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mechanical engineering

Carbide vs. High Speed STEEL

Should I use Carbide or High Speed Steel?

Depends upon the application.

- Carbide tools are primarily used in finishing applications due to their high rigidity. This rigidity provides the user with a higher degree of accuracy and a better finish in their applications than with High Speed Steel. Carbide is more temperature resistant and can also be ran 2-3 times faster than HSS. This means you can maximize your output on a production line by using a Carbide tool. Carbide is also extremely hard, letting them keep a sharper edge longer and making them more suitable for abrasive materials. However, this hardness comes at the expense of their toughness. Carbide is brittle and tends to chip rather than wear when conditions are not ideal. This means if you are inexperienced or the equipment you are using is not up to par, you run the risk of damaging the tool.
- High Speed Steel on the other hand, is very durable providing a good wear resistance. HSS tools are better used in higher load applications due to their higher durability as opposed to the brittle carbide. HSS is also more forgiving in non-ideal conditions and are generally much more inexpensive. This means if you tend to be hard on tools or your equipment is not quite up to par, HSS may be the way to go.

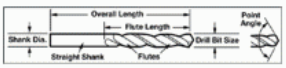
End Mills

END MILL BIT INFORMATION

High-Speed Steel
Pro's: Tough, wear resistant, cheaper than carbide
Con's: Dull quicker than carbide, lower cutting temp, shorter life than carbide

Solid Carbide
Pro's: Harder than steel, higher cutting temps, higher speeds and higher feed rates, machine almost every type of material
Con's: Brittle, machine setup must be completely rigid

Drill Bits



DRILL BIT INFORMATION

Heavy Duty High-Speed Steel
Pro's: More rigid than general purpose drill bits, use them for hard steel, stainless steel, titanium, and other hard materials. All have a self-centering 135° split point that won't skid or walk when starting a hole. The point also allows faster penetration and produces smaller chips for better chip evacuation.
Con's: Wear out quicker than carbide, lower speeds and temperatures, cannot cut abrasive material effectively

Pro's: Carbide drill bits retain their hardness and sharp edge at higher temperatures, have better abrasion resistance. Most carbide bit styles are used on abrasive materials such as cast iron, nonferrous alloys, hard rubber, plastics, glass, ceramics, and composites, extreme rigidity, accuracy and an improved surface finish.
Con's: The machine setup must be as rigid as possible with no spindle vibration or end play, more brittle than high-speed steel.

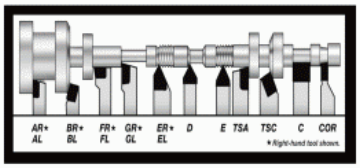
Mill/Lathe/Drill Press Cutting Speeds

Note:
- The Tool type is stamped on the side of the tool
- Table RPM not to exceed maximum safe machine RPM.
- Ream at ½ Drill RPM

Diameter (in)	(in)	(mm)	HIGH STRENGTH STEEL- (HSS) Stainless Steel	Tool Steel	Medium Carbon Steel	Low Carbon Steel	Aluminum	Brass	CARBIDE (CARB) Stainless Steel	Tool Steel	Medium Carbon Steel	Low Carbon Steel	Aluminum	Brass
1/16	0.063	2	1468	2446	3669	4892	9783	12229	8561	9783	9783	14675	29350	29350
1/8	0.125	3	734	1223	1834	2448	4892	6115	4280	4892	4892	7338	14675	14675
1/4	0.25	6	367	611	917	1223	2446	3057	2140	2446	2446	3669	7338	7338
5/16	0.313	8	294	489	734	978	1957	2446	1712	1957	1957	2935	5870	5870
3/8	0.375	10	245	408	611	815	1631	2036	1427	1631	1631	2446	4892	4892
7/16	0.438	11	210	349	524	699	1398	1747	1223	1398	1398	2096	4193	4193
1/2	0.5	13	183	306	459	611	1223	1529	1070	1223	1223	1834	3669	3669
9/16	0.563	14	163	272	408	544	1087	1359	951	1087	1087	1631	3261	3261
5/8	0.625	16	147	245	367	489	978	1223	856	978	978	1468	2935	2935
11/16	0.688	17	133	222	334	445	889	1112	778	889	889	1334	2668	2668
3/4	0.75	19	122	204	306	408	815	1019	713	815	815	1223	2446	2446
13/16	0.813	21	113	188	282	376	753	941	659	753	753	1129	2258	2258
7/8	0.875	22	105	175	262	349	699	874	611	699	699	1048	2096	2096
15/16	0.938	24	98	163	245	326	652	815	571	652	652	978	1957	1957
1	1	25	92	153	229	306	611	764	535	611	611	917	1834	1834
1 1/8	1.125	29	82	136	204	272	544	679	476	544	544	815	1631	1631
1 1/4	1.25	32	73	122	183	245	489	611	428	489	489	734	1468	1468
1 5/16	1.313	33	70	116	175	233	466	582	408	466	466	699	1398	1398
1 3/8	1.375	35	67	111	167	222	445	556	389	445	445	667	1334	1334
1 7/16	1.438	37	64	106	160	213	425	532	372	425	425	638	1276	1276
1 1/2	1.5	38	61	102	153	204	408	510	357	408	408	611	1223	1223
1 9/16	1.563	40	59	98	147	196	391	489	342	391	391	587	1174	1174
1 5/8	1.625	41	56	94	141	188	376	470	329	376	376	564	1129	1129
1 11/16	1.688	43	54	91	136	181	362	453	317	362	362	544	1087	1087
1 3/4	1.75	44	52	87	131	175	349	437	306	349	349	524	1048	1048
1 13/16	1.813	46	51	84	127	169	337	422	295	337	337	506	1012	1012
1 7/8	1.875	48	49	82	122	163	326	408	285	326	326	489	978	978
1 15/16	1.938	49	47	79	118	158	316	394	276	316	316	473	947	947
2	2	51	46	76	115	153	306	382	268	306	306	459	917	917
2 1/4	2.25	57	41	68	102	136	272	340	238	272	272	408	815	815
2 1/2	2.5	64	37	61	92	122	245	306	214	245	245	367	734	734
2 3/4	2.75	70	33	56	83	111	222	278	195	222	222	334	667	667
3	3	76	31	51	76	102	204	255	178	204	204	306	611	611
3 1/2	3.5	89	26	44	66	87	175	218	153	175	175	262	524	524
4	4	102	23	38	57	76	153	191	134	153	153	229	459	459
4 1/2	4.5	114	20	34	51	68	136	170	119	136	136	204	408	408
5	5	127	18	31	46	61	122	153	107	122	122	183	367	367
5 1/2	5.5	140	17	28	42	56	111	139	97	111	111	167	334	334
6	6	152	15	25	38	51	102	127	89	102	102	153	306	306

Values are in RPM | Values are in RPM

Lathe Bits



Lathe Bit Information

M-2 High-Speed Steel— For general purpose applications and can withstand interrupted cuts. It also has good heat and wear resistance and is easy to grind.

M-3 High-Speed Steel— A little harder to grind than M-2, but has greater resistance to heat and wear. Use on abrasive materials.

M-34 Cobalt High-Speed Steel— Combines good wear resistance and excellent heat resistance. For heavy duty cutting on difficult-to-machine alloys and high-strength steels. It's easy to grind like M-2, but isn't quite as tough. Also effective on softer or gummy materials.

M-42 and M-43 Cobalt High-Speed Steel— Very good wear resistance and stand up to heat better than any other M-series high-speed steel. They're also easy to grind like M-2. Use on high-tensile-strength and heat-resistant super alloys and stainless steels.

Carbide-Tipped— Premium micrograin carbide has high heat resistance and hardness. For hard-to-machine materials. Cannot be used on interrupted cuts.

T-15 High-Speed Steel— Best wear resistance and cutting ability of all high-speed steel materials. It also has good heat resistance and adequate toughness, but is more difficult to grind. This outstanding steel can machine materials from high-tensile-strength steel to cast iron, brass, aluminum, and plastic. Ideal for long-running applications and light cuts at high speeds.

CPM T-15 and CPM 76 High-Speed Steel— Made using a particle metallurgy process instead of wrought bar stock. They have superior toughness, grindability, and overall performance, plus high hardness and wear resistance. *CPM T-15* is easier to grind than T-15. It's designed for heavy cuts at high speeds in materials that are hard and have high abrasion resistance. *CPM 76* is similar to CPM T-15 but has superior heat resistance. It's best for applications requiring high heat resistance, high wear resistance, and good toughness.