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CARBIDE END MILLS

CARBIDE DRILLS

CARBIDE THREAD MILLS

CARBIDE BURS

INDEX

Tolerances for Solid Carbide End Mills

Cutting Diameter: 1/32" through 1/4" +.000 - .002
 17/64" through 1" +.000 - .003

Shank Diameter: h6

General-Purpose End Mills

Features and Benefits of General-Purpose End Mills

- 10% cobalt submicron grain carbide substrate.
- 30° right-hand spiral, right-hand cut helix designed for maximum chip clearance.
- 2-, 3-, and 4-flute configurations available.
- Square end and ball nose end geometries available.
- Multiple lengths in select styles and sizes.
- TiCN-coated tools available in most styles.

Applications for General-Purpose End Mills

- Use in general milling applications in medium to low-carbon steels, cast iron, non-ferrous light metals, and plastics.
- Double-end end mills economically increase productivity.
- 2-flute end mills are generally used for plunging, slotting, and heavy peripheral cuts.
- 3-flute end mills provide a compromise between the chip clearance of a 2-flute tool and the rigidity and wear resistance of a 4-flute tool; especially useful for many slotting operations.
- 4-flute end mills are most commonly used in profiling and in harder materials; stiffer construction results in minimal deflection. They also provide good surface finishes and wear-resistant characteristics for excellent size control.

Cutting Data for General-Purpose Solid Carbide End Mills

Material	Hardness		Surface Feet per Minute	Chip Load per Tooth										
	Brinell	HRc		1/16"	1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"	
low and plain carbon, alloy and tool steels	<220 HB	<19	Low	270	.0004	.0006	.0010	.0015	.0020	.0025	.0030	.0035	.0040	.0045
			High	360										
plain carbon, alloy, and tool steels	225-286	20-30	Low	180	.0004	.0006	.0010	.0015	.0020	.0025	.0030	.0035	.0040	.0045
			High	270										
			Low	135	.0003	.0004	.0007	.0011	.0014	.0018	.0021	.0025	.0028	.0032
			High	180										
austenitic stainless steels 200 and 300 series	135-275	<28	Low	180	.0002	.0004	.0006	.0010	.0015	.0020	.0025	.0030	.0035	.0040
			High	315										
ductile and malleable cast iron	120-320	<35	Low	160	.0003	.0004	.0007	.0011	.0014	.0018	.0021	.0025	.0028	.0032
			High	270										
cast iron (gray)	120-220	<18	Low	315	.0008	.0012	.0020	.0030	.0040	.0050	.0060	.0070	.0080	.0090
			High	450										
			Low	225	.0005	.0007	.0012	.0018	.0024	.0030	.0036	.0042	.0048	.0055
			High	315										
low-silicon aluminum & other non-ferrous alloys	50-150	—	Low	720	.0006	.0010	.0016	.0024	.0032	.0040	.0048	.0560	.0064	.0072
			High	900										
cobalt-based high-temperature alloys	150-425	<45	Low	30	.0004	.0006	.0010	.0015	.0020	.0025	.0030	.0035	.0040	.0045
			High	45										
nickel-based high-temperature alloys	140-300	<32	Low	45	.0002	.0004	.0006	.0009	.0012	.0015	.0018	.0021	.0024	.0027
			High	90										
			Low	40	.0002	.0004	.0006	.0009	.0012	.0015	.0018	.0021	.0024	.0027
			High	70										

Higher values for surface speed should be used for radial depths of cut less than 25% of the diameter. Lower values for surface speed should be used for radial depths of cut greater than 25% of the diameter. The above recommendations are for axial lengths of cut not to exceed 1 times the cutter diameter for profiling and .5 times the diameter for slotting.

Recommended speeds above are for uncoated tools only and should be adjusted when using coated tools. Generally, speeds can be increased by the following factors:

- TiCN-coated tools – 20-25% increase
- TiAlN-coated tools – 40-50% increase

The above speeds are a recommended starting point only. If the tool is working well, without vibrations or significant noise, increase the SFM in 5-10% increments. Ultimate speeds will depend upon setup conditions. Higher or lower parameters may be required to achieve optimum conditions.

Single End General-Purpose

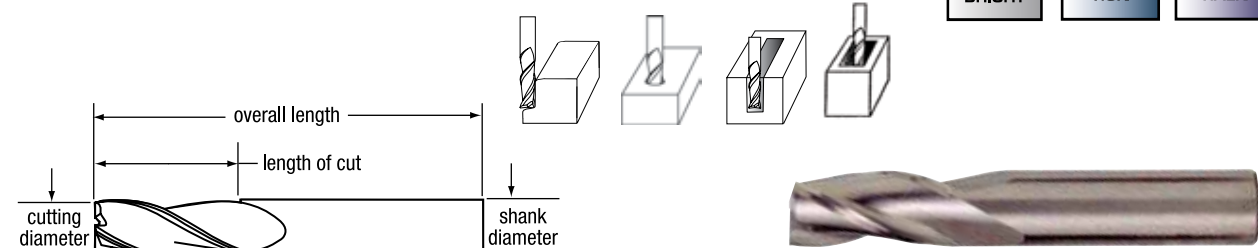
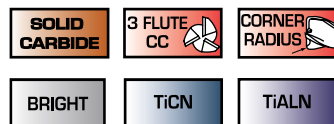


Series MSE-3

Applications



Features



	cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	EDP number		
	fractional	decimal	metric						bright	TiCN	TiAlN
1/16	.0625	1.59	1/8	1/4	1 1/2	3	0.000	B27104	B37104	B67104	
5/64	.0781	1.98	1/8	1/4	1 1/2	3	0.000	B27105	B37105	B67105	
3/32	.0938	2.38	1/8	3/8	1 1/2	3	0.000	B27106	B37106	B67106	
7/64	.1094	2.78	1/8	3/8	1 1/2	3	0.000	B27107	B37107	B67107	
1/8	.1250	3.18	1/8	1/2	1 1/2	3	0.000	B27108	B37108	B67108	
1/8	.1250	3.18	1/8	1/2	1 1/2	3	0.010	B27200	B37200	B67200	
9/64	.1406	3.57	3/16	9/16	2	3	0.000	B27109	B37109	B67109	
5/32	.1562	3.97	3/16	9/16	2	3	0.000	B27110	B37110	B67110	
11/64	.1719	4.37	3/16	5/8	2	3	0.000	B27111	B37111	B67111	
3/16	.1875	4.76	3/16	5/8	2	3	0.000	B27112	B37112	B67112	
3/16	.1875	4.76	3/16	5/8	2	3	0.010	B27201	B37201	B67201	
13/64	.2031	5.16	1/4	5/8	2 1/2	3	0.000	B27113	B37113	B67113	
7/32	.2188	5.56	1/4	5/8	2 1/2	3	0.000	B27114	B37114	B67114	
15/64	.2344	5.95	1/4	3/4	2 1/2	3	0.000	B27115	B37115	B67115	
1/4	.2500	6.35	1/4	3/4	2 1/2	3	0.000	B27116	B11971	B67116	
1/4	.2500	6.35	1/4	3/4	2 1/2	3	0.020	B27202	B37202	B67202	
1/4	.2500	6.35	1/4	3/4	2 1/2	3	0.030	B27203	B37203	B67203	
17/64	.2656	6.75	5/16	3/4	2 1/2	3	0.000	B27117	B37117	B67117	
9/32	.2812	7.14	5/16	3/4	2 1/2	3	0.000	B27118	B37118	B67118	
5/16	.3125	7.94	5/16	13/16	2 1/2	3	0.000	B27120	B11972	B67120	
5/16	.3125	7.94	5/16	13/16	2 1/2	3	0.020	B27205	B37205	B67205	
5/16	.3125	7.94	5/16	13/16	2 1/2	3	0.030	B27206	B37206	B67206	
3/8	.3750	9.53	3/8	7/8	2 1/2	3	0.000	B27124	B11973	B67124	
3/8	.3750	9.53	3/8	7/8	2 1/2	3	0.020	B27208	B37208	B67208	
3/8	.3750	9.53	3/8	7/8	2 1/2	3	0.030	B27209	B37209	B67209	
3/8	.3750	9.53	3/8	7/8	2 1/2	3	0.045	B27210	B37210	B67210	
7/16	.4375	11.11	7/16	7/8	2 1/2	3	0.000	B27128	B11974	B67128	
1/2	.5000	12.70	1/2	1	3	3	0.000	B27132	B11975	B67132	
1/2	.5000	12.70	1/2	1	3	3	0.030	B27212	B37212	B67212	
1/2	.5000	12.70	1/2	1	3	3	0.060	B27213	B37213	B67213	
1/2	.5000	12.70	1/2	1	3	3	0.090	B27214	B37214	B67214	
9/16	.5625	14.29	9/16	1 1/4	3	3	0.000	B27136	B37136	B67136	
5/8	.6250	15.88	5/8	1 1/4	3 1/2	3	0.000	B27140	B11976	B67140	
5/8	.6250	15.88	5/8	1 1/4	3 1/2	3	0.030	B27216	B37216	B67216	
5/8	.6250	15.88	5/8	1 1/4	3 1/2	3	0.060	B27217	B37217	B67217	
5/8	.6250	15.88	5/8	1 1/4	3 1/2	3	0.090	B27218	B37218	B67218	
3/4	.7500	19.05	3/4	1 1/2	4	3	0.000	B27148	B11977	B67148	
3/4	.7500	19.05	3/4	1 1/2	4	3	0.030	B27220	B37220	B67220	
3/4	.7500	19.05	3/4	1 1/2	4	3	0.060	B27221	B37221	B67221	
3/4	.7500	19.05	3/4	1 1/2	4	3	0.090	B27222	B37222	B67222	
7/8	.8750	22.23	7/8	1 1/2	4	3	0.000	B27156	B11986	B67156	
1	1.0000	25.40	1	1 1/2	4	3	0.000	B27164	B11978	B67164	
1	1.0000	25.40	1	1 1/2	4	3	0.030	B27224	B37224	B67224	
1	1.0000	25.40	1	1 1/2	4	3	0.060	B27225	B37225	B67225	
1	1.0000	25.40	1	1 1/2	4	3	0.090	B27226	B37226	B67226	

Single End General-Purpose

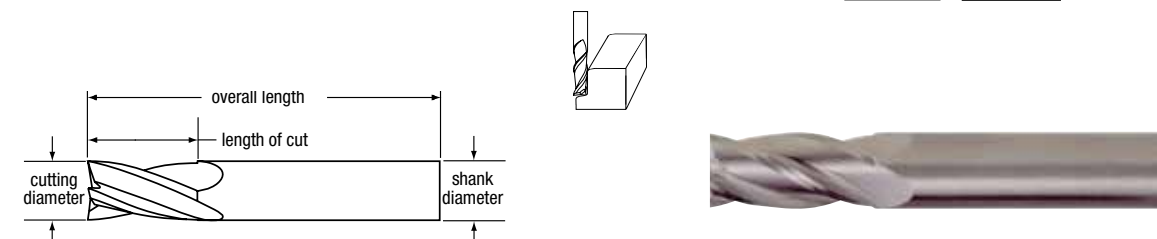
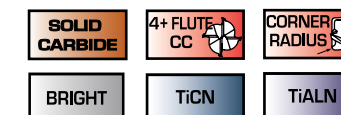


Series MSE-4

Applications



Features



	cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	EDP number		
	fractional	decimal	metric						bright	TiCN	TiAlN
1/32	.0312	0.79	1/8	1/16	1 1/2	4	0.000	B52643	-----	B69643	
1/32	.0312	0.79	1/8	1/8	1 1/2	4	0.000	B52641	B01636	B69641	
3/64	.0469	1.19	1/8	1/8	1 1/2	4	0.000	B52642	B01637	B69642	
1/16	.0625	1.59	1/8	1/8	1 1/2	4	0.000	B52644	B01638	B69644	
1/16	.0625	1.59	1/8	1/4	1 1/2	4	0.000	B52101	B01475	B69101	
1/16	.0625	1.59	1/8	1/4	1 1/2	4	0.010	B52645	-----	B69645	
5/64	.0781	1.98	1/8	1/4	1 1/2	4	0.000	B52102	B01476	B69102	
3/32	.0938	2.38	1/8	1/4	1 1/2	4	0.000	B52646	B01639	B69646	
3/32	.0938	2.38	1/8	3/8	1 1/2	4	0.000	B52104	B01477	B69104	
3/32	.0938	2.38	1/8	3/8	1 1/2	4	0.010	B52106	-----	B69106	
3/32	.0938	2.38	1/8	3/8	1 1/2	4	0.020	B52190	-----	B69157	
7/64	.1094	2.78	1/8	1/4	1 1/2	4	0.000	B52118	-----	B62118	
7/64	.1094	2.78	1/8	3/8	1 1/2	4	0.000	B52105	B01478	B69105	
1/8	.1250	3.18	1/8	1/4	1 1/2	4	0.000	B52648	B01640	B69648	
1/8	.1250	3.18	1/8	1/2	1 1/2	4	0.000	B52107	B01479	B69107	
1/8	.1250	3.18	1/8	1/2	1 1/2	4	0.010	B52160	B01750	B69160	
1/8	.1250	3.18	1/8	1/2	1 1/2	4	0.015	B52191	-----	B69158	
1/8	.1250	3.18	1/8	1/2	1 1/2	4	0.020	B52095	-----	B62095	
1/8	.1250	3.18	1/8	1/2	1 1/2	4	0.030	B52192	-----	B69159	
1/8	.1250	3.18	1/8	3/4	2 1/4	4	0.000	B51250	B01343	B68250	
1/8	.1250	3.18	1/8	1	3	4	0.000	B51450	B01399	B68450	
1/8	.1250	3.18	1/8	1	3	4	0.045	B52096	-----	B62096	
9/64	.1406	3.57	3/16	9/16	2	4	0.000	B52108	B01480	B69108	
5/32	.1562	3.97	3/16	5/16	2	4	0.000	B52650	B01641	B69650	
5/32	.1562	3.97	3/16	9/16	2	4	0.000	B52110	B01481	B69110	
11/64	.1719	4.37	3/16	5/8	2	4	0.000	B52111	B01482	B69111	
3/16	.1875	4.76	3/16	5/16	2	4	0.000	B52652	B01642	B69652	
3/16	.1875	4.76	3/16	5/8	2	4	0.000	B52113	B01483	B69113	
3/16	.1875	4.76	3/16	5/8	2	4	0.010	B52162	B01751	B69162	
3/16	.1875	4.76	3/16	5/8	2	4	0.015	B52087	-----	B62087	
3/16	.1875	4.76	3/16	5/8	2	4	0.020	B52088	-----	B62088	
3/16	.1875	4.76	3/16	5/8	2	4	0.030	B52089	-----	B62089	
3/16	.1875	4.76	3/16	3/4	2 1/2	4	0.000	B51252	B01344	B68252	
3/16	.1875	4.76	3/16	1	3	4	0.000	B52090	-----	B62090	
3/16	.1875	4.76	3/16	1	3	4	0.045	B52193	-----	B69163	
3/16	.1875	4.76	3/16	1	4	4	0.000	B51451	-----	B68451	
3/16	.1875	4.76	3/16	1	4	4	0.045	B52091	-----	B62091	
3/16	.1875	4.76	3/16	1 1/8	3	4	0.000	B51452	B01400	B68452	

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Single End General-Purpose



Series MSE-4 (continued)

	cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	EDP number		
	fractional	decimal	metric						bright	TiCN	TiAlN
	13/64	.2031	5.16	1/4	5/8	2 1/2	4	0.000	B52114	B01484	B69114
	7/32	.2188	5.56	1/4	5/8	2 1/2	4	0.000	B52116	B01485	B69116
	15/64	.2344	5.95	1/4	3/4	2 1/2	4	0.000	B52117	B01486	B69117
	6mm	.2362	6.00	6mm	32mm	100mm	4	0.000	B52194	-----	B69115
	1/4	.2500	6.35	1/4	1/2	2	4	0.000	B52657	B01644	B69657
	1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.000	B52120	B01487	B69120
	1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.010	B52092	-----	B62092
	1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.015	B52093	-----	B62093
	1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.020	B52164	B01752	B69164
	1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.030	B52165	B01753	B69165
	1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.045	B69118	-----	B69119
	1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.060	B52195	-----	B69122
	1/4	.2500	6.35	1/4	1 1/8	3	4	0.000	B51254	B01340	B68254
	1/4	.2500	6.35	1/4	1 1/2	4	4	0.000	B51454	B01732	B68454
	1/4	.2500	6.35	1/4	1 1/2	6	4	0.000	B51455	B01402	B68455
	17/64	.2656	6.75	5/16	3/4	2 1/2	4	0.000	B52121	B01730	B69121
	9/32	.2812	7.14	5/16	3/4	2 1/2	4	0.000	B52123	B01489	B69123
	19/64	.2969	7.54	5/16	7/8	2 1/2	4	0.000	B52196	-----	B69124
	5/16	.3125	7.94	5/16	1/2	2	4	0.000	B52659	B01645	B81587
	5/16	.3125	7.94	5/16	13/16	2 1/2	4	0.000	B52126	B01491	B69126
	5/16	.3125	7.94	5/16	13/16	2 1/2	4	0.020	B52167	B01755	B69167
	5/16	.3125	7.94	5/16	13/16	2 1/2	4	0.030	B52168	B01756	B69168
	5/16	.3125	7.94	5/16	1	3	4	0.000	B52097	-----	B68457
	5/16	.3125	7.94	5/16	1 1/8	3	4	0.000	B51256	B01347	B68256
	5/16	.3125	7.94	5/16	1 5/8	4	4	0.000	B51456	B01403	B68456
	21/64	.3281	8.33	3/8	7/8	2 1/2	4	0.000	B51475	-----	B68475
	11/32	.3438	8.73	3/8	7/8	2 1/2	4	0.000	B51476	-----	B69129
	23/64	.3594	9.13	3/8	7/8	2 1/2	4	0.000	B51477	-----	B68477
	3/8	.3750	9.53	3/8	5/8	2	4	0.000	B52661	B01646	B81588
	3/8	.3750	9.53	3/8	1	2 1/2	4	0.000	B52132	B01495	B69132
	3/8	.3750	9.53	3/8	1	2 1/2	4	0.010	B52430	-----	B69130
	3/8	.3750	9.53	3/8	1	2 1/2	4	0.015	B52431	-----	B69131
	3/8	.3750	9.53	3/8	1	2 1/2	4	0.020	B52170	B01758	B69170
	3/8	.3750	9.53	3/8	1	2 1/2	4	0.030	B52171	B01759	B69171
	3/8	.3750	9.53	3/8	1	2 1/2	4	0.045	B52172	B01760	B69172
	3/8	.3750	9.53	3/8	1	2 1/2	4	0.060	B52134	-----	B69134
	3/8	.3750	9.53	3/8	1	4	4	0.000	B52472	-----	B68472
	3/8	.3750	9.53	3/8	1	4	4	0.020	B52436	-----	B69136
	3/8	.3750	9.53	3/8	1 1/8	3	4	0.000	B51258	B01348	B68258
	3/8	.3750	9.53	3/8	1 3/4	4	4	0.000	B51458	B01733	B68458
	3/8	.3750	9.53	3/8	1 1/2	6	4	0.000	B51459	B01405	B68459
	25/64	.3906	9.92	7/16	7/8	2 3/4	4	0.000	B52274	-----	B61074
	13/32	.4062	10.32	7/16	7/8	2-3/4	4	0.000	B52098	-----	B62098
	27/64	.4218	10.71	7/16	7/8	2-3/4	4	0.000	B52099	-----	B62099
	7/16	.4375	11.11	7/16	5/8	2 1/2	4	0.000	B52663	B01647	B69663
	7/16	.4375	11.11	7/16	1	2 1/2	4	0.000	B52138	B01499	B69138
	7/16	.4375	11.11	7/16	2	4	4	0.000	B51260	B01341	B68260
	7/16	.4375	11.11	7/16	3	6	4	0.000	B51460	B01734	B68460

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Single End General-Purpose



Series MSE-4 (continued)

	cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	EDP number		
	fractional	decimal	metric						bright	TiCN	TiAlN
	29/64	.4531	11.51	1/2	1	3	4	0.000	B52276	-----	B62276
	15/32	.4688	11.91	1/2	1	3	4	0.000	B52277	-----	B62077
	31/64	.4844	12.30	1/2	1	3	4	0.000	B52278	-----	B62078
	1/2	.5000	12.70	1/2	5/8	2 1/2	4	0.000	B52666	B01648	B81590
	1/2	.5000	12.70	1/2	1	3	4	0.000	B52145	B01503	B69145
	1/2	.5000	12.70	1/2	1	3	4	0.015	B52243	-----	B69143
	1/2	.5000	12.70	1/2	1	3	4	0.020	B52244	-----	B69144
	1/2	.5000	12.70	1/2	1	3	4	0.030	B52173	B01762	B69173
	1/2	.5000	12.70	1/2	1	3	4	0.045	B52246	-----	B69146
	1/2	.5000	12.70	1/2	1	3	4	0.060	B52174	B01763	B69174
	1/2	.5000	12.70	1/2	1	3	4	0.090	B52175	B01764	B69175
	1/2	.5000	12.70	1/2	1	3	4	0.125	B52185	-----	B62100
	1/2	.5000	12.70	1/2	2	4	4	0.000	B51262	B01352	B68262
	1/2	.5000	12.70	1/2	3	6	4	0.000	B51462	B01408	B68462
	1/2	.5000	12.70	1/2	1 1/2	6	4	0.000	B51461	B01407	B68461
	9/16	.5625	14.29	9/16	1 1/4	3	4	0.000	B52147	B01765	B69147
	5/8	.6250	15.88	5/8	3/4	3	4	0.000	B52668	B01649	B81591
	5/8	.6250	15.88	5/8	1 1/4	3 1/2	4	0.000	B52149	B01505	B69149
	5/8	.6250	15.88	5/8	1 1/4	3 1/2	4	0.030	B52176	B01766	B69176
	5/8	.6250	15.88	5/8	1 1/4	3 1/2	4	0.060	B52177	B01767	B69177
	5/8	.6250	15.88	5/8	1 1/4	3 1/2	4	0.090	B52178	B01768	B69178
	5/8	.6250	15.88	5/8	2 1/4	5	4	0.000	B51264	B01342	B68264
	5/8	.6250	15.88	5/8	3	6	4	0.000	B51464	B01409	B68464
	3/4	.7500	19.05	3/4	1	3	4	0.000	B52671	B01650	B81592
	3/4	.7500	19.05	3/4	1 1/2	4	4	0.000	B52151	B01506	B69151
	3/4	.7500	19.05	3/4	1 1/2	4	4	0.030	B52179	B01770	B69179
	3/4	.7500	19.05	3/4	1 1/2	4	4	0.060	B52180	B01771	B69180
	3/4	.7500	19.05	3/4	1 1/2	4	4	0.090	B52181	B01772	B69181
	3/4	.7500	19.05	3/4	2 1/4	5	4	0.000	B51266	B01351	B68266
	3/4	.7500	19.05	3/4	3	6	4	0.000	B51466	B01410	B68466
	7/8	.8750	22.23	7/8	1 1/2	4	4	0.000	B52153	B01507	B69153
	7/8	.8750	22.23	7/8	2 1/4	5	4	0.000	B51268	B01355	B68268
	7/8	.8750	22.23	7/8	3	6	4	0.000	B51468	B01735	B68468
	1	1.0000	25.40	1	1 1/2	4	4	0.000	B52157	B01508	B00046
	1	1.0000	25.40	1	1 1/2	4	4	0.030	B52182	B01774	B69182
	1	1.0000	25.40	1	1 1/2	4	4	0.060	B52183	B01775	B69183
	1	1.0000	25.40	1	1 1/2	4	4	0.090	B52184	B01776	B69184
	1	1.0000	25.40	1	2 1/4	5	4	0.000	B51270	B01356	B68270
	1	1.0000	25.40	1	3	6	4	0.000	B51470	B01412	B68470