3/4"	1.00"	1-1/4"	1-1/2"	2.00"	
			UNCOATED	COATED	CHIP PER TOOTH						
STAINLESS STEELS ISO-M											
Precipitation 13-8, 15-5, 17-4PH		Slotting Axial 1 x D	60-80	100-150	0.0015	0.0020	0.0026	0.0036	0.0046	0.0054	0.0070
		Heavy Profiling			0.0015	0.0020	0.0029	0.0040	0.0050	0.0060	0.0075
Austenitic 302, 303, 304L, 316L		Slotting 1 x D	60-80	100-150	0.0015	0.0020	0.003	0.0045	0.0056	0.0067	0.0090
		Heavy Profiling			0.0019	0.0025	0.0034	0.0049	0.0061	0.0074	0.0098
Martensitic 403, 410, 416		Slotting Axial 1 x D	60-100	100-170	0.0015	0.0020	0.0030	0.0045	0.0056	0.0067	0.0090
		Heavy Profiling			0.0019	0.0025	0.0034	0.0049	0.0061	0.0074	0.0098
HIGH TEMP ALLOYS ISO-S											
Cobalt Base Stellite, Haynes 25, 188, X-40, L-605		Slotting 1 x D	5-25	10-40	0.0011	0.0014	0.0018	0.0026	0.0033	0.0040	0.0053
		Heavy Profiling			0.0011	0.0014	0.0020	0.0029	0.0037	0.0045	0.0059
Nickel Base Inconel 600, 625, 718, Nickel 200, 270, Invar, Monel 400, 405, K-Monel, PermaNickel 300, Incoly 600		Slotting Axial 1 x D	10-20	20-40	0.0011	0.0014	0.0018	0.0026	0.0033	0.0040	0.0053
		Heavy Profiling			0.0011	0.0014	0.0020	0.0029	0.0037	0.0045	0.0059
Iron Base Incoloy 800-802, Multimet N-155, Timken 16-26-6		Slotting 1 x D	15-35	30-60	0.0011	0.0014	0.0018	0.0026	0.0033	0.0040	0.0053
		Heavy Profiling			0.0011	0.0014	0.0020	0.0029	0.0037	0.0045	0.0059
STEELS ISO-P											
High Strength Steels 4140, 4340, 52100		Slotting Axial 1 x D	50-80	100-150	0.0015	0.0020	0.0025	0.0035	0.0045	0.0053	0.0071
		Heavy Profiling			0.0015	0.0020	0.0028	0.0039	0.0050	0.0059	0.0079
High Alloy Steels - Mold & Die A-2, P20, 01, 02, D2, H-13		Slotting 1 x D	40-65	80-115	0.0015	0.0020	0.0025	0.0035	0.0045	0.0053	0.0071
		Heavy Profiling			0.0015	0.0020	0.0028	0.0039	0.005	0.0059	0.0079
Medium Alloy Steels 200, 250, 300		Slotting Axial 1 x D	60-120	100-180	0.0016	0.0023	0.0033	0.0050	0.0062	0.0075	0.0093
		Heavy Profiling			0.0020	0.0027	0.0040	0.0054	0.007	0.0082	0.0110
Low Alloy Steels-Maraging 10XX, 11XX, 13XX		Slotting 1 x D	70-150	130-200	0.0018	0.0025	0.0037	0.0053	0.0068	0.0080	0.0100
		Heavy Profiling			0.0022	0.0029	0.0042	0.0059	0.0074	0.0090	0.0115
CAST IRONS ISO-K											
Ductile Iron Ductile Cast Iron		Slotting Axial 1 x D	40-80	70-130	0.0015	0.0019	0.0030	0.0042	0.0056	0.0065	0.0087
		Heavy Profiling			0.0018	0.0024	0.0034	0.0048	0.0061	0.0073	0.0093
Cast Iron Grey Cast Iron		Slotting 1 x D	60-150	120-200	0.0014	0.0018	0.0024	0.0034	0.0044	0.0053	0.0070
		Heavy Profiling			0.0014	0.0018	0.0027	0.0038	0.0050	0.0058	0.0078
TITANIUMS ISO-S											
Titanium Alloys 6AL-4V, ASTM 1, 2, 3, 6AL-2S For 5553, decrease SFM and IPM by 25%		Slotting Axial 1 x D	50-90	75-150	0.0015	0.0020	0.0028	0.0040	0.0052	0.0062	0.0080
		Heavy Profiling			0.0017	0.0022	0.0032	0.0045	0.0057	0.0067	0.0090
ALUMINUM ISO-N											
Aluminum Alloys 6061-T6, 7075		Slotting Axial 1 x D	400-650	650-950	0.0024	0.0058	0.0067	0.0103	0.0112	0.0180	0.0210
		Heavy Profiling			0.0027	0.0058	0.0076	0.0110	0.0120	0.0205	0.0260
					For Light Periphery Profiling increase above profiling chip load by 25 - 35 %						

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SPEED & FEED INFORMATION

Cobalt & HSS End Mills

MATERIAL	HEAT-RESISTANT COBALT BASE ALLOYS, HIGH TENSILE STEELS (50-55 C)				HEAT-RESISTANT NICKEL BASE ALLOYS, HIGH STRENGTH STAINLESS STEELS, HIGH STRENGTH TITANIUM ALLOYS (46-50 C)				HEAT-RESISTANT FERRITIC BASE ALLOYS MEDIUM STRENGTH STAINLESS STEELS UNALLOYED TITANIUM TOOL STEELS (30-40 C)				MACHINE STEEL, HARD BRASS AND BRONZE, ELECTROLYTIC COPPER MILD STEEL FORGINGS (20-30 C)				CAST IRON, MILD STEEL, HALF-HARD BRASS AND BRONZE				BRASS, BRONZE, ALLOYED ALUMINUM, ABRASIVE PLASTICS				ALUMINUM, PLASTICS, WOOD							
	SPEED		FEED		SPEED		FEED		SPEED		FEED		SPEED		FEED		SPEED		FEED		SPEED		FEED		SPEED		FEED		SPEED		FEED	
	5-10 SFM	CHIP LOAD	10-15 SFM	CHIP LOAD	15-20 SFM	CHIP LOAD	20-40 SFM	CHIP LOAD	40-60 SFM	CHIP LOAD	60-80 SFM	CHIP LOAD	80-100 SFM	CHIP LOAD	100-200 SFM	CHIP LOAD	200-400 SFM	CHIP LOAD	400-600 SFM	CHIP LOAD	600-800 SFM	CHIP LOAD	800-1000 SFM	CHIP LOAD	1000-1200 SFM	CHIP LOAD	1200-1500 SFM	CHIP LOAD	1500-2000 SFM	CHIP LOAD		
DIA. OF END MILLS	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH	RPM	PER TOOTH		
1/16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
3/32	-	-	-	-	611-815	.0002-.0005	815-1629	.0002-.0005	1629-2750	.0002-.0005	2750-3259	.0002-.0005	3259-4071	.0002-.0005	4071-6111	.0002-.0005	6111-12222	.0002-.0005	12222-24444	.0002-.0005	24444-36667	.0002-.0005	36667-48888	.0002-.0005	48888-61111	.0002-.0005	61111-122222	.0002-.0005	122222-244444	.0002-.0005	244444-366666	.0002-.0005
1/8	-	-	-	-	456-611	.0002-.0005	611-1222	.0002-.0005	1222-1833	.0002-.0005	1833-2440	.0002-.0005	2440-3056	.0002-.0005	3056-4612	.0002-.0005	4612-6112	.0002-.0005	6112-9177	.0002-.0005	9177-12222	.0002-.0005	12222-1528	.0005-.002	1528-3056	.0005-.002	3056-4612	.0002-.0005	4612-6112	.0002-.0005	6112-9177	.0002-.0005
3/16	-	-	-	-	306-407	.0002-.0005	407-815	.0002-.0005	815-1222	.0002-.0005	1222-1625	.0002-.0005	1625-2037	.0002-.0005	2037-3074	.0002-.0005	3074-4711	.0002-.0005	4711-7111	.0002-.0005	7111-1222	.0005-.002	1222-1528	.0005-.002	1528-3056	.0005-.002	3056-4612	.0002-.0005	4612-6112	.0002-.0005	6112-9177	.0002-.0005
1/4	76-153	.0002-.001	153-230	.0002-.001	229-306	.0002-.001	306-611	.0002-.001	611-917	.0002-.001	917-1222	.0005-.002	1222-1528	.0005-.002	1528-2037	.0002-.0005	2037-3074	.0002-.0005	3074-4711	.0002-.0005	4711-7111	.0002-.0005	7111-1222	.0005-.002	1222-1528	.0005-.002	1528-3056	.0005-.002	3056-4612	.0002-.0005	4612-6112	.0002-.0005
5/16	61-122	.0002-.001	122-183	.0002-.001	183-244	.0002-.001	244-489	.0002-.001	489-733	.0002-.001	733-978	.0003-.002	978-1222	.0005-.002	1222-1528	.0005-.002	1528-2037	.0002-.0005	2037-3074	.0002-.0005	3074-4711	.0002-.0005	4711-7111	.0002-.0005	7111-1222	.0005-.002	1222-1528	.0005-.002	1528-3056	.0005-.002	3056-4612	.0002-.0005
3/8	51-102	.0002-.001	102-153	.0002-.001	153-203	.0002-.001	203-407	.0005-.002	406-611	.0005-.002	611-917	.0003-.002	917-1222	.0005-.002	1222-1528	.0005-.002	1528-2037	.0002-.0005	2037-3074	.0002-.0005	3074-4711	.0002-.0005	4711-7111	.0002-.0005	7111-1222	.0005-.002	1222-1528	.0005-.002	1528-3056	.0005-.002	3056-4612	.0002-.0005
7/16	44-88	.0005-.001	88-132	.0005-.001	131-175	.0005-.002	175-244	.0005-.002	244-367	.0005-.002	367-489	.001-.003	489-611	.001-.003	611-917	.001-.003	917-1222	.0005-.002	1222-1528	.0005-.002	1528-2037	.0002-.0005	2037-3074	.0002-.0005	3074-4711	.0002-.0005	4711-7111	.0002-.0005	7111-1222	.0005-.002	1222-1528	.0005-.002
1/2	38-76	.0005-.001	76-115	.0005-.001	115-153	.0005-.002	153-306	.0005-.003	306-458	.001-.003	458-611	.001-.003	611-917	.001-.003	917-1222	.0005-.002	1222-1528	.0005-.002	1528-2037	.0002-.0005	2037-3074	.0002-.0005	3074-4711	.0002-.0005	4711-7111	.0002-.0005	7111-1222	.0005-.002	1222-1528	.0005-.002	1528-3056	.0005-.002
9/16	34-68	.0005-.002	68-104	.0005-.002	104-136	.0005-.002	136-272	.0005-.003	272-412	.001-.003	412-543	.001-.004	543-678	.001-.004	678-811	.001-.004	811-1222	.0005-.002	1222-1528	.0005-.002	1528-2037	.0002-.0005	2037-3074	.0002-.0005	3074-4711	.0002-.0005	4711-7111	.0002-.0005	7111-1222	.0005-.002	1222-1528	.0005-.002
5/8	31-61	.0005-.002	61-92	.0005-.002	92-122	.0005-.002	122-244	.001-.004	244-367	.001-.004	367-489	.001-.004	489-611	.001-.004	611-917	.001-.004	917-1222	.0005-.002	1222-1528	.0005-.002	1528-2037	.0002-.0005	2037-3074	.0002-.0005	3074-4711	.0002-.0005	4711-7111	.0002-.0005	7111-1222	.0005-.002	1222-1528	.0005-.002
11/16	28-56	.0005-.002	56-84	.0005-.002	84-111	.0005-.002	111-222	.001-.004	222-337	.001-.004	337-444	.001-.004	444-555	.001-.004	555-1110	.0005-.004	1110-2222	.0005-.004	2222-3333	.0005-.004	3333-4444	.0005-.004	4444-5555	.0005-.004	5555-6666	.0005-.004	6666-7777	.0005-.004	7777-8888	.0005-.004	8888-9999	.0005-.004
3/4	26-51	.0005-.002	51-76	.0005-.002	76-102	.001-.004	102-203	.001-.004	203-306	.001-.004	306-407	.001-.004	407-509	.002-.006	509-1018	.001-.006	1018-2036	.001-.006	2036-3054	.001-.006	3054-4072	.001-.006	4072-5090	.002-.006	5090-6108	.001-.006	6108-7126	.002-.006	7126-8144	.002-.006	8144-9162	.002-.006
13/16	24-47	.001-.003	47-71	.001-.003	71-94	.001-.004	94-189	.001-.004	189-284	.001-.004	284-379	.002-.006	379-469	.002-.006	469-559	.002-.006	559-649	.002-.006	649-739	.002-.006	739-829	.002-.006	829-919	.002-.006	919-1009	.002-.006	1009-1109	.002-.006	1109-1209	.002-.006	1209-1309	.002-.006
7/8	22-44	.001-.003	44-65	.001-.003	65-87	.001-.004	87-175	.001-.004	175-262	.002-.006	262-349	.002-.006	349-436	.002-.006	436-523	.002-.006	523-610	.002-.006	610-697	.002-.006	697-784	.002-.006	784-871	.002-.006	871-958	.002-.006	958-1045	.002-.006	1045-1132	.002-.006	1132-1219	.002-.006
15/16	20-40	.001-.003	40-62	.001-.003	62-81	.001-.004	81-163	.001-.004	163-246	.002-.006	246-326	.002-.006	326-407	.002-.006	407-487	.002-.006	487-567	.002-.006	567-647	.002-.006	647-727	.002-.006	727-807	.002-.006	807-887	.002-.006	887-967	.002-.006	967-1047	.002-.006	1047-1127	.002-.006
1	19-38	.001-.003	38-58	.001-.003	58-76	.001-.004	76-153	.002-.006	153-229	.002-.006	229-306	.002-.006	306-382	.002-.006	382-458	.002-.006	458-534	.002-.006	534-610	.002-.006	610-686	.002-.006	686-762	.002-.006	762-838	.002-.006	838-914	.002-.006	914-990	.002-.006	990-1066	.002-.006
1 1/8	34	.0015-.004	34-51	.0015-.004	51-68	.0015-.005	68-136	.002-.006	136-204	.002-.006	204-272	.002-.006	272-340	.003 UP	340-408	.002 UP	408-476	.002 UP	476-544	.002 UP	544-612	.002 UP	612-680	.002 UP	680-748	.002 UP	748-816	.002 UP	816-884	.002 UP	884-952	.002 UP
1 1/4	31	.0015-.004	31-46	.0015-.004	46-61	.0015-.005	61-122	.002-.006	122-183	.002-.006	183-244	.003 UP	244-306	.003 UP	306-368	.002 UP	368-430	.002 UP	430-492	.002 UP	492-554	.002 UP	554-616	.002 UP	616-678	.002 UP	678-740	.002 UP	740-802	.002 UP	802-864	.002 UP
1 3/8	28	.0015-.004	28-42	.0015-.004	42-55	.0015-.005	55-111	.002-.006	111-167	.003 UP	167-222	.003 UP	222-278	.003 UP	278-334	.002 UP	334-390	.002 UP	390-446	.002 UP	446-502	.002 UP	502-558	.002 UP	558-614	.002 UP	614-670	.002 UP	670-726	.002 UP	726-782	.002 UP
1 1/2	26	.0015-.004	26-38	.0015-.004	38-51	.002 UP	51-102	.003 UP	102-153	.003 UP	153-204	.003 UP	204-255	.003 UP	255-306	.002 UP	306-357	.002 UP	357-408	.002 UP	408-459	.002 UP	459-510	.002 UP	510-561	.002 UP	561-612	.002 UP	612-663	.002 UP	663-714	.002 UP
1 5/8	24	.002 UP	35	.002 UP	35-47	.002 UP	47-94	.003 UP	94-141	.003 UP	141-188	.003 UP	188-235	.003 UP	235-282	.002 UP	282-329	.002 UP	329-376	.002 UP	376-423	.002 UP	423-470	.002 UP	470-517	.002 UP	517-564	.002 UP	564-611	.002 UP	611-658	.002 UP
1 3/4	22	.002 UP	32	.002 UP	32-43	.002 UP	43-87	.003 UP	87-131	.003 UP	131-175	.003 UP	175-218	.003 UP	218-261	.002 UP	261-304	.002 UP	304-347	.002 UP	347-390	.002 UP	390-433	.002 UP	433-476	.002 UP	476-519	.002 UP	519-562	.002 UP	562-605	.002 UP
1 7/8	20	.002 UP	30	.002 UP	30-40	.002 UP	40-81	.003 UP	81-122	.003 UP	122-163	.003 UP	163-204	.003 UP	204-245	.002 UP	245-286	.002 UP	286-327	.002 UP	327-368	.002 UP	368-409	.002 UP	409-450	.002 UP	450-491	.002 UP	491-532	.002 UP	532-573	.002 UP
2	19	.002 UP	29	.002 UP	29-38	.002 UP	38-76	.003 UP	76-115	.003 UP	115-153	.003 UP	153-191	.003 UP	191-229	.002 UP	229-267	.002 UP	267-305	.002 UP	305-343	.002 UP	343-381	.002 UP	381-419	.002 UP	419-457	.002 UP	457-495	.002 UP	495-533	.002 UP
2 1/8	18	.003 UP	28	.003 UP	28	.003 UP	36	.003 UP	36-72	.003 UP	72-108	.003 UP	108-144	.003 UP	144-179	.003 UP	179-215	.003 UP	215-251	.003 UP	251-287	.003 UP	287-323	.003 UP	323-359	.003 UP	359-395	.003 UP	395-431	.003 UP	431-467	.003 UP
2 1/4	17	.003 UP	26	.003 UP																												

SPEED & FEED INFORMATION

Carbide Drills

SERIES: HDR, IDR, JDR, LDR, HDRNC

MATERIAL	ISO	CARBIDE SFM	HSSCO SFM	FEED RATE PER TOOTH (IPR)			
				1/16"	1/8"	1/4"	1/2"
Stainless Steels-Soft	M	80-300	20-40	0.0005	0.0005	0.0020	0.0040
Stainless Steels-Hard (PH)	M	40-100	15-25	0.0005	0.0005	0.0010	0.0015
Nickel Base Alloys	S	75-200	15-25	0.0005	0.0006	0.0010	0.0015
Inconel/Monel/Hastelloy	S	75-200	15-25	0.0005	0.0005	0.0010	0.0015
Titanium-Soft	S	80-350	20-25	0.0005	0.0020	0.0040	0.0050
Titanium-Hard	S	40-100	20-25	0.0005	0.0008	0.0020	0.0040
Low Carbon Steels	P	150-300	75-130	0.0005	0.0010	0.0020	0.0040
Die Steels	P	60-130	30-45	0.0005	0.0005	0.0020	0.0040
Hardened Steels > HRc 50	H	25-75	-	0.0005	0.0010	0.0020	0.0030
Cast Iron	K	100-300	60-110	0.0010	0.0020	0.0030	0.0050
Malleable Iron	K	65-200	40-80	0.0010	0.0020	0.0030	0.0050
Aluminium Alloys	N	100-400	150-250	0.0010	0.0020	0.0030	0.0050
Brass & Bronze	N	150-300	100-150	0.0005	0.0010	0.0020	0.0040
Copper	N	150-300	75-150	0.0010	0.0030	0.0050	0.0060
Magnesium	N	300-600	200-350	0.0015	0.0030	0.0050	0.0080
Plastics	N	150-450	70-150	0.0015	0.0030	0.0040	0.0060

Countersinks

MATERIAL	ISO	HSS SFM	COUNTERSINK TYPE	
			M42 8% COBALT WITH <u>TIN</u> SFM	CARBIDE SFM
Stainless Steels - Free Machining	M	30-80	40-100	80-125
Stainless Steels - Others	M	15-50	20-65	50-75
Inconels/Monels	S	30-50	40-65	50-75
Titaniums (6Al4V)	S	50-60	60-75	60-90
Steels Annealed	P	40-50	50-65	50-80
Steels HRc 18-24	P	30-40	40-50	40-60
Steels HRc 25-37	P	25-35	30-45	35-55
Mild Steels	P	70-100	85-125	80-170
Cast Iron	K	75-125	95-150	125-225
Malleable Iron	K	80-90	100-115	90-150
Aluminums Alloys	N	150-250	180-300	300-500
Brass (Bronze)	N	75-125	95-150	150-250
Magnesium	N	125-250	150-300	250-400
Plastics	N	100-250	125-300	250-400

► Multiple flute countersinks are designed for increased feed rates. A controlled feed rate will result in better surface finish.

► All Melin countersinks are manufactured on CNC grinders to ensure consistent and accurate flute spacing. Carbide countersinks should be used in rigid tool holders to maximize tool life.

All technical data provided are suggested starting points. They may be increased or decreased depending on machine condition, depth of cut, finish required, coolant, etc. Call our TECHNICAL SERVICE TEAM with questions.

SPEED & FEED INFORMATION

Countersinks

Nose Diameter for Pre-Setting CNC Precision Countersinks

SIZE	NC POINT DIAMETER					
	60°	82°	90°	100°	110°	120°
0.188	0.058	0.032	0.032	0.032	0.032	0.032
0.250	0.078	0.046	0.046	0.046	0.046	0.046
0.313	0.080	0.047	0.047	0.047	0.047	0.047
0.375	0.125	0.078	0.078	0.078	0.062	0.062
0.438	0.140	0.096	0.096	0.096	0.070	0.070
0.500	0.156	0.109	0.109	0.109	0.078	0.078
0.625	0.203	0.125	0.125	0.125	0.109	0.109
0.750	0.250	0.156	0.156	0.156	0.125	0.125
0.875	0.281	0.172	0.172	0.172	0.140	0.140
1.000	0.328	0.203	0.203	0.203	0.171	0.171

Carbide Burs

SERIES: Carbide Burs

Bur Diameter	RPM
1/8 Solid Carbide	45,000-50,000
3/16 Solid Carbide	35,000-40,000
3/16 Carbide Head Brazed to 1/8 Steel Shank	30,000-35,000
1/4 Solid Carbide	30,000-35,000
Carbide Head Brazed to 1/8 Steel Shank	25,000-30,000
5/16 Carbide Head Brazed to 1/4 Steel Shank	25,000-30,000
3/8 Carbide Head Brazed to 1/4 Steel Shank	25,000-30,000
7/16 Carbide Head Brazed to 1/4 Steel Shank	20,000-25,000
1/2 Carbide Head Brazed to 1/4 Steel Shank	20,000-25,000
5/8 Carbide Head Brazed to 1/4 Steel Shank	15,000-20,000
3/4 Carbide Head Brazed to 1/4 Steel Shank	15,000-20,000
1 Carbide Head Brazed to 1/4 Steel Shank	12,000-18,000

All technical data provided are suggested starting points. They may be increased or decreased depending on machine condition, depth of cut, finish required, coolant, etc. Call our TECHNICAL SERVICE TEAM with questions.

SPEED & FEED INFORMATION

Calculations

End mill speed & feed formulas are the various individual equations that determine the proper overall machining setup or more specifically the speed of the cutting tool and the rate which it is fed into the work piece. Each individual formula is distinct in what it determines but coordinates with the others to ensure successful cutting tool application. You can visit the **TECHNICAL** section on www.melintool.com for more information.

INCH

$$\text{RPM} = \frac{\text{Revolutions Per Minute}}{3.82 \times \text{SFM} / \text{Tool Dia}}$$

$$\text{SFM} = \frac{\text{Surface Foot Per Minute}}{.262 \times \text{RPM} \times \text{Tool Dia}}$$

$$\text{CPT or IPT} = \frac{\text{Chip-Load Per Tooth}}{\text{IPM} / \text{RPM} / \text{No. Of Flutes}}$$

$$\text{IPM} = \frac{\text{Inches Per Minute}}{\text{CPT} \times \text{RPM} \times \text{No. Of Flutes}}$$

$$\text{MRRCI} = \frac{\text{Metal Removal Rate Cubic Inches}}{\text{IPM} \times \text{Axial Doc} \times \text{Radial Woc}}$$

$$\text{IPR} = \frac{\text{Inches Per Revolution}}{\text{IPM} / \text{RPM}}$$

METRIC

$$\text{RPM} = \frac{\text{Revolutions Per Minute}}{1000 \times \text{M/MIN} / (3.14 \times D)}$$

$$\text{M/MIN} = \frac{\text{Meters Per Minute}}{(3.14 \times D \times \text{RPM}) / 1000}$$

$$\text{Fz OR CPT} = \frac{\text{Chip-Load Per Tooth}}{\text{Feedrate (mm) per MIN} / (Z \times \text{RPM})}$$

$$\text{VF OR FPM} = \frac{\text{Feedrate (mm) Per Minute}}{\text{Feerate (mm) per Tooth} \times Z \times \text{RPM}}$$

D = Cutter Dia.
Z = No. Of Teeth.

EQUIVALENTS & CONVERSIONS:

ABBREVIATIONS

RPM	Revolutions Per Minute
SFM	Surface Feet Per Minute
CPT	Chip Load Per Tooth
IPM	Inches Per Minute
V _f	Millimeters Per Minute
ae	Radial Width of Cut
ap	Axial Depth of Cut
V _f	Millimeters Per Minute
Vc	Surface Meters Per Minute
Fz	Metric Chip Load Per Tooth

$$N, n \text{ or } \text{Min}^{-1} = \text{RPM}$$

$$Vc \text{ or } \text{M/MIN} = \text{SFM}$$

$$Fz \text{ or } \text{mm/TOOTH} = \text{CPT}$$

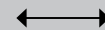
$$V_f \text{ or } \text{mm/MIN} = \text{IPM}$$

$$\text{SFM} / 3.281 = \text{M/MIN}$$

$$\text{M/MIN} \times 3.281 = \text{SFM}$$

$$\text{mm/MIN} / 25.4 = \text{IPM}$$

$$\text{mm/TOOTH} / 25.4 = \text{CPT}$$



IMPERIAL

METRIC

$$\text{Inch} \times 25.4 = \text{Millimeter}$$

$$\text{Millimeter} \times .03937 = \text{Inch}$$

DECIMAL EQUIVALENT CHART

SIZE	DECIMAL	SIZE	DECIMAL	SIZE	DECIMAL	SIZE	DECIMAL	SIZE	DECIMAL
97	.0059	54	.0550	25	.1495	6.7mm	.2638	7/16"	.4375
96	.0063	1.4mm	.0551	3.8mm	.1496	17/64"	.2656	11.5mm	.4528
95	.0067	1.45mm	.0571	24	.1520	6.75mm	.2657	29/64"	.4531
94	.0071	1.5mm	.0591	3.9mm	.1535	H	.2660	15/32"	.4688
93	.0075	53	.0595	23	.1540	6.8mm	.2677	12mm	.4724
92	.0079	1.55mm	.0610	5/32"	.1562	6.9mm	.2717	31/64"	.4844
.2mm	.0079	1/16"	.0625	22	.1570	I	.2720	12.5mm	.4921
91	.0083	1.6mm	.0630	4mm	.1575	7mm	.2756	1/2"	.5000
90	.0087	52	.0635	21	.1590	J	.2770	13mm	.5118
.22mm	.0087	1.65mm	.0650	20	.1610	7.1mm	.2795	33/64"	.5156
89	.0091	1.7mm	.0669	4.1mm	.1614	K	.2810	17/32"	.5312
88	.0095	51	.0670	4.2mm	.1654	9/32"	.2812	13.5mm	.5315
.25mm	.0098	1.75mm	.0689	19	.1660	7.2mm	.2835	35/64"	.5469
87	.0100	50	.0700	4.25mm	.1673	7.25mm	.2854	14mm	.5512
86	.0105	1.8mm	.0709	4.3mm	.1693	7.3mm	.2874	9/16"	.5625
85	.0110	1.85mm	.0728	18	.1695	L	.2900	14.5mm	.5709
.28mm	.0110	49	.0730	11/64"	.1719	7.4mm	.2913	37/64"	.5781
84	.0115	1.9mm	.0748	17	.1730	M	.2950	15mm	.5906
.3mm	.0118	48	.0760	4.4mm	.1732	7.5mm	.2953	19/32"	.5938
83	.0120	1.95mm	.0768	16	.1770	19/64"	.2969	39/64"	.6094
82	.0125	5/64"	.0781	4.5mm	.1772	7.6mm	.2992	15.5mm	.6102
.32mm	.0126	47	.0785	15	.1800	N	.3020	5/8"	.6250
81	.0130	2mm	.0787	4.6mm	.1811	7.7mm	.3031	16mm	.6299
80	.0135	2.05mm	.0807	14	.1820	7.75mm	.3051	41/64"	.6406
.35mm	.0138	46	.0810	13	.1850	7.8mm	.3071	16.5mm	.6496
79	.0145	45	.0820	4.7mm	.1850	7.9mm	.3110	21/32"	.6562
1/64"	.0156	2.1mm	.0827	4.75mm	.1870	5/16"	.3125	17mm	.6693
.4mm	.0157	2.15mm	.0846	3/16"	.1875	8mm	.3150	43/64"	.6719
78	.0160	44	.0860	4.8mm	.1890	O	.3160	11/16"	.6875
.45mm	.0177	2.2mm	.0866	12	.1890	8.1mm	.3189	17.5mm	.6890
77	.0180	2.25mm	.0886	11	.1910	8.2mm	.3228	45/64"	.7031
.5mm	.0197	43	.0890	4.9mm	.1929	P	.3230	18mm	.7087
76	.0200	2.3mm	.0906	10	.1935	8.25mm	.3248	23/32"	.7188
75	.0210	2.35mm	.0925	9	.1960	8.3mm	.3268	18.5mm	.7283
.55mm	.0217	42	.0935	5mm	.1969	21/64"	.3281	47/64"	.7344
74	.0225	3/32"	.0938	8	.1990	8.4mm	.3307	19mm	.7480
.6mm	.0236	2.4mm	.0945	5.1mm	.2008	Q	.3320	3/4"	.7500
73	.0240	41	.0960	7	.2010	8.5mm	.3346	49/64"	.7656
72	.0250	2.45mm	.0965	13/64"	.2031	8.6mm	.3386	19.5mm	.7677
.65mm	.0256	40	.0980	6	.2040	R	.3390	25/32"	.7812
71	.0260	2.5mm	.0984	5.2mm	.2047	8.7mm	.3425	20mm	.7874
.7mm	.0276	39	.0995	5	.2055	11/32"	.3438	51/64"	.7969
70	.0280	38	.1015	5.25mm	.2067	8.75mm	.3445	20.5mm	.8071
69	.0292	2.6mm	.1024	5.3mm	.2087	8.8mm	.3465	13/16"	.8125
.75mm	.0295	37	.1040	4	.2090	S	.3480	21mm	.8268
68	.0310	2.7mm	.1063	5.4mm	.2126	8.9mm	.3504	53/64"	.8281
1/32"	.0312	36	.1065	3	.2130	9mm	.3543	27/32"	.8438
.8mm	.0315	2.75mm	.1083	5.5mm	.2165	T	.3580	21.5mm	.8465
67	.0320	7/64"	.1094	7/32"	.2188	9.1mm	.3583	55/64"	.8594
66	.0330	35	.1100	5.6mm	.2205	23/64"	.3594	22mm	.8661
.85mm	.0335	2.8mm	.1102	2	.2210	9.2mm	.3622	7/8"	.8750
65	.0350	34	.1110	5.7mm	.2244	9.25mm	.3642	22.5mm	.8858
.9mm	.0354	33	.1130	5.75mm	.2264	9.3mm	.3661	57/64"	.8906
64	.0360	2.9mm	.1142	1	.2280	U	.3680	23mm	.9055
63	.0370	32	.1160	5.8mm	.2283	9.4mm	.3701	29/32"	.9062
.95mm	.0374	3mm	.1181	5.9mm	.2323	9.5mm	.3740	59/64"	.9219
62	.0380	31	.1200	A	.2340	3/8"	.3750	23.5mm	.9252
61	.0390	3.1mm	.1220	15/64"	.2344	V	.3770	15/16"	.9375
1mm	.0394	1/8"	.1250	6mm	.2362	9.6mm	.3780	24mm	.9449
60	.0400	3.2mm	.1260	B	.2380	9.7mm	.3819	61/64"	.9531
59	.0410	3.25mm	.1280	6.1mm	.2402	9.75mm	.3839	24.5mm	.9646
1.05mm	.0413	30	.1285	C	.2420	9.8mm	.3858	31/32"	.9688
58	.0420	3.3mm	.1299	6.2mm	.2441	W	.3860	25mm	.9843
57	.0430	3.4mm	.1339	D	.2460	9.9mm	.3898	63/64"	.9844
1.1mm	.0433	29	.1360	6.25mm	.2461	25/64"	.3906	1"	1.0000
1.15mm	.0453	3.5mm	.1378	6.3mm	.2480	10mm	.3937		
56	.0465	28	.1405	E	.2500	X	.3970		
3/64"	.0469	9/64"	.1406	1/4"	.2500	Y	.4040		
1.2mm	.0472	3.6mm	.1417	6.4mm	.2520	13/32"	.4062		
1.25mm	.0492	27	.1440	6.5mm	.2559	Z	.4130		
1.3mm	.0512	3.7mm	.1457	F	.2570	10.5mm	.4134		
55	.0520	26	.1470	6.6mm	.2598	27/64"	.4219		
1.35mm	.0531	3.75mm	.1476	G	.2610	11mm	.4331		

