



Style No.	Flutes	Description	Finish	Page No.
<b>High-Performance Variable Index End Mills</b>				
Operating Parameters				2
MSE-V-4R	.4-flute	.corner radius	bright, TiAlN	3-5
MSE-V-4B	.4-flute	.ball nose	bright, TiAlN	5
MSE-V2-5R	.5-flute	.corner radius	bright, TiAlN	6-8
<b>High-Performance End Mills for Steel and Stainless Steel</b>				
Operating Parameters				9
HPDEM-5	.5-flute	.square end, double end	bright, TiCN, TiAlN	10
HPEM-3	.3-flute	.square end	bright, TiCN, TiAlN	11
HPEM-5	.5-flute	.square end	bright, TiCN, TiAlN	12
HPEM-6	.6-flute	.square end	bright, TiAlN	13
<b>High-Performance End Mills for Aluminum</b>				
Operating Parameters				14
HPAM-2	.2-flute	.square end	bright, TiCN	15
HPAM-3	.3-flute	.square end	bright, TiCN	16
<b>High-Performance Roughing End Mills</b>				
Operating Parameters				17
MRS	.multi-flute	.square end . . . for steel	bright, TiCN	17
MRA	.multi-flute	.square end . . . for aluminum	bright, TiCN	18
<b>General-Purpose End Mills</b>				
Operating Parameters				19
<b>Double End</b>				
MDE-2	.2-flute	.square end	bright, TiCN	20
MDE-2B	.2-flute	.ball nose	bright, TiCN	21
MDE-4	.4-flute	.square end	bright, TiCN	22
MDE-4B	.4-flute	.ball nose	bright, TiCN	23
<b>Single End</b>				
MSE-2	.2-flute	.square end	bright, TiCN	24-25
MSE-2B	.2-flute	.ball nose	bright, TiCN	26-27
MSE-3	.3-flute	.square end	bright, TiCN	28
MSE-4	.4-flute	.square nose	bright, TiCN	29-31
MSE-4B	.4-flute	.ball nose	bright, TiCN	32-33
<b>Straight Flute</b>				
MSEST-2	.2-flute	.square end	bright	34
<b>Engraving Tool</b>				
MEG-2	.2-flute	.ball nose	TiCN	34
<b>Chamfer Tools</b>				
MCH-2R	.2-flute	.single end	bright	35
MCH-2D	.2-flute	.double end	bright	35
MCH-4R	.4-flute	.single end	bright	35
MCH-4D	.4-flute	.double end	bright	35

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

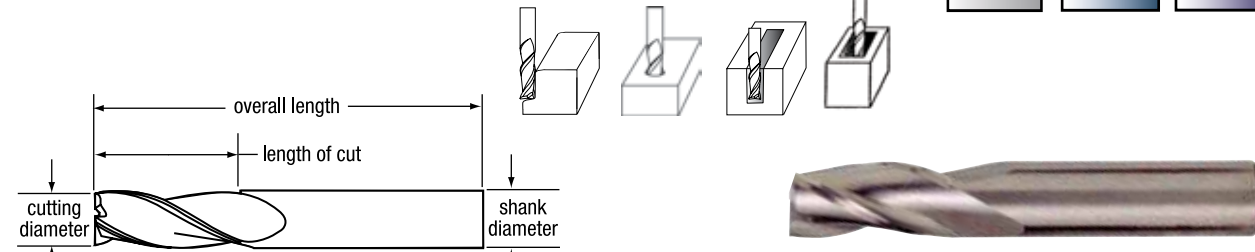
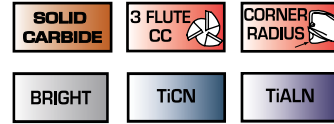


## Series MSE-3

### 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

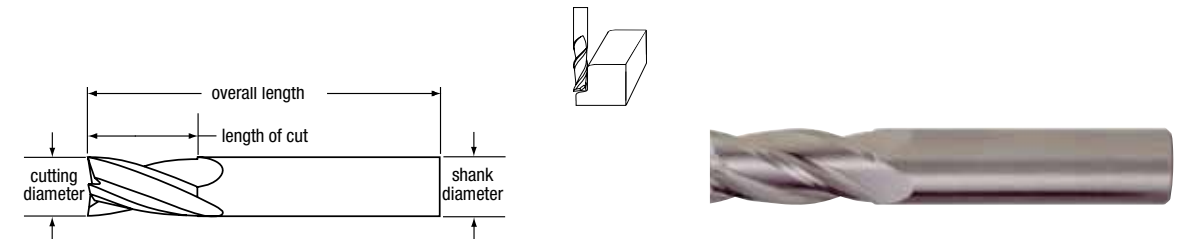
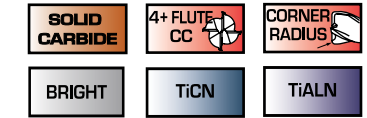


## Series MSE-4

### 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	

continued on next page