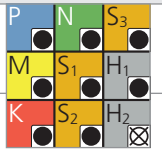
CrazyMill Cool Ball - Type C - Finishing

RECOMMENDATION FOR USE
● Excellent | ◐ Good | ○ Acceptable | ⊠ Not recommended

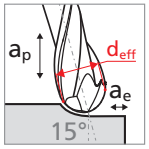


v_c [m/min] | **[SFM]**
f_z [mm] | **[IPT]**
d_{eff} [mm] | **[inch]**

MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

Materials group	Material	AISI/ASTM/ UNS	Ød1 0.3 mm | .012"			Ød1 0.4 mm | .016"			Ød1 0.5 mm | .020"			Ød1 0.6 mm | .024"			Ød1 0.8 mm | .032"			Ød1 1.0 mm | .039"			Ød1 1.2 mm | .047"			Ød1 1.5 | .059"			Ød1 1.8 mm | .071"			Ød1 2.0 mm | .079"			Ød1 2.5 mm | .098"			Ød1 3.0 mm | .118"			Ød1 4.0 mm | .158"			Ød1 6.0 mm | .236"			Ød1 8.0 mm | .315"		
			v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z
P	Unalloyed carbon steel Rm<800 N/mm²	AISI 1010	45	0.24	0.006	59	0.31	0.008	74	0.39	0.012	89	0.47	0.014	100	0.63	0.017	140	0.79	0.018	140	0.94	0.020	200	1.18	0.029	200	1.42	0.031	220	1.57	0.041	220	1.97	0.043	240	2.36	0.048	260	3.15	0.060	260	4.72	0.060	260	6.29	0.060
		AISI 1015	**148**	**.009**	**.00024**	**194**	**.012**	**.00033**	**243**	**.015**	**.00047**	**292**	**.019**	**.00057**	**328**	**.025**	**.00066**	**459**	**.031**	**.00071**	**459**	**.037**	**.00080**	**656**	**.046**	**.00113**	**656**	**.056**	**.00123**	**722**	**.062**	**.00161**	**722**	**.077**	**.00170**	**787**	**.093**	**.00189**	**853**	**.124**	**.00236**	**853**	**.186**	**.00236**	**853**	**.248**	**.00236**
		AISI 1045																																														
		AISI 1020																																														
		AISI 1215																																														
	Low alloyed steel Rm>900 N/mm²	ASTM 3415	45	0.24	0.005	59	0.31	0.007	74	0.39	0.011	89	0.47	0.013	100	0.63	0.014	140	0.79	0.017	140	0.94	0.019	200	1.18	0.026	200	1.42	0.029	220	1.57	0.038	220	1.97	0.041	240	2.36	0.046	260	3.15	0.058	260	4.72	0.058	260	6.29	0.058
		AISI 5115	**148**	**.009**	**.00019**	**194**	**.012**	**.00028**	**243**	**.015**	**.00043**	**292**	**.019**	**.00052**	**328**	**.025**	**.00057**	**459**	**.031**	**.00066**	**459**	**.037**	**.00076**	**656**	**.046**	**.00104**	**656**	**.056**	**.00113**	**722**	**.062**	**.00151**	**722**	**.077**	**.00161**	**787**	**.093**	**.00180**	**853**	**.124**	**.00227**	**853**	**.186**	**.00227**	**853**	**.248**	**.00227**
		AISI 52100																																														
		AISI 4140																																														
		AISI O2																																														
	High alloyed tool steel Rm<1200N/mm²	AISI D2	45	0.24	**0.005**	59	0.31	0.007	74	0.39	0.010	89	0.47	0.011	100	0.63	0.013	140	0.79	0.013	140	0.94	0.016	200	1.18	0.024	200	1.42	0.026	220	1.57	0.036	220	1.97	0.038	240	2.36	0.042	260	3.15	0.053	260	4.72	0.053	260	6.29	0.053
		AISI D4/D6	**148**	**.009**	**.00019**	**194**	**.012**	**.00028**	**243**	**.015**	**.00038**	**292**	**.019**	**.00043**	**328**	**.025**	**.00052**	**459**	**.031**	**.00052**	**459**	**.037**	**.00061**	**656**	**.046**	**.00094**	**656**	**.056**	**.00104**	**722**	**.062**	**.00142**	**722**	**.077**	**.00151**	**787**	**.093**	**.00165**	**853**	**.124**	**.00208**	**853**	**.186**	**.00208**	**853**	**.248**	**.00208**
		AISI M2																																														
		AISI T1																																														
M	Stainless steel ferritic	AISI 430	45	0.24	0.006	59	0.31	0.008	74	0.39	0.012	89	0.47	0.014	100	0.63	0.014	140	0.79	0.019	140	0.94	0.022	200	1.18	0.029	200	1.42	0.031	220	1.57	0.041	220	1.97	0.043	240	2.36	0.048	260	3.15	0.058	260	4.72	0.058	260	6.29	0.058
		AISI 430F	**148**	**.009**	**.00024**	**194**	**.012**	**.00033**	**243**	**.015**	**.00047**	**292**	**.019**	**.00057**	**328**	**.025**	**.00057**	**459**	**.031**	**.00076**	**459**	**.037**	**.00085**	**656**	**.046**	**.00113**	**656**	**.056**	**.00123**	**722**	**.062**	**.00161**	**722**	**.077**	**.00170**	**787**	**.093**	**.00189**	**853**	**.124**	**.00227**	**853**	**.186**	**.00227**	**853**	**.248**	**.00227**
	Stainless steel martensitic	AISI 420C	45	0.24	0.005	59	0.31	0.007	74	0.39	0.011	89	0.47	0.012	100	0.63	0.014	140	0.79	0.018	140	0.94	0.020	200	1.18	0.026	200	1.42	0.029	220	1.57	0.038	220	1.97	0.041	240	2.36	0.043	260	3.15	0.055	260	4.72	0.055	260	6.29	0.055
		AISI 440B	**148**	**.009**	**.00019**	**194**	**.012**	**.00028**	**243**	**.015**	**.00043**	**292**	**.019**	**.00047**	**328**	**.025**	**.00057**	**459**	**.031**	**.00071**	**459**	**.037**	**.00080**	**656**	**.046**	**.00104**	**656**	**.056**	**.00113**	**722**	**.062**	**.00151**	**722**	**.077**	**.00161**	**787**	**.093**	**.00170**	**853**	**.124**	**.00217**	**853**	**.186**	**.00217**	**853**	**.248**	**.00217**
	Stainless steel martensitic – PH	AISI 630	45	0.24	0.005	59	0.31	0.007	74	0.39	0.011	89	0.47	0.012	100	0.63	0.013	140	0.79	0.018	140	0.94	0.020	200	1.18	0.026	200	1.42	0.029	220	1.57	0.038	220	1.97	0.041	240	2.36	0.043	260	3.15	0.055	260	4.72	0.055	260	6.29	0.055
		ASTM 15-5 PH	**148**	**.009**	**.00019**	**194**	**.012**	**.00028**	**243**	**.015**	**.00043**	**292**	**.019**	**.00047**	**328**	**.025**	**.00052**	**459**	**.031**	**.00071**	**459**	**.037**	**.00080**	**656**	**.046**	**.00104**	**656**	**.056**	**.00113**	**722**	**.062**	**.00151**	**722**	**.077**	**.00161**	**787**	**.093**	**.00170**	**853**	**.124**	**.00217**	**853**	**.186**	**.00217**	**853**	**.248**	**.00217**
	Stainless steel austenitic	AISI 304	45	0.24	0.005	59	0.31	0.007	74	0.39	0.010	89	0.47	0.012	100	0.63	0.011	140	0.79	0.014	140	0.94	0.017	200	1.18	0.019	200	1.42	0.022	220	1.57	0.036	220	1.97	0.038	240	2.36	0.041	260	3.15	0.053	260	4.72	0.053	260	6.29	0.053
		AISI 316L	**148**	**.009**	**.00019**	**194**	**.012**	**.00028**	**243**	**.015**	**.00038**	**292**	**.019**	**.00047**	**328**	**.025**	**.00043**	**459**	**.031**	**.00057**	**459**	**.037**	**.00066**	**656**	**.046**	**.00076**	**656**	**.056**	**.00085**	**722**	**.062**	**.00142**	**722**	**.077**	**.00151**	**787**	**.093**	**.00161**	**853**	**.124**	**.00208**	**853**	**.186**	**.00208**	**853**	**.248**	**.00208**
		AISI 316LM																																														
		AISI 904L																																														
K	Cast iron	ASTM 30	45	0.24	0.004	59	0.31	0.006	74	0.39	0.007	89	0.47	0.009	100	0.63	0.011	120	0.79	0.013	120	0.94	0.026	140	1.18	0.029	140	1.42	0.031	160	1.57	0.034	160	1.97	0.043	180	2.36	0.050	200	3.15	0.062	200	4.72	0.062	200	6.29	0.062
		ASTM 40B	**148**	**.009**	**.00014**	**194**	**.012**	**.00024**	**243**	**.015**	**.00028**	**292**	**.019**	**.00035**	**328**	**.025**	**.00048**	**394**	**.031**	**.00052**	**394**	**.037**	**.00104**	**459**	**.046**	**.00113**	**459**	**.056**	**.00123**	**525**	**.062**	**.00132**	**525**	**.077**	**.00170**	**591**	**.093**	**.00198**	**656**	**.124**	**.00246**	**656**	**.186**	**.00246**	**656**	**.248**	**.00246**
		ASTM60-40-18																																														
		ASTM80-60-03																																														

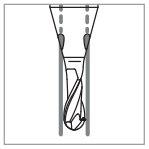
Finishing

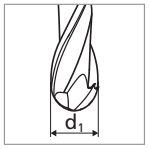


- $a_p = 0.1 \times d_1$
- $a_e = 0.05 \times d_1$

Machining angle = 15°

n_{max} = 60'000 rpm





CrazyMill Cool Ball - Type C - Finishing

RECOMMENDATION FOR USE
● Excellent | ◐ Good | ○ Acceptable | ⊠ Not recommended

P	N	S_3
●	●	●
M	**S_1**	**H_1**
●	●	●
K	**S_2**	**H_2**
●	●	⊠

MILLING WITH INTEGRATED COOLING | CUTTING DATA OVERVIEW

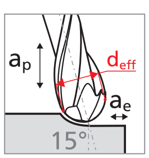
v_c [m/min] | [SFM]
f_z [mm] | [IPT]
d_{eff} [mm] | [inch]

Materials group	Material	AISI/ASTM/UNS	Ød1 0.3 mm .012"			Ød1 0.4 mm .016"			Ød1 0.5 mm .020"			Ød1 0.6 mm .024"			Ød1 0.8 mm .032"		
			v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z
N	Aluminium alloy wrought	ASTM 6351	45	0.24	0.007	59	0.31	0.010	74	0.39	0.014	89	0.47	0.017	100	0.63	0.019
		ASTM 7075	148	.009	.00028	194	.012	.00038	243	.015	.00057	292	.019	.00066	328	.025	.00076
	Aluminium alloy cast	ASTM A380	45	0.24	0.007	59	0.31	0.010	74	0.39	0.014	89	0.47	0.017	100	0.63	0.019
		UNS A03590	148	.009	.00028	194	.012	.00038	243	.015	.00057	292	.019	.00066	328	.025	.00076
	Copper	UNS C10100	45	0.24	0.007	59	0.31	0.010	74	0.39	0.017	89	0.47	0.019	100	0.63	0.022
		UNS C11000	148	.009	.00028	194	.012	.00038	243	.015	.00066	292	.019	.00076	328	.025	.00085
	Brass lead free	UNS C27400	45	0.24	0.007	59	0.31	0.010	74	0.39	0.017	89	0.47	0.019	100	0.63	0.022
		UNS C28000	148	.009	.00028	194	.012	.00038	243	.015	.00066	292	.019	.00076	328	.025	.00085
	Brass, Bronze Rm<400N/mm²	UNS C38500	45	0.24	0.007	59	0.31	0.010	74	0.39	0.017	89	0.47	0.019	100	0.63	0.022
		UNS C51900	148	.009	.00028	194	.012	.00038	243	.015	.00066	292	.019	.00076	328	.025	.00085
	Bronze Rm<600N/mm²	UNS C63000	45	0.24	0.007	59	0.31	0.010	74	0.39	0.014	89	0.47	0.017	100	0.63	0.019
		UNS C63200	148	.009	.00028	194	.012	.00038	243	.015	.00057	292	.019	.00066	328	.025	.00076
S_1	Super alloys	Inconel 625, Inconel 718	45	0.24	0.004	59	0.31	0.005	74	0.39	0.005	89	0.47	0.006	100	0.63	0.007
		Hastelloy B-2, Hastelloy X	148	.009	.00014	194	.012	.00020	243	.015	.00020	292	.019	.00024	328	.025	.00028
S_2	Titanium pure	ASTM B348	45	0.24	0.005	59	0.31	0.005	74	0.39	0.010	100	0.47	0.011	100	0.63	0.013
		ASTM B348	148	.009	.00019	194	.012	.00020	243	.015	.00038	328	.019	.00043	328	.025	.00052
	Titanium alloys	ASTM B348	45	0.24	0.005	59	0.31	0.005	74	0.39	0.010	89	0.47	0.011	100	0.63	0.013
		ASTM F1295	148	.009	.00019	194	.012	.00020	243	.015	.00038	292	.019	.00043	328	.025	.00052
S_3	CrCo alloys	Haynes 25	45	0.24	0.004	59	0.31	0.004	74	0.39	0.006	89	0.47	0.006	100	0.63	0.007
		ASTM F1537	148	.009	.00014	194	.012	.00014	243	.015	.00024	292	.019	.00024	328	.025	.00028
H_1	Hardened steel < 55 HRC	AISI O1	45	0.24	0.005	59	0.31	0.007	74	0.39	0.008	80	0.47	0.010	80	0.63	0.011
			148	.009	.00019	194	.012	.00028	243	.015	.00033	262	.019	.00038	262	.025	.00043
H_2	Hardened steel ≥ 55 HRC	AISI D2															

Materials group	Material	AISI/ASTM/UNS	Ød1 1.0 mm .039"			Ød1 1.2 mm .047"			Ød1 1.5 .059"			Ød1 1.8 mm .071"			Ød1 2.0 mm .079"		
			v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z
N	Aluminium alloy wrought	ASTM 6351	140	0.79	0.022	140	0.94	0.024	200	1.18	0.031	200	1.42	0.034	220	1.57	0.043
		ASTM 7075	459	.031	.00085	459	.037	.00094	656	.046	.00123	656	.056	.00132	722	.062	.00170
	Aluminium alloy cast	ASTM A380	140	0.79	0.022	140	0.94	0.024	200	1.18	0.031	200	1.42	0.034	220	1.57	0.043
		UNS A03590	459	.031	.00085	459	.037	.00094	656	.046	.00123	656	.056	.00132	722	.062	.00170
	Copper	UNS C10100	140	0.79	0.024	140	0.94	0.026	200	1.18	0.031	200	1.42	0.034	220	1.57	0.043
		UNS C11000	459	.031	.00094	459	.037	.00104	656	.046	.00123	656	.056	.00132	722	.062	.00170
	Brass lead free	UNS C27400	140	0.79	0.024	140	0.94	0.026	200	1.18	0.031	200	1.42	0.034	220	1.57	0.043
		UNS C28000	459	.031	.00094	459	.037	.00104	656	.046	.00123	656	.056	.00132	722	.062	.00170
	Brass, Bronze Rm<400N/mm²	UNS C38500	140	0.79	0.024	140	0.94	0.026	200	1.18	0.031	200	1.42	0.034	220	1.57	0.043
		UNS C51900	459	.031	.00094	459	.037	.00104	656	.046	.00123	656	.056	.00132	722	.062	.00170
	Bronze Rm<600N/mm²	UNS C63000	140	0.79	0.022	140	0.94	0.024	200	1.18	0.031	200	1.42	0.034	220	1.57	0.043
		UNS C63200	459	.031	.00085	459	.037	.00094	656	.046	.00123	656	.056	.00132	722	.062	.00170
S_1	Super alloys	Inconel 625, Inconel 718	120	0.79	0.008	120	0.94	0.010	130	1.18	0.011	130	1.42	0.012	140	1.57	0.012
		Hastelloy B-2, Hastelloy X	394	.031	.00033	394	.037	.00038	427	.046	.00043	427	.056	.00047	459	.062	.00047
S_2	Titanium pure	ASTM B348	120	0.79	0.019	120	0.94	0.022	130	1.18	0.024	130	1.42	0.026	140	1.57	0.034
		ASTM B348	394	.031	.00076	394	.037	.00085	427	.046	.00094	427	.056	.00104	459	.062	.00132
	Titanium alloys	ASTM B348	120	0.79	0.019	120	0.94	0.022	130	1.18	0.024	130	1.42	0.026	140	1.57	0.034
		ASTM F1295	394	.031	.00076	394	.037	.00085	427	.046	.00094	427	.056	.00104	459	.062	.00132
S_3	CrCo alloys	Haynes 25	140	0.79	0.008	140	0.94	0.010	180	1.18	0.011	180	1.42	0.012	200	1.57	0.012
		ASTM F1537	459	.031	.00033	459	.037	.00038	591	.046	.00043	591	.056	.00047	656	.062	.00047
H_1	Hardened steel < 55 HRC	AISI O1	100	0.79	0.012	100	0.94	0.014	140	1.18	0.017	140	1.42	0.022	180	1.57	0.024
			328	.031	.00047	328	.037	.00057	459	.046	.00066	459	.056	.00085	591	.062	.00094
H_2	Hardened steel ≥ 55 HRC	AISI D2															

Materials group	Material	AISI/ASTM/UNS	Ød1 2.5 mm .098"			Ød1 3.0 mm .118"			Ød1 4.0 mm .158"			Ød1 6.0 mm .236"			Ød1 8.0 mm .315"		
			v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z	v_c	d_{eff}	f_z
N	Aluminium alloy wrought	ASTM 6351	220	1.97	0.048	240	2.36	0.070	260	3.15	0.066	260	4.72	0.066	260	6.29	0.066
		ASTM 7075	722	.077	.00189	787	.093	.00274	853	.124	.00260	853	.186	.00260	853	.248	.00260
	Aluminium alloy cast	ASTM A380	220	1.97	0.048	240	2.36	0.070	260	3.15	0.066	260	4.72	0.066	260	6.29	0.066
		UNS A03590	722	.077	.00189	787	.093	.00274	853	.124	.00260	853	.186	.00260	853	.248	.00260
	Copper	UNS C10100	220	1.97	0.048	240	2.36	0.070	260	3.15	0.066	260	4.72	0.066	260	6.29	0.066
		UNS C11000	722	.077	.00189	787	.093	.00274	853	.124	.00260	853	.186	.00260	853	.248	.00260
	Brass lead free	UNS C27400	220	1.97	0.048	240	2.36	0.070	260	3.15	0.066	260	4.72	0.066	260	6.29	0.066
		UNS C28000	722	.077	.00189	787	.093	.00274	853	.124	.00260	853	.186	.00260	853	.248	.00260
	Brass, Bronze Rm<400N/mm²	UNS C38500	220	1.97	0.048	240	2.36	0.070	260	3.15	0.066	260	4.72	0.066	260	6.29	0.066
		UNS C51900	722	.077	.00189	787	.093	.00274	853	.124	.00260	853	.186	.00260	853	.248	.00260
	Bronze Rm<600N/mm²	UNS C63000	220	1.97	0.048	240	2.36	0.070	260	3.15	0.066	260	4.72	0.066	260	6.29	0.066
		UNS C63200	722	.077	.00189	787	.093	.00274	853	.124	.00260	853	.186	.00260	853	.248	.00260
S_1	Super alloys	Inconel 625, Inconel 718	140	1.97	0.014	150	2.36	0.018	170	3.15	0.024	170	4.72	0.024	170	6.29	0.024
		Hastelloy B-2, Hastelloy X	459	.077	.00057	492	.093	.00071	558	.124	.00094	558	.186	.00094	558	.248	.00094
S_2	Titanium pure	ASTM B348	140	1.97	0.036	150	2.36	0.041	170	3.15	0.050	170	4.72	0.050	170	6.29	0.050
		ASTM B348	459	.077	.00142	492	.093	.00161	558	.124	.00198	558	.186	.00198	558	.248	.00198
	Titanium alloys	ASTM B348	140	1.97	0.036	150	2.36	0.041	170	3.15	0.050	170	4.72	0.050	170	6.29	0.050
		ASTM F1295	459	.077	.00142	492	.093	.00161	558	.124	.00198	558	.186	.00198	558	.248	.00198
S_3	CrCo alloys	Haynes 25	200	1.97	0.014	220	2.36	0.018	240	3.15	0.024	240	4.72	0.024	240	6.29	0.024
		ASTM F1537	656	.077	.00057	722	.093	.00071	787	.124	.00094	787	.186	.00094	787	.248	.00094
H_1	Hardened steel < 55 HRC	AISI O1	180	1.97	0.031	200	2.36	0.036	240	3.15	0.038	240	4.72	0.038	240	6.29	0.038
			591	.077	.00123	656	.093	.00142	787	.124	.00151	787	.186	.00151	787	.248	.00151
H_2	Hardened steel ≥ 55 HRC	AISI D2															

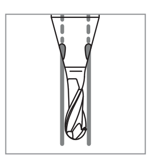
Finishing

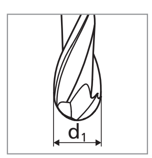


- $a_p = 0.1 \times d_1$
- $a_e = 0.05 \times d_1$

Machining angle = 15°

n_{max} = 60'000 rpm





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