

®

C

CLEVELAND

CARBIDE END MILLS
SPECIFICATIONS



FASTENAL®

COATING GUIDE

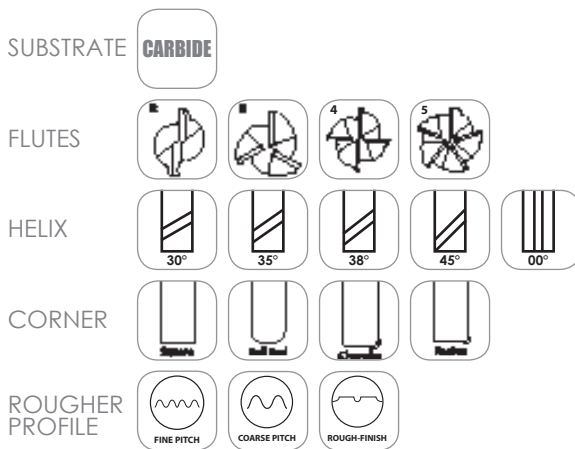


Material	Hardness	TiN	TiCN	TiAlN
Austenitic Stainless Steel	< 35 HRc		*	X
Martensitic Stainless Steel	< 35 HRc		*	X
Martensitic Stainless Steel	>= 35 HRc			X
PH Stainless Steel	< 35 HRc		*	X
PH Stainless Steel	<= 35 HRc		*	X
Ni, Co, Fe Based Super Alloys				X
Titanium				X
Alloy Steel	16-23 HRc	*	*	X
Alloy Steel	23-38 HRc	*	*	X
Alloy Steel	> 38 HRc		*	X
Carbon Steel	16-23 HRc	*	*	X
Carbon Steel	23-38 HRc	*	*	X
Carbon Steel	> 38 HRc		*	X
Low Carbon Steel	13-23 HRc	*	*	X
Low Carbon Steel	23-38 HRc	*	*	X
Low Carbon Steel	> 38 HRc		*	X
Gray Cast Iron	18-22 HRc		*	X
Nodular Cast Iron	22-32 HRc	*	X	
Aluminum	< 10% Si	*	X	
Aluminum	> 10% Si	*	X	
Hardened Steel	>45 HRc			

Additional coating upon request.

X = BEST Performance X₁ = SPECIFIC applications * = Additional recommended coating options

ICON GLOSSARY



ISO MATERIAL GROUP

CODE	MATERIAL GROUP	MATERIAL SELECTION
P	Steels	Carbon Steel, Alloy Steels 1018, 1045, 4140, D-2
M	Stainless	Martensitic & Austenitic 304, 316, 312, 316L, 421, 420, 17-4PH
H	Hardened Steels	D-2, 4340, H-13
K	Cast Iron	Grey-Cast Iron & Ductile Iron Class-20, (60-40-18)
S	Special Alloys	Inconel, Hastelloy, Titanium, etc. Inconel 718, Hastello B, 6Al-4V
N	Non-Ferrous	Aluminum-6060-T6, 7075, Plastics, Detron, Graphite, Fiberglass

COATINGS



MACHINING



Style No.	Flutes	Description	Finish	Page No.
High-Performance Variable Index End Mills				
Operating Parameters				2
CEM-V-4R	.4-flute	.corner radius	bright, TiAlN	3-4
CEM-V-4B	.4-flute	.ball nose	bright, TiAlN	5
CEM-V2-5R	.5-flute	.corner radius	bright, TiAlN	6-7
High-Performance End Mills for Steel and Stainless Steel				
Operating Parameters				8
CEM-HPDE-5	.5-flute	.square end, double end	bright, TiAlN	9
CEM-EMS-3	.3-flute	.square end	bright, TiAlN	10
CEM-EMS-5	.5-flute	.square end	bright, TiAlN	11
High-Performance End Mills for Aluminum				
Operating Parameters				12
CEM-AM2	.2-flute	.square end	bright, TiCN	13
CEM-AM3	.3-flute	.square end	bright, TiCN	14
High-Performance Roughing End Mills				
Operating Parameters				15
CEM-RS	.multi-flute	.square end . . . for steel	bright, TiAlN	15
CEM-RA	.multi-flute	.square end . . . for aluminum	bright, TiCN	16
General-Purpose End Mills				
Operating Parameters				17
Double End				
CEM-DE2	.2-flute	.square end	bright, TiAlN	18
CEM-DE2B	.2-flute	.ball nose	bright, TiAlN	18
CEM-DE4	.4-flute	.square end	bright, TiAlN	19
CEM-DE4B	.4-flute	.ball nose	bright, TiAlN	19
Single End				
CEM-SE2	.2-flute	.square end	bright, TiAlN	20-21
CEM-SE2B	.2-flute	.ball nose	bright, TiAlN	22-23
CEM-SE3	.3-flute	.square end	bright, TiAlN	24
CEM-SE4	.4-flute	.square nose	bright, TiAlN	25-27
CEM-SE4B	.4-flute	.ball nose	bright, TiAlN	28-29
Straight Flute				
CEM-SEST2	.2-flute	.square end	bright	30
Engraving Tool				
CEM-EG2	.2-flute	.ball nose	TiCN	30
Chamfer Tools				
CEM-CH2R	.2-flute	.single end	bright	31
CEM-CH2D	.2-flute	.double end	bright	31
CEM-CH4R	.4-flute	.single end	bright	31
CEM-CH4D	.4-flute	.double end	bright	31

TOLERANCES FOR SOLID CARBIDE END MILLS

Cutting Diameter:

1/32" through 1/4" +.000 -.002

17/64" through 1" +.000 -.003

Shank Diameter (h6):

+.0000 -.0005

Operating Parameters for Series CEM-V-4* Variable Index End Mills

regular and stub length

side milling axial 1.5 x D • side milling radial .5 x D • slotting axial 1 x D

INCH SIZES	Speed	feed per tooth (inches)								
	sfm	5/32	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
easy to cut stainless steel (303)	340	0.0010	0.0012	0.0016	0.0020	0.0024	0.0026	0.0028	0.0028	0.0030
moderately difficult to cut stainless (304)	290	0.0008	0.0010	0.0014	0.0018	0.0020	0.0022	0.0024	0.0026	0.0028
difficult to cut stainless steels (316L)	240	0.0006	0.0010	0.0012	0.0016	0.0018	0.0020	0.0022	0.0024	0.0024
soft steels (1020)	600	0.0010	0.0012	0.0016	0.0024	0.0024	0.0028	0.0030	0.0031	0.0039
titanium alpha beta alloys (Ti6Al4V)	200	0.0005	0.0006	0.0008	0.0012	0.0012	0.0016	0.0018	0.0020	0.0028
gray cast iron (GG)	600	0.0010	0.0012	0.0016	0.0024	0.0024	0.0028	0.0030	0.0031	0.0039

long length

side milling axial 1.3 x D • side milling radial .2 - .3 x D • slotting axial .3 - .5 x D

INCH SIZES	Speed	feed per tooth (inches)								
	sfm	5/32	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
easy to cut stainless steel (303)	340	0.0009	0.0011	0.0014	0.0018	0.0022	0.0023	0.0025	0.0025	0.0027
moderately difficult to cut stainless (304)	290	0.0007	0.0009	0.0013	0.0016	0.0018	0.0020	0.0022	0.0023	0.0025
difficult to cut stainless steel (316L)	240	0.0005	0.0009	0.0011	0.0014	0.0016	0.0018	0.0020	0.0022	0.0022
soft steels (1020)	600	0.0009	0.0011	0.0014	0.0022	0.0022	0.0025	0.0027	0.0028	0.0035
titanium alpha beta alloys (Ti6Al4V)	200	0.0005	0.0005	0.0007	0.0011	0.0011	0.0014	0.0016	0.0018	0.0025
gray cast iron (GG)	600	0.0009	0.0011	0.0014	0.0022	0.0022	0.0025	0.0027	0.0028	0.0035

Operating Parameters for Series CEM-V2-5* Variable Index End Mills

**ENHANCED
GEOMETRY**

side milling axial 1.5 x D • side milling radial 0.5 x D • slotting axial 1 x D

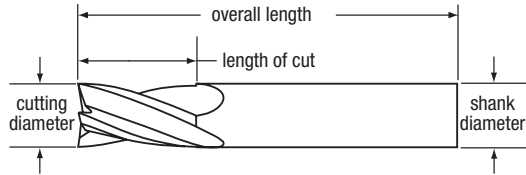
INCH SIZES material	speed	chip load per tooth (inches)							
	sfm	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1
medium and high carbon steels >0.3% C	600-750	0.0015	0.0021	0.0023	0.0026	0.0028	0.0030	0.0031	0.0039
alloy steels and tool steels <330HB, <35HRc	600-700	0.0011	0.0017	0.0020	0.0023	0.0028	0.0030	0.0031	0.0039
alloy steels and tool steels 340-450 HB, 36-48 HRc	525-625	0.0010	0.0015	0.0016	0.0020	0.0028	0.0030	0.0031	0.0039
austenitic stainless steel 302, 303, 304	350-445	0.0011	0.0017	0.0020	0.0023	0.0022	0.0024	0.0026	0.0028
austenitic stainless steel 316, 316L	225-315	0.0009	0.0013	0.0016	0.0019	0.0020	0.0024	0.0024	0.0024
austenitic stainless steel duplex	190-230	0.0008	0.0010	0.0014	0.0015	0.0020	0.0024	0.0024	0.0024
cast iron, gray GG	520-660	0.0014	0.0022	0.0025	0.0030	0.0028	0.0030	0.0031	0.0039
ductile and maleable cast iron CGI < 80 KSI	430-660	0.0009	0.0013	0.0018	0.0019	0.0028	0.0030	0.0031	0.0039
nickel-based heat-resistant alloys	100-160	0.0004	0.0007	0.0011	0.0015	0.0016	0.0019	0.0023	0.0028
alpha-beta titanium alloys Ti6Al4V	195-240	0.0008	0.0010	0.0014	0.0015	0.0016	0.0018	0.0020	0.0028

Series CEM-V-4R

Applications |



Features |



CARBIDE END MILLS

cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiAlN	
								Cleveland	Fastenal	Cleveland	Fastenal
1/8	.1250	3.18	1/8	1/4	1-1/2	4	0.000	C60001	3454633	C80001	3456931
1/8	.1250	3.18	1/8	1/4	1-1/2	4	0.010	C60002	3454634	C80002	3456932
1/8	.1250	3.18	1/8	3/8	1-1/2	4	0.000	C60003	3454635	C80003	3456933
1/8	.1250	3.18	1/8	3/8	1-1/2	4	0.010	C60004	3454636	C80004	3456934
1/8	.1250	3.18	1/8	1/2	1-1/2	4	0.000	C60005	3454637	C80005	3456935
1/8	.1250	3.18	1/8	1/2	1-1/2	4	0.010	C60006	3454638	C80006	3456936
3/16	.1875	4.76	3/16	3/8	2	4	0.000	C60007	3454639	C80007	3456937
3/16	.1875	4.76	3/16	3/8	2	4	0.010	C60008	3454640	C80008	3456938
3/16	.1875	4.76	3/16	7/16	2	4	0.000	C60009	3454641	C80009	3456939
3/16	.1875	4.76	3/16	7/16	2	4	0.010	C60010	3454642	C80010	3456940
3/16	.1875	4.76	3/16	3/4	2-1/2	4	0.000	C60011	3454643	C80011	3456941
3/16	.1875	4.76	3/16	3/4	2-1/2	4	0.010	C60012	3454644	C80012	3456942
1/4	.2500	6.35	1/4	1/2	2	4	0.000	C60013	3454645	C80013	3456943
1/4	.2500	6.35	1/4	1/2	2	4	0.020	C60014	3454646	C80014	3456944
1/4	.2500	6.35	1/4	3/4	2-1/2	4	0.000	C60015	3454647	C80015	3456945
1/4	.2500	6.35	1/4	3/4	2-1/2	4	0.020	C60016	3454648	C80016	3456946
1/4	.2500	6.35	1/4	3/4	2-1/2	4	0.045	C60017	3454649	C80017	3456947
1/4	.2500	6.35	1/4	1-1/8	3	4	0.000	C60018	3454650	C80018	3456948
1/4	.2500	6.35	1/4	1-1/8	3	4	0.020	C60019	3454651	C80019	3456949
1/4	.2500	6.35	1/4	1-1/4	3	4	0.000	C60020	3454652	C80020	3456950
5/16	.3125	7.94	5/16	1/2	2	4	0.000	C60021	3454653	C80021	3456951
5/16	.3125	7.94	5/16	1/2	2	4	0.020	C60022	3454654	C80022	3456952
5/16	.3125	7.94	5/16	13/16	2-1/2	4	0.000	C60023	3454655	C80023	3456953
5/16	.3125	7.94	5/16	13/16	2-1/2	4	0.020	C60024	3454656	C80024	3456954
5/16	.3125	7.94	5/16	1-1/4	3	4	0.000	C60025	3454657	C80025	3456955
5/16	.3125	7.94	5/16	1-1/4	3	4	0.020	C60026	3454658	C80026	3456956
3/8	.3750	9.53	3/8	5/8	2	4	0.000	C60027	3454659	C80027	3456957
3/8	.3750	9.53	3/8	5/8	2	4	0.020	C60028	3454660	C80028	3456958
3/8	.3750	9.53	3/8	7/8	2-1/2	4	0.000	C60029	3454661	C80029	3456959
3/8	.3750	9.53	3/8	7/8	2-1/2	4	0.020	C60030	3454662	C80030	3456960
3/8	.3750	9.53	3/8	1-1/8	3	4	0.000	C60031	3454663	C80031	3456961
3/8	.3750	9.53	3/8	1-1/8	3	4	0.020	C60032	3454664	C80032	3456962
3/8	.3750	9.53	3/8	2	4	4	0.000	C60033	3454665	C80033	3456963
3/8	.3750	9.53	3/8	2	4	4	0.020	C60034	3454666	C80034	3456964
7/16	.4375	11.11	7/16	5/8	2-1/2	4	0.000	C60035	3454667	C80035	3456965
7/16	.4375	11.11	7/16	5/8	2-1/2	4	0.020	C60036	3454668	C80036	3456966
7/16	.4375	11.11	7/16	1	3	4	0.000	C60037	3454669	C80037	3456967
7/16	.4375	11.11	7/16	1	3	4	0.020	C60038	3454670	C80038	3456968
7/16	.4375	11.11	7/16	2	4	4	0.000	C60039	3454671	C80039	3456969
1/2	.5000	12.70	1/2	5/8	2-1/2	4	0.000	C60040	3454672	C80040	3456970
1/2	.5000	12.70	1/2	5/8	2-1/2	4	0.020	C60041	3454673	C80041	3456971

continued on next page

Series CEM-V-4R (continued)

series CEM-V-4H (continued)								order number			
cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	bright		TiALN	
fractional	decimal	metric						Cleveland	Fastenal	Cleveland	Fastenal
1/2	.5000	12.70	1/2	5/8	2-1/2	4	0.030	C60042	3454674	C80042	3456972
1/2	.5000	12.70	1/2	1	3	4	0.000	C60043	3454675	C80043	3456973
1/2	.5000	12.70	1/2	1	3	4	0.030	C60044	3454676	C80044	3456974
1/2	.5000	12.70	1/2	1	3	4	0.060	C60045	3454677	C80045	3456975
1/2	.5000	12.70	1/2	1	3	4	0.090	C60046	3454678	C80046	3456976
1/2	.5000	12.70	1/2	1	3	4	0.125	C60047	3454679	C80047	3456977
1/2	.5000	12.70	1/2	1-1/4	3	4	0.000	C60048	3454680	C80048	3456978
1/2	.5000	12.70	1/2	1-1/4	3	4	0.020	C60049	3454681	C80049	3456979
1/2	.5000	12.70	1/2	1-1/4	3	4	0.030	C60050	3454682	C80050	3456980
1/2	.5000	12.70	1/2	1-1/4	3	4	0.060	C60051	3454683	C80051	3456981
1/2	.5000	12.70	1/2	1-1/4	3	4	0.090	C60052	3454684	C80052	3456982
1/2	.5000	12.70	1/2	1-1/4	3	4	0.125	C60053	3454685	C80053	3456983
1/2	.5000	12.70	1/2	2	4	4	0.000	C60054	3454686	C80054	3456984
1/2	.5000	12.70	1/2	2	4	4	0.030	C60055	3454687	C80055	3456985
1/2	.5000	12.70	1/2	2	4	4	0.060	C60056	3454688	C80056	3456986
1/2	.5000	12.70	1/2	2	4	4	0.090	C60057	3454689	C80057	3456987
1/2	.5000	12.70	1/2	2	4	4	0.125	C60058	3454690	C80058	3456988
5/8	.6250	15.88	5/8	3/4	3	4	0.000	C60059	3454691	C80059	3456989
5/8	.6250	15.88	5/8	3/4	3	4	0.030	C60060	3454692	C80060	3456990
5/8	.6250	15.88	5/8	1-1/4	3-1/2	4	0.000	C60061	3454693	C80061	3456991
5/8	.6250	15.88	5/8	1-1/4	3-1/2	4	0.030	C60062	3454694	C80062	3456992
5/8	.6250	15.88	5/8	1-1/4	3-1/2	4	0.060	C60063	3454695	C80063	3456993
5/8	.6250	15.88	5/8	1-1/4	3-1/2	4	0.090	C60064	3454696	C80064	3456994
5/8	.6250	15.88	5/8	1-1/4	3-1/2	4	0.125	C60065	3454697	C80065	3456995
5/8	.6250	15.88	5/8	2-1/4	5	4	0.000	C60066	3454698	C80066	3456996
5/8	.6250	15.88	5/8	2-1/4	5	4	0.030	C60067	3454699	C80067	3456997
5/8	.6250	15.88	5/8	2-1/4	5	4	0.060	C60068	3454700	C80068	3456998
5/8	.6250	15.88	5/8	2-1/4	5	4	0.090	C60069	3454701	C80069	3456999
5/8	.6250	15.88	5/8	2-1/4	5	4	0.125	C60070	3454702	C80070	3457000
3/4	.7500	19.05	3/4	7/8	3	4	0.030	C60071	3454703	C80071	3457001
3/4	.7500	19.05	3/4	1	3	4	0.000	C60072	3454704	C80072	3457002
3/4	.7500	19.05	3/4	1	3	4	0.030	C60073	3454705	C80073	3457003
3/4	.7500	19.05	3/4	1-1/2	4	4	0.000	C60074	3454706	C80074	3457004
3/4	.7500	19.05	3/4	1-1/2	4	4	0.030	C60075	3454707	C80075	3457005
3/4	.7500	19.05	3/4	1-1/2	4	4	0.060	C60076	3454708	C80076	3457006
3/4	.7500	19.05	3/4	1-1/2	4	4	0.090	C60077	3454709	C80077	3457007
3/4	.7500	19.05	3/4	1-1/2	4	4	0.125	C60078	3454710	C80078	3457008
3/4	.7500	19.05	3/4	2-1/4	5	4	0.000	C60079	3454711	C80079	3457009
3/4	.7500	19.05	3/4	2-1/4	5	4	0.030	C60080	3454712	C80080	3457010
3/4	.7500	19.05	3/4	2-1/4	5	4	0.060	C60081	3454713	C80081	3457011
3/4	.7500	19.05	3/4	2-1/4	5	4	0.090	C60082	3454714	C80082	3457012
3/4	.7500	19.05	3/4	2-1/4	5	4	0.125	C60083	3454715	C80083	3457013
1	1.0000	25.40	1	1-1/2	4	4	0.000	C60084	3454716	C80084	3457014
1	1.0000	25.40	1	1-1/2	4	4	0.030	C60085	3454717	C80085	3457015
1	1.0000	25.40	1	1-1/2	4	4	0.060	C60086	3454718	C80086	3457016
1	1.0000	25.40	1	1-1/2	4	4	0.090	C60087	3454719	C80087	3457017
1	1.0000	25.40	1	1-1/2	4	4	0.125	C60088	3454720	C80088	3457018
1	1.0000	25.40	1	2-1/4	5	4	0.000	C60089	3454721	C80089	3457019
1	1.0000	25.40	1	2-1/4	5	4	0.030	C60090	3454722	C80090	3457020
1	1.0000	25.40	1	2-1/4	5	4	0.060	C60091	3454723	C80091	3457021
1	1.0000	25.40	1	2-1/4	5	4	0.090	C60092	3454724	C80092	3457022
1	1.0000	25.40	1	2-1/4	5	4	0.125	C60093	3454725	C80093	3457023
1	1.0000	25.40	1	3	6	4	0.000	C60094	3454726	C80094	3457024

continued on next page

Series CEM-V-4R (continued)

cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiALN	
								Cleveland	Fastenal	Cleveland	Fastenal
1	1.0000	25.40	1	3	6	4	0.030	C60095	3454727	C80095	3457025
1	1.0000	25.40	1	3	6	4	0.060	C60096	3454728	C80096	3457026
1	1.0000	25.40	1	3	6	4	0.090	C60097	3454729	C80097	3457027
1	1.0000	25.40	1	3	6	4	0.125	C60098	3454730	C80098	3457028

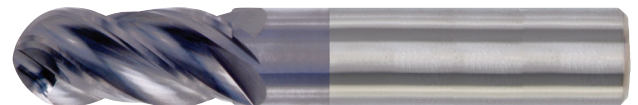
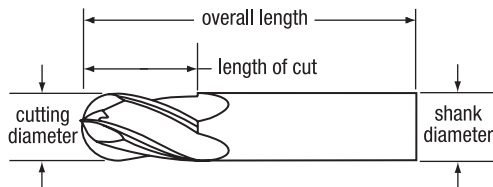
VARIABLE INDEX END MILLS FOR FERROUS MATERIALS

Series CEM-V-4B

Applications |



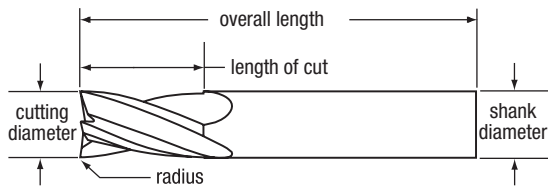
Features |



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	order number			
fractional	decimal	metric					bright		TiALN	
							Cleveland	Fastenal	Cleveland	Fastenal
1/8	.1250	3.18	1/8	3/8	1-1/2	4	C60108	3454738	C80108	3457036
3/16	.1875	4.76	3/16	7/16	2	4	C60109	3454739	C80109	3457037
1/4	.2500	6.35	1/4	3/4	2-1/2	4	C60110	3454740	C80110	3457038
5/16	.3125	7.94	5/16	13/16	2-1/2	4	C60111	3454741	C80111	3457039
3/8	.3750	9.53	3/8	7/8	2-1/2	4	C60112	3454742	C80112	3457040
7/16	.4375	11.11	7/16	1	3	4	C60113	3454743	C80113	3457041
1/2	.5000	12.70	1/2	1	3	4	C60115	3454745	C80115	3457043
5/8	.6250	15.88	5/8	1-1/4	3-1/2	4	C60116	3454746	C80116	3457044
3/4	.7500	19.05	3/4	1-1/2	4	4	C60117	3454747	C80117	3457045
1	1.0000	25.40	1	2-1/4	5	4	C60118	3454748	C80118	3457046

Series **CEM-V2-5R**

Applications |

**IMPROVED GEOMETRY**

Features |



- for slotting up to 1 x D
- minimized chatter from unequal flute spacing
- use one tool for roughing and finishing operations



									order number			
cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius		bright		TiAlN	
fractional	decimal	metric							Cleveland	Fastenal	Cleveland	Fastenal
3/16	.1875	4.76	3/16	3/8	2	5	0.000		C60525	3454946	C80525	3457190
3/16	.1875	4.76	3/16	3/8	2	5	0.010		C60526	3454947	C80526	3457191
3/16	.1875	4.76	3/16	7/16	2	5	0.000		C60527	3454948	C80527	3457192
3/16	.1875	4.76	3/16	7/16	2	5	0.010		C60528	3454949	C80528	3457193
3/16	.1875	4.76	3/16	3/4	2-1/2	5	0.000		C60529	3454950	C80529	3457194
3/16	.1875	4.76	3/16	3/4	2-1/2	5	0.010		C60530	3454951	C80530	3457195
1/4	.2500	6.35	1/4	1/2	2	5	0.000		C60531	3454952	C80531	3457196
1/4	.2500	6.35	1/4	1/2	2	5	0.020		C60532	3454953	C80532	3457197
1/4	.2500	6.35	1/4	3/4	2-1/2	5	0.000		C60533	3454954	C80533	3457198
1/4	.2500	6.35	1/4	3/4	2-1/2	5	0.020		C60534	3454955	C80534	3457199
1/4	.2500	6.35	1/4	1-1/8	3	5	0.010		C60535	3454956	C80535	3457200
1/4	.2500	6.35	1/4	1-1/8	3	5	0.020		C60536	3454957	C80536	3457201
1/4	.2500	6.35	1/4	1-1/4	3	5	0.000		C60537	3454958	C80537	3457202
5/16	.3125	7.94	5/16	1/2	2	5	0.000		C60538	3454959	C80538	3457203
5/16	.3125	7.94	5/16	1/2	2	5	0.020		C60539	3454960	C80539	3457204
5/16	.3125	7.94	5/16	13/16	2-1/2	5	0.000		C60540	3454961	C80540	3457205
5/16	.3125	7.94	5/16	13/16	2-1/2	5	0.020		C60541	3454962	C80541	3457206
5/16	.3125	7.94	5/16	1-1/4	3	5	0.000		C60542	3454963	C80542	3457207
5/16	.3125	7.94	5/16	1-1/4	3	5	0.020		C60543	3454964	C80543	3457208
3/8	.3750	9.53	3/8	1/2	2	5	0.030		C60544	3454965	C80544	3457209
3/8	.3750	9.53	3/8	5/8	2	5	0.000		C60545	3454966	C80545	3457210
3/8	.3750	9.53	3/8	5/8	2	5	0.020		C60546	3454967	C80546	3457211
3/8	.3750	9.53	3/8	7/8	2-1/2	5	0.000		C60547	3454968	C80547	3457212
3/8	.3750	9.53	3/8	7/8	2-1/2	5	0.020		C60548	3454969	C80548	3457213
3/8	.3750	9.53	3/8	1-1/8	3	5	0.000		C60549	3454970	C80549	3457214
3/8	.3750	9.53	3/8	1-1/8	3	5	0.020		C60550	3454971	C80550	3457215
3/8	.3750	9.53	3/8	2	4	5	0.000		C60551	3454972	C80551	3457216
3/8	.3750	9.53	3/8	2	4	5	0.020		C60552	3454973	C80552	3457217
7/16	.4375	11.11	7/16	5/8	2-1/2	5	0.000		C60553	3454974	C80553	3457218
7/16	.4375	11.11	7/16	5/8	2-1/2	5	0.020		C60554	3454975	C80554	3457219
7/16	.4375	11.11	7/16	1	3	5	0.000		C60555	3454976	C80555	3457220
7/16	.4375	11.11	7/16	1	3	5	0.020		C60556	3454977	C80556	3457221
7/16	.4375	11.11	7/16	2	4	5	0.000		C60557	3454978	C80557	3457222
1/2	.5000	12.70	1/2	5/8	2-1/2	5	0.000		C60558	3454979	C80558	3457223
1/2	.5000	12.70	1/2	5/8	2-1/2	5	0.030		C60559	3454980	C80559	3457224
1/2	.5000	12.70	1/2	1	3	5	0.000		C60560	3454981	C80560	3457225
1/2	.5000	12.70	1/2	1	3	5	0.030		C60561	3454982	C80561	3457226
1/2	.5000	12.70	1/2	1	3	5	0.060		C60562	3454983	C80562	3457227
1/2	.5000	12.70	1/2	1	3	5	0.090		C60563	3454984	C80563	3457228

continued on next page

Series CEM-V2-5R (continued)

cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiAlN	
								Cleveland	Fastenal	Cleveland	Fastenal
1/2	.5000	12.70	1/2	1	3	5	0.125	C60564	3454985	C80564	3457229
1/2	.5000	12.70	1/2	1-1/4	3	5	0.000	C60565	3454986	C80565	3457230
1/2	.5000	12.70	1/2	1-1/4	3	5	0.020	C60566	3454987	C80566	3457231
1/2	.5000	12.70	1/2	1-1/4	3	5	0.030	C60567	3454988	C80567	3457232
1/2	.5000	12.70	1/2	1-1/4	3	5	0.060	C60568	3454989	C80568	3457233
1/2	.5000	12.70	1/2	1-1/4	3	5	0.090	C60569	3454990	C80569	3457234
1/2	.5000	12.70	1/2	1-1/4	3	5	0.125	C60570	3454991	C80570	3457235
1/2	.5000	12.70	1/2	2	4	5	0.000	C60571	3454992	C80571	3457236
1/2	.5000	12.70	1/2	2	4	5	0.030	C60572	3454993	C80572	3457237
1/2	.5000	12.70	1/2	2	4	5	0.060	C60573	3454994	C80573	3457238
1/2	.5000	12.70	1/2	2	4	5	0.090	C60574	3454995	C80574	3457239
1/2	.5000	12.70	1/2	2	4	5	0.125	C60575	3454996	C80575	3457240
5/8	.6250	15.88	5/8	3/4	3	5	0.000	C60576	3454997	C80576	3457241
5/8	.6250	15.88	5/8	3/4	3	5	0.030	C60577	3454998	C80577	3457242
5/8	.6250	15.88	5/8	1-1/4	3-1/2	5	0.000	C60578	3454999	C80578	3457243
5/8	.6250	15.88	5/8	1-1/4	3-1/2	5	0.030	C60579	3455000	C80579	3457244
5/8	.6250	15.88	5/8	1-1/4	3-1/2	5	0.060	C60580	3455001	C80580	3457245
5/8	.6250	15.88	5/8	1-1/4	3-1/2	5	0.090	C60581	3455002	C80581	3457246
5/8	.6250	15.88	5/8	1-1/4	3-1/2	5	0.125	C60582	3455003	C80582	3457247
5/8	.6250	15.88	5/8	2-1/4	5	5	0.000	C60583	3455004	C80583	3457248
5/8	.6250	15.88	5/8	2-1/4	5	5	0.030	C60584	3455005	C80584	3457249
5/8	.6250	15.88	5/8	2-1/4	5	5	0.060	C60585	3455006	C80585	3457250
5/8	.6250	15.88	5/8	2-1/4	5	5	0.090	C60586	3455007	C80586	3457251
5/8	.6250	15.88	5/8	2-1/4	5	5	0.125	C60587	3455008	C80587	3457252
3/4	.7500	19.05	3/4	1	3	5	0.000	C60588	3455009	C80588	3457253
3/4	.7500	19.05	3/4	1	3	5	0.030	C60589	3455010	C80589	3457254
3/4	.7500	19.05	3/4	1-1/2	4	5	0.000	C60590	3455011	C80590	3457255
3/4	.7500	19.05	3/4	1-1/2	4	5	0.030	C60591	3455012	C80591	3457256
3/4	.7500	19.05	3/4	1-1/2	4	5	0.060	C60592	3455013	C80592	3457257
3/4	.7500	19.05	3/4	1-1/2	4	5	0.090	C60593	3455014	C80593	3457258
3/4	.7500	19.05	3/4	1-1/2	4	5	0.125	C60594	3455015	C80594	3457259
3/4	.7500	19.05	3/4	2-1/4	5	5	0.000	C60595	3455016	C80595	3457260
3/4	.7500	19.05	3/4	2-1/4	5	5	0.030	C60596	3455017	C80596	3457261
3/4	.7500	19.05	3/4	2-1/4	5	5	0.060	C60597	3455018	C80597	3457262
3/4	.7500	19.05	3/4	2-1/4	5	5	0.090	C60598	3455019	C80598	3457263
3/4	.7500	19.05	3/4	2-1/4	5	5	0.125	C60599	3455020	C80599	3457264
1	1.0000	25.40	1	1-1/2	4	5	0.000	C60600	3455021	C80600	3457265
1	1.0000	25.40	1	1-1/2	4	5	0.030	C60601	3455022	C80601	3457266
1	1.0000	25.40	1	1-1/2	4	5	0.060	C60602	3455023	C80602	3457267
1	1.0000	25.40	1	1-1/2	4	5	0.090	C60603	3455024	C80603	3457268
1	1.0000	25.40	1	1-1/2	4	5	0.125	C60604	3455025	C80604	3457269
1	1.0000	25.40	1	2-1/4	5	5	0.000	C60605	3455026	C80605	3457270
1	1.0000	25.40	1	2-1/4	5	5	0.030	C60606	3455027	C80606	3457271
1	1.0000	25.40	1	2-1/4	5	5	0.060	C60607	3455028	C80607	3457272
1	1.0000	25.40	1	2-1/4	5	5	0.090	C60608	3455029	C80608	3457273
1	1.0000	25.40	1	2-1/4	5	5	0.125	C60609	3455030	C80609	3457274
1	1.0000	25.40	1	3	6	5	0.000	C60610	3455031	C80610	3457275
1	1.0000	25.40	1	3	6	5	0.030	C60611	3455032	C80611	3457276
1	1.0000	25.40	1	3	6	5	0.060	C60612	3455033	C80612	3457277
1	1.0000	25.40	1	3	6	5	0.090	C60613	3455034	C80613	3457278
1	1.0000	25.40	1	3	6	5	0.125	C60614	3455035	C80614	3457279

Operating Parameters: CEM-EMS High-Performance End Mills for Steel

Material	Hardness		Surface Feet per Minute		Chip Load per Tooth		
	Brinell	HRc	Speed Range	SFM	1/32" - 1/4"	1/4" - 1/2"	1/2" - 1"
low alloy steels	<220 HB	<19	Low	600	.0005	.0010	.0020
			High	750	.0010	.0020	.0030
medium alloy steels 01 to 07, W1 to W3, M1 to M3, T1 to T5, A2 to A3, S1 to S7, P2 to P3	225-286	20-30	Low	600	.0003	.0005	.0010
			High	750	.0005	.0010	.0015
high alloy steels M4 to M7, T6 to T15, D2 to D7, A4 to A7, P4	294-371	31-40	Low	525	.0003	.0005	.0008
			High	625	.0005	.0010	.0015
stainless steels 200/300 series	135-275	<28	Low	250	.0005	.0010	.0020
			High	350	.0010	.0020	.0030
stainless steels 400/500 series	135-330	<35	Low	340	.0003	.0008	.0010
			High	400	.0005	.0010	.0015
nickel-based alloys	140-475	<32-50	Low	100	.0005	.0010	.0015
			High	160	.0010	.0015	.0040
titanium alloys	110-450	<48	Low	195	.0005	.0010	.0025
			High	240	.0010	.0030	.0050
inconel	140-475	<48	Low	100	.0005	.0010	.0015
			High	160	.0010	.0015	.0030
aluminum, low silicon	—	—	Low	800	.0030	.0040	.0060
			High	1600	.0040	.0060	.0080

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.

Series CEM-EMS for stainless steels and exotic materials

Features and Benefits of CEM-EMS End Mills

- Maximized strength due to increased cross-sectional area in the core and flute body.
- Combination of micrograin carbide substrate with high-performance coatings.
- Achieve 50% greater chip loads and 20% to 40% higher speeds than conventional end mills.

Applications for CEM-EMS End Mills

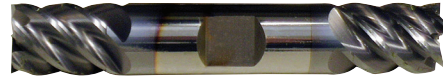
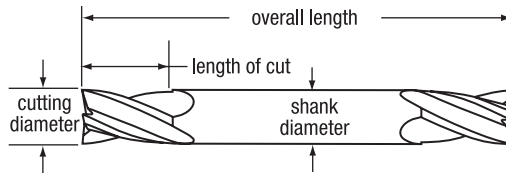
- Designed for cutting applications involving excessive mechanical stress.
- Ideally suited for use in stainless steel and exotics such as hastalloy, waspalloy, and inconel.
- 3-flute square end for pocketing, slotting, or roughing.
- 3-flute ball nose gives enhanced surface finish in contour cutting and rapid chip removal in plunge cutting.
- 5-flute design for profiling and finishing applications.

Series CEM-EMSDE-5 • Double End

Applications |



Features |



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
								bright		TiAlN	
fractional	decimal	metric	diameter					Cleveland	Fastenal	Cleveland	Fastenal
1/8	.1250	3.18	1/8	1/4	1 1/2	5	0.000	C60100	3454731	C80100	3457029
3/16	.1875	4.76	3/16	5/16	2	5	0.000	C60101	3454732	C80101	3457030
1/4	.2500	6.35	1/4	3/8	2 1/2	5	0.000	C60102	3454733	C80102	3457031
5/16	.3125	7.94	5/16	7/16	2 1/2	5	0.000	C60103	3454734	C80103	3457032
3/8	.3750	9.53	3/8	1/2	2 1/2	5	0.000	C60104	3454735	C80104	3457033
7/16	.4375	11.11	7/16	9/16	3	5	0.000	C60105	3454736	C80105	3457034
1/2	.5000	12.70	1/2 *	5/8	3	5	0.000	C60106	3454737	C80106	3457035

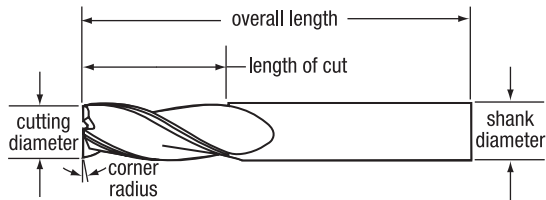
*Weldon shank; all others plain shank

Series **CEM-EMS-3**

Applications |



Features |

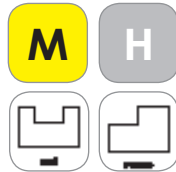


cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number		TiAlN	
fractional	decimal	metric						bright Cleveland	bright Fastenal	Cleveland	Fastenal
1/8	.1250	3.18	1/8	1/4	1 1/2	3	0.010	C60365	3454827	C80365	3457121
1/8	.1250	3.18	1/8	1/2	1 1/2	3	0.010	C60366	3454828	C80366	3457122
5/32	.1562	3.97	3/16	5/16	1 1/2	3	0.010	C60367	3454829	C80367	3457123
5/32	.1562	3.97	3/16	9/16	2	3	0.010	C60368	3454830	C80368	3457124
3/16	.1875	4.76	3/16	5/16	2	3	0.010	C60369	3454831	C80369	3457125
3/16	.1875	4.76	3/16	5/8	2	3	0.010	C60370	3454832	C80370	3457126
7/32	.2188	5.56	1/4	1/2	2	3	0.020	C60371	3454833	C80371	3457127
7/32	.2188	5.56	1/4	3/4	2 1/2	3	0.020	C60372	3454834	C80372	3457128
1/4	.2500	6.35	1/4	3/8	2	3	0.020	C60373	3454835	C80373	3457129
1/4	.2500	6.35	1/4	3/4	2 1/2	3	0.020	C60374	3454836	C80374	3457130
9/32	.2812	7.14	5/16	7/16	2	3	0.020	C60375	3454837	C80375	3457131
9/32	.2812	7.14	5/16	13/16	2 1/2	3	0.020	C60376	3454838	C80376	3457132
5/16	.3125	7.94	5/16	7/16	2	3	0.020	C60377	3454839	C80377	3457133
5/16	.3125	7.94	5/16	13/16	2 1/2	3	0.020	C60378	3454840	C80378	3457134
11/32	.3438	8.73	3/8	1/2	2	3	0.020	C60379	3454841	C80379	3457135
11/32	.3438	8.73	3/8	7/8	2 1/2	3	0.020	C60380	3454842	C80380	3457136
3/8	.3750	9.53	3/8	1/2	2	3	0.020	C60381	3454843	C80381	3457137
3/8	.3750	9.53	3/8	7/8	2 1/2	3	0.020	C60382	3454844	C80382	3457138
13/32	.4062	10.32	7/16	9/16	2 1/2	3	0.020	C60383	3454845	C80383	3457139
13/32	.4062	10.32	7/16	1	2 1/2	3	0.020	C60384	3454846	C80384	3457140
7/16	.4375	11.11	7/16	9/16	2 1/2	3	0.020	C60385	3454847	C80385	3457141
7/16	.4375	11.11	7/16	1	2 1/2	3	0.020	C60386	3454848	C80386	3457142
15/32	.4688	11.91	1/2 *	5/8	2 1/2	3	0.020	C60387	3454849	C80387	3457143
15/32	.4688	11.91	1/2 *	1 1/4	3	3	0.020	C60388	3454850	C80388	3457144
1/2	.5000	12.70	1/2 *	5/8	2 1/2	3	0.030	C60389	3454851	C80389	3457145
1/2	.5000	12.70	1/2 *	1 1/4	3	3	0.030	C60390	3454852	C80390	3457146
5/8	.6250	15.88	5/8 *	3/4	3	3	0.030	C60391	3454853	C80391	3457147
5/8	.6250	15.88	5/8 *	1 5/8	4	3	0.030	C60392	3454854	C80392	3457148
3/4	.7500	19.05	3/4 *	7/8	3	3	0.030	C60393	3454855	C80393	3457149
3/4	.7500	19.05	3/4 *	1 5/8	4	3	0.030	C60394	3454856	C80394	3457150
1	1.0000	25.40	1 *	1 1/8	3	3	0.030	C60395	3454857	C80395	3457151
1	1.0000	25.40	1 *	2	4	3	0.030	C60396	3454858	C80396	3457152

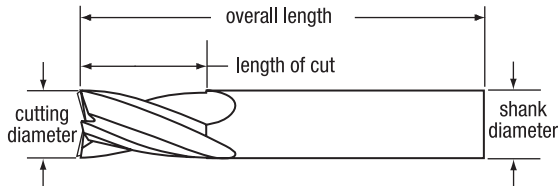
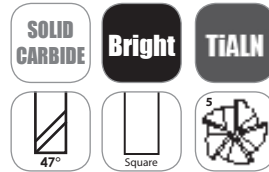
*Weldon shank; all others plain shank

Series CEM-EMS-5

Applications |



Features |



CARBIDE END MILLS

cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiAlN	
								Cleveland	Fastenal	Cleveland	Fastenal
1/8	.1250	3.18	1/8	1/4	1 1/2	5	0.000	C60417	3454859	C80417	3457153
1/8	.1250	3.18	1/8	1/2	1 1/2	5	0.000	C60418	3454860	C80418	3457154
1/8	.1250	3.18	1/8	1/2	2	5	0.000	C60419	3454861	C80419	3457155
5/32	.1562	3.97	3/16	5/16	2	5	0.000	C60420	3454862	C80420	3457156
5/32	.1562	3.97	3/16	9/16	2	5	0.000	C60421	3454863	C80421	3457157
3/16	.1875	4.76	3/16	5/16	2	5	0.000	C60422	3454864	C80422	3457158
3/16	.1875	4.76	3/16	9/16	2	5	0.000	C60423	3454865	C80423	3457159
7/32	.2188	5.56	1/4	3/8	2	5	0.000	C60424	3454866	C80424	3457160
7/32	.2188	5.56	1/4	3/4	2 1/2	5	0.000	C60425	3454867	C80425	3457161
1/4	.2500	6.35	1/4	3/8	2	5	0.000	C60426	3454868	C80426	3457162
1/4	.2500	6.35	1/4	3/4	2 1/2	5	0.000	C60427	3454869	C80427	3457163
1/4	.2500	6.35	1/4	1 1/4	4	5	0.000	C60428	3454870	C80428	3457164
9/32	.2812	7.14	5/16	7/16	2	5	0.000	C60429	3454871	C80429	3457165
9/32	.2812	7.14	5/16	13/16	2 1/2	5	0.000	C60430	3454872	C80430	3457166
5/16	.3125	7.94	5/16	7/16	2	5	0.000	C60431	3454873	C80431	3457167
5/16	.3125	7.94	5/16	13/16	2 1/2	5	0.000	C60432	3454874	C80432	3457168
5/16	.3125	7.94	5/16	1 1/4	4	5	0.000	C60433	3454875	C80433	3457169
3/8	.3750	9.53	3/8	1/2	2	5	0.000	C60434	3454876	C80434	3457170
3/8	.3750	9.53	3/8	7/8	2 1/2	5	0.000	C60435	3454877	C80435	3457171
3/8	.3750	9.53	3/8	1 1/2	4	5	0.000	C60436	3454878	C80436	3457172
7/16	.4375	11.11	7/16	9/16	2 1/2	5	0.000	C60437	3454879	C80437	3457173
7/16	.4375	11.11	7/16	1	2 1/2	5	0.000	C60438	3454880	C80438	3457174
7/16	.4375	11.11	7/16	2	4	5	0.000	C60439	3454881	C80439	3457175
1/2	.5000	12.70	1/2*	5/8	2 1/2	5	0.000	C60440	3454882	C80440	3457176
1/2	.5000	12.70	1/2*	1 1/4	3	5	0.000	C60441	3454883	C80441	3457177
1/2	.5000	12.70	1/2*	2	4	5	0.000	C60442	3454884	C80442	3457178
9/16	.5625	14.29	9/16*	1 1/2	3 1/2	5	0.000	C60443	3454885	C80443	3457179
5/8	.6250	15.88	5/8*	3/4	3	5	0.000	C60444	3454886	C80444	3457180
5/8	.6250	15.88	5/8*	1 5/8	4	5	0.000	C60445	3454887	C80445	3457181
5/8	.6250	15.88	5/8*	2 1/2	5	5	0.000	C60446	3454888	C80446	3457182
3/4	.7500	19.05	3/4*	7/8	3	5	0.000	C60447	3454889	C80447	3457183
3/4	.7500	19.05	3/4*	1 5/8	4	5	0.000	C60448	3454890	C80448	3457184
3/4	.7500	19.05	3/4*	3 1/4	6	5	0.000	C60449	3454891	C80449	3457185
7/8	.8750	22.23	7/8*	2	4	5	0.000	C60450	3454892	C80450	3457186
1	1.0000	25.40	1*	1 1/8	3	5	0.000	C60451	3454893	C80451	3457187
1	1.0000	25.40	1*	2	4	5	0.000	C60452	3454894	C80452	3457188
1	1.0000	25.40	1*	3 1/4	6	5	0.000	C60453	3454895	C80453	3457189

*Weldon shank; all others plain shank

Operating Parameters: CEM-AM High-Performance End Mills for Aluminum

Type of Cut	Aluminum Alloys 6061-T6, 7075-T6, 440, 356, 380, C61300	Depth of Cut % of tool diameter	SFM (speed)	End Mill Diameter Chip Load per Tooth					
				1/4"	3/8"	1/2"	5/8"	3/4"	1"
medium radial 1.0 x dia depth	< 32 HRC	30% x dia. radial	1200 +	.0045	.0071	.0100	.0123	.0149	.0200
	> 32 HRC		600 +	.0036	.0057	.0080	.0098	.0119	.0160
heavy radial 1.0 x dia depth	< 32 HRC	50% x dia. radial	1200 +	.0036	.0057	.0080	.0098	.0119	.016
medium radial 2.0 x dia depth	< 32 HRC	30% x dia. radial	1200 +	.0045	.0071	.0100	.0123	.0149	.0200
	> 32 HRC		600 +	.0036	.0057	.0080	.0098	.0119	.0160
heavy radial 2.0 x dia depth	< 32 HRC	50% x dia. radial	1200 +	.0036	.0057	.0080	.0098	.0119	.0160
finishing medium radial	< 32 HRC	< 25% of dia.	1200 +	.0045	.0071	.0100	.0123	.0149	.0200
	> 32 HRC		600 +	.0036	.0057	.0080	.0098	.0119	.0160
finishing light radial	< 32HRC	< 10% of dia.	1200 +	.0045	.00713	.0100	.01225	.01485	.0200
finishing	< 32 HRC	< .010 radial depth	1200 +	.0054	.0086	.0120	.0147	.0178	.0240
	> 32 HRC		600 +	.0045	.0071	.0100	.0123	.0149	.0200

This chart represents starting points based on a coated tool. Reduce rates up to 50% when using an uncoated tool.

These speed and feed rates are suggested as general guidelines. Machine type, horsepower, spindle speed limitations, toolholding and workholding devices all may impact a cutting tool's ability to perform properly. Greenfield Industries is not responsible for tool failure, part damage, or injury that may be caused by following these general recommendations..

Formulae

$$RPM = (SFM \times 3.82) / \text{tool diameter}$$

$$IPM = \text{number of flutes} \times RPM \times \text{chip load per tooth}$$

Series CEM-AM for aluminum and nonferrous materials

Features and Benefits of CEM-AM End Mills

- Delivers superior performance, providing increased tool life and improved part finish.
- Concentric margins stabilize the tool in the cut and reduce chatter at elevated speeds.
- Greater resistance to chipping with increased feed and speed rates over conventional carbide tools.
- Design incorporates rake enhancements in the flute for improved chip flow and higher feed rates at high and low spindle speeds.
- Tool design eliminates excess pressure that causes chip packing.

Applications for CEM-AM End Mills

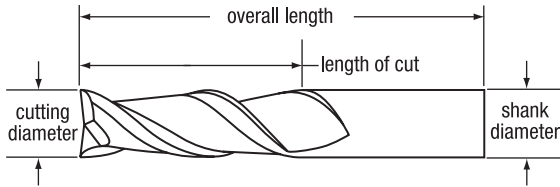
- 2-flute square end offers excellent performance in roughing and finishing, in ramp cutting and in plunging.
- 2-flute ball nose designed for contouring aluminum, copper, and other non-ferrous materials.
- 3-flute square end gives superior surface finishes without sacrificing metal removal rates in high-speed slotting, profiling, and ramping.

Series CEM-AM2 • Square End

Applications |



Features |



CARBIDE END MILLS

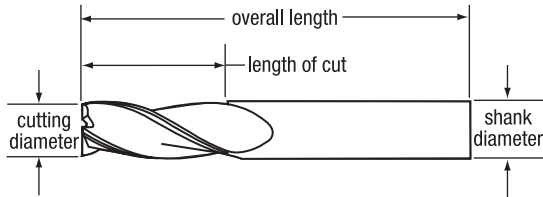
							order number			
cutting diameter			shank diameter	length of cut	overall length	no. of flutes	bright		TiCN	
fractional	decimal	metric					Cleveland	Fastenal	Cleveland	Fastenal
1/8	.1250	3.18	1/8	1/4	1 1/2	2	C60477	3454912	C70477	3456865
1/8	.1250	3.18	1/8	3/8	1 1/2	2	C60478	3454913	C70478	3456866
3/16	.1875	4.76	3/16	5/16	2	2	C60479	3454914	C70479	3456867
3/16	.1875	4.76	3/16	9/16	2	2	C60480	3454915	C70480	3456868
1/4	.2500	6.35	1/4	3/8	2 1/2	2	C60481	3454916	C70481	3456869
1/4	.2500	6.35	1/4	3/4	2 1/2	2	C60482	3454917	C70482	3456870
1/4	.2500	6.35	1/4	1 1/4	3	2	C60483	3454918	C70483	3456871
5/16	.3125	7.94	5/16	7/16	2 1/2	2	C60484	3454919	C70484	3456872
5/16	.3125	7.94	5/16	13/16	2 1/2	2	C60485	3454920	C70485	3456873
5/16	.3125	7.94	5/16	1 1/4	3 1/2	2	C60486	3454921	C70486	3456874
5/16	.3125	7.94	5/16	2 1/8	4	2	C60487	3454922	C70487	3456875
3/8	.3750	9.53	3/8	1/2	2 1/2	2	C60488	3454923	C70488	3456876
3/8	.3750	9.53	3/8	1	2 1/2	2	C60489	3454924	C70489	3456877
3/8	.3750	9.53	3/8	1 1/2	4	2	C60490	3454925	C70490	3456878
3/8	.3750	9.53	3/8	2 1/2	6	2	C60491	3454926	C70491	3456879
7/16	.4375	11.11	7/16	9/16	2 1/2	2	C60492	3454927	C70492	3456880
7/16	.4375	11.11	7/16	1	2 1/2	2	C60493	3454928	C70493	3456881
7/16	.4375	11.11	7/16	2	4	2	C60494	3454929	C70494	3456882
1/2	.5000	12.70	1/2	5/8	3	2	C60495	3454930	C70495	3456883
1/2	.5000	12.70	1/2	1 1/4	3	2	C60496	3454931	C70496	3456884
1/2	.5000	12.70	1/2	2	4	2	C60497	3454932	C70497	3456885
1/2	.5000	12.70	1/2	3 1/8	6	2	C60498	3454933	C70498	3456886
5/8	.6250	15.88	5/8	3/4	3 1/2	2	C60499	3454934	C70499	3456887
5/8	.6250	15.88	5/8	1 5/8	4	2	C60500	3454935	C70500	3456888
5/8	.6250	15.88	5/8	2 1/2	5	2	C60501	3454936	C70501	3456889
5/8	.6250	15.88	5/8	3 3/4	6	2	C60502	3454937	C70502	3456890
3/4	.7500	19.05	3/4	1	4	2	C60503	3454938	C70503	3456891
3/4	.7500	19.05	3/4	1 5/8	4	2	C60504	3454939	C70504	3456892
3/4	.7500	19.05	3/4	3 1/4	6	2	C60505	3454940	C70505	3456893
3/4	.7500	19.05	3/4	4	6 1/2	2	C60506	3454941	C70506	3456894
1	1.0000	25.40	1	1 1/4	5	2	C60507	3454942	C70507	3456895
1	1.0000	25.40	1	2	5	2	C60508	3454943	C70508	3456896
1	1.0000	25.40	1	3 1/4	6	2	C60509	3454944	C70509	3456897
1	1.0000	25.40	1	4 1/8	7	2	C60510	3454945	C70510	3456898

Series CEM-AM3 • Square End

Applications |



Features |



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	order number			
fractional	decimal	metric					bright		TiCN	
							Cleveland	Fastenal	Cleveland	Fastenal
1/8	.1250	3.18	1/8	1/4	1 1/2	3	C60616	3455036	C70616	3456899
1/8	.1250	3.18	1/8	3/8	1 1/2	3	C60617	3455037	C70617	3456900
3/16	.1875	4.76	3/16	5/16	2	3	C60618	3455038	C70618	3456901
3/16	.1875	4.76	3/16	9/16	2	3	C60619	3455039	C70619	3456902
1/4	.2500	6.35	1/4	3/8	2	3	C60620	3455040	C70620	3456903
1/4	.2500	6.35	1/4	5/8	2 1/2	3	C60621	3455041	C70621	3456904
1/4	.2500	6.35	1/4	1 1/4	3	3	C60622	3455042	C70622	3456905
5/16	.3125	7.94	5/16	7/16	2	3	C60623	3455043	C70623	3456906
5/16	.3125	7.94	5/16	5/8	2 1/2	3	C60624	3455044	C70624	3456907
5/16	.3125	7.94	5/16	1 1/4	3 1/2	3	C60625	3455045	C70625	3456908
5/16	.3125	7.94	5/16	2 1/8	4	3	C60626	3455046	C70626	3456909
3/8	.3750	9.53	3/8	1/2	2	3	C60627	3455047	C70627	3456910
3/8	.3750	9.53	3/8	1	2 1/2	3	C60628	3455048	C70628	3456911
3/8	.3750	9.53	3/8	1 1/2	3 1/2	3	C60629	3455049	C70629	3456912
3/8	.3750	9.53	3/8	2 1/2	6	3	C60630	3455050	C70630	3456913
7/16	.4375	11.11	7/16	9/16	2 1/2	3	C60631	3455051	C70631	3456914
7/16	.4375	11.11	7/16	1 1/4	2 1/2	3	C60632	3455052	C70632	3456915
7/16	.4375	11.11	7/16	2	4	3	C60633	3455053	C70633	3456916
1/2	.5000	12.70	1/2	5/8	2 1/2	3	C60634	3455054	C70634	3456917
1/2	.5000	12.70	1/2	1 1/4	3	3	C60635	3455055	C70635	3456918
1/2	.5000	12.70	1/2	2	4	3	C60636	3455056	C70636	3456919
1/2	.5000	12.70	1/2	3 1/8	6	3	C60637	3455057	C70637	3456920
5/8	.6250	15.88	5/8	3/4	3	3	C60638	3455058	C70638	3456921
5/8	.6250	15.88	5/8	1 5/8	4	3	C60639	3455059	C70639	3456922
5/8	.6250	15.88	5/8	2 1/2	5	3	C60640	3455060	C70640	3456923
5/8	.6250	15.88	5/8	3 3/4	6	3	C60641	3455061	C70641	3456924
3/4	.7500	19.05	3/4	1	3	3	C60642	3455062	C70642	3456925
3/4	.7500	19.05	3/4	1 5/8	4	3	C60643	3455063	C70643	3456926
3/4	.7500	19.05	3/4	3 1/4	6	3	C60644	3455064	C70644	3456927
1	1.0000	25.40	1	1 1/4	4	3	C60645	3455065	C70645	3456928
1	1.0000	25.40	1	2	5	3	C60646	3455066	C70646	3456929
1	1.0000	25.40	1	3 1/4	6	3	C60647	3455067	C70647	3456930

Operating Parameters for High-Performance Roughers

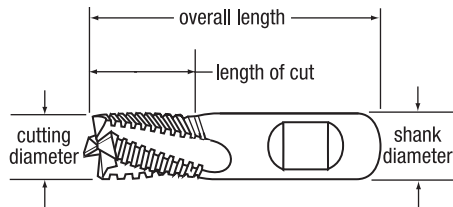
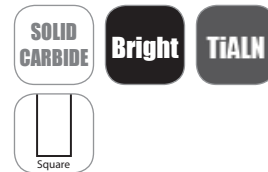
Material	Hardness		Surface Feet per Minute			Chip Load per Tooth	
	Brinell	HRC	Uncoated	TiCN	TiAlN	1/4" to 1/2"	1/2" - 1"
low and plain carbon, alloy, and tool steels	<220 HB	<19	–	325 - 500	430 - 575	.0015 - .0030	.0030 - .0045
plain carbon, alloy and tool steels	225 - 286	20 - 30	–	215 - 375	350 - 430	.0015 - .0030	.0030 - .0045
	294 - 371	31 - 40	–	180 - 280	210 - 320	.0011 - .0021	.0021 - .0032
austenitic stainless steels 200 and 300 series	135 - 275	<28	–	215 - 440	250 - 500	.0010 - .0025	.0025 - .0040
ferritic, martensitic, 400/500 series and PH stainless steels	135 - 330	<35	–	190 - 375	225 - 430	.0015 - .0030	.0030 - .0045
aluminum, low silicon and other non-ferrous alloys	50 -150	600	2000	2400 - 2500	–	.0020 - .0038	.0038 - .0077
aluminum, high silicon			600 - 2000	720 - 2500	–	.0018 - .0035	.0035 - .0071

Series **CEM-RS** Rougher • multi-flute • center cutting • square end

Applications |



Features |



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiAlN	
								Cleveland	Fastenal	Cleveland	Fastenal
1/4	.2500	6.35	1/4*	3/8	2	3	0.000	C60148	3454749	C80148	3457047
1/4	.2500	6.35	1/4*	3/4	2 1/2	3	0.000	C60149	3454750	C80149	3457048
3/8	.3750	9.53	3/8*	1/2	2	4	0.000	C60150	3454751	C80150	3457049
3/8	.3750	9.53	3/8*	7/8	2 1/2	4	0.000	C60151	3454752	C80151	3457050
1/2	.5000	12.70	1/2*	5/8	2 1/2	4	0.000	C60152	3454753	C80152	3457051
1/2	.5000	12.70	1/2*	1	3	4	0.000	C60153	3454754	C80153	3457052
5/8	.6250	15.88	5/8*	3/4	3	4	0.000	C60154	3454755	C80154	3457053
5/8	.6250	15.88	5/8*	1-1/4	3 1/2	4	0.000	C60155	3454756	C80155	3457054
3/4	.7500	19.05	3/4*	7/8	3 1/2	4	0.000	C60156	3454757	C80156	3457055
3/4	.7500	19.05	3/4*	1-1/2	4	4	0.000	C60157	3454758	C80157	3457056
1	1.0000	25.40	1*	1	3 1/2	4	0.000	C60158	3454759	C80158	3457057
1	1.0000	25.40	1*	1-1/2	4	4	0.000	C60159	3454760	C80159	3457058

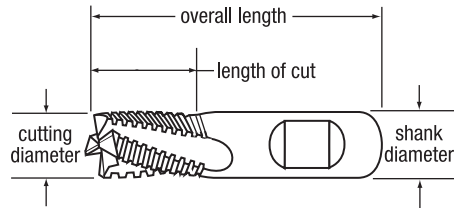
*Weldon shank; all others plain shank

Series CEM-RA Rougher • Square End

Applications |



Features |



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	order number			
fractional	decimal	metric					bright		TiCN	
							Cleveland	Fastenal	Cleveland	Fastenal
1/4	.2500	6.35	1/4*	3/8	2	3	C60455	3454896	C70455	3456849
1/4	.2500	6.35	1/4*	3/4	2 1/2	3	C60456	3454897	C70456	3456850
3/8	.3750	9.53	3/8*	1/2	2	3	C60457	3454898	C70457	3456851
3/8	.3750	9.53	3/8*	7/8	2 1/2	3	C60458	3454899	C70458	3456852
1/2	.5000	12.70	1/2*	5/8	2 1/2	3	C60459	3454900	C70459	3456853
1/2	.5000	12.70	1/2*	1	3	3	C60460	3454901	C70460	3456854
1/2	.5000	12.70	1/2*	2	4 1/2	3	C60461	3454902	C70461	3456855
5/8	.6250	15.88	5/8*	3/4	3	3	C60462	3454903	C70462	3456856
5/8	.6250	15.88	5/8*	1 1/4	3 1/2	3	C60463	3454904	C70463	3456857
5/8	.6250	15.88	5/8*	2 1/4	5	3	C60464	3454905	C70464	3456858
3/4	.7500	19.05	3/4*	1	3 1/2	3	C60465	3454906	C70465	3456859
3/4	.7500	19.05	3/4*	1 1/2	4	3	C60466	3454907	C70466	3456860
3/4	.7500	19.05	3/4*	2 1/4	5	3	C60467	3454908	C70467	3456861
1	1.0000	25.40	1*	1 1/8	3 1/2	3	C60468	3454909	C70468	3456862
1	1.0000	25.40	1*	1 1/2	4	3	C60469	3454910	C70469	3456863
1	1.0000	25.40	1*	2 1/4	5	3	C60470	3454911	C70470	3456864

*Weldon shank; all others plain shank

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.
- TiAlN-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 High	270 360	.0004	.0006	.0010	.0015	.0020	.0025	.0030	.0035	.0040	.0045
plain carbon, alloy, and tool steels	225-286	20-30	Low High	180 270	.0004	.0006	.0010	.0015	.0020	.0025	.0030	.0035	.0040	.0045
	294-371	31-40	Low High	135 180	.0003	.0004	.0007	.0011	.0014	.0018	.0021	.0025	.0028	.0032
austenitic stainless steels 200 and 300 series	135-275	<28	Low High	180 315	.0002	.0004	.0006	.0010	.0015	.0020	.0025	.0030	.0035	.0040
ductile and malleable cast iron	120-320	<35	Low High	160 270	.0003	.0004	.0007	.0011	.0014	.0018	.0021	.0025	.0028	.0032
cast iron (gray)	120-220	<18	Low High	315 450	.0008	.0012	.0020	.0030	.0040	.0050	.0060	.0070	.0080	.0090
	220-320	19-34	Low High	225 315	.0005	.0007	.0012	.0018	.0024	.0030	.0036	.0042	.0048	.0055
low-silicon aluminum & other non-ferrous alloys	50-150	—	Low High	720 900	.0006	.0010	.0016	.0024	.0032	.0040	.0048	.0560	.0064	.0072
cobalt-based high-temperature alloys	150-425	<45	Low High	30 45	.0004	.0006	.0010	.0015	.0020	.0025	.0030	.0035	.0040	.0045
nickel-based high-temperature alloys	140-300	<32	Low High	45 90	.0002	.0004	.0006	.0009	.0012	.0015	.0018	.0021	.0024	.0027
	300-475	32-50	Low High	40 70	.0002	.0004	.0006	.0009	.0012	.0015	.0018	.0021	.0024	.0027

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

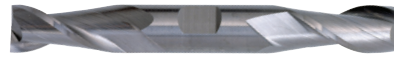
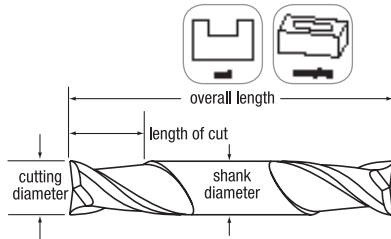
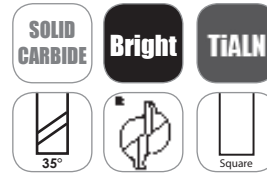
The above speeds are a recommended starting point only. If the tool is working well, without vibrations or significant noise, increase the SFM in 5-10% increments. Ultimate speeds will depend upon setup conditions. Higher or lower parameters may be required to achieve optimum conditions.

Series **CEM-DE2**

Applications |



Features |



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiAlN	
								Cleveland	Fastenal	Cleveland	Fastenal
1/16	.0625	1.59	1/8	1/8	1 1/2	2	0.000	C60169	3454761	C80169	3457059
3/32	.0938	2.38	1/8	3/16	1 1/2	2	0.000	C60170	3454762	C80170	3457060
1/8	.1250	3.18	1/8	1/4	1 1/2	2	0.000	C60171	3454763	C80171	3457061
1/8	.1250	3.18	3/8*	3/8	3	2	0.000	C60172	3454764	C80172	3457062
5/32	.1562	3.97	3/16	5/16	2	2	0.000	C60173	3454765	C80173	3457063
5/32	.1562	3.97	3/8*	7/16	3	2	0.000	C60174	3454766	C80174	3457064
3/16	.1875	4.76	3/16	3/8	2	2	0.000	C60175	3454767	C80175	3457065
3/16	.1875	4.76	3/8*	1/2	3	2	0.000	C60176	3454768	C80176	3457066
7/32	.2188	5.56	3/8*	9/16	3 1/2	2	0.000	C60177	3454769	C80177	3457067
1/4	.2500	6.35	1/4	1/2	2 1/2	2	0.000	C60178	3454770	C80178	3457068
1/4	.2500	6.35	3/8*	5/8	3 1/2	2	0.000	C60179	3454771	C80179	3457069
9/32	.2812	7.14	3/8*	11/16	3 1/2	2	0.000	C60180	3454772	C80180	3457070
5/16	.3125	7.94	3/8*	3/4	3 1/2	2	0.000	C60181	3454773	C80181	3457071
3/8	.3750	9.53	3/8	9/16	3	2	0.000	C60182	3454774	C80182	3457072
3/8	.3750	9.53	3/8*	3/4	3 1/2	2	0.000	C60183	3454775	C80183	3457073
7/16	.4375	11.11	1/2*	7/8	4	2	0.000	C60184	3454776	C80184	3457074
1/2	.5000	12.70	1/2	5/8	3	2	0.000	C60185	3454777	C80185	3457075
1/2	.5000	12.70	1/2*	1	4	2	0.000	C60186	3454778	C80186	3457076

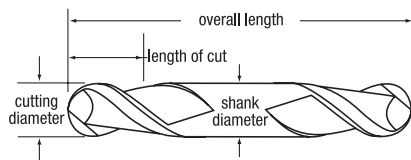
*Weldon shank; all others plain shank

Series **CEM-DE2B**

Applications |



Features |



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	order number			
fractional	decimal	metric					bright		TiAlN	
							Cleveland	Fastenal	Cleveland	Fastenal
1/16	.0625	1.59	1/8	1/8	1 1/2	2	C60205	3454779	C80205	3457077
3/32	.0938	2.38	1/8	3/16	1 1/2	2	C60206	3454780	C80206	3457078
1/8	.1250	3.18	3/8 *	3/8	3	2	C60207	3454781	C80207	3457079
5/32	.1562	3.97	3/8 *	7/16	3	2	C60208	3454782	C80208	3457080
3/16	.1875	4.76	3/8 *	1/2	3	2	C60209	3454783	C80209	3457081
7/32	.2188	5.56	3/8 *	9/16	3 1/2	2	C60210	3454784	C80210	3457082
1/4	.2500	6.35	3/8 *	5/8	3 1/2	2	C60211	3454785	C80211	3457083
9/32	.2812	7.14	3/8 *	11/16	3 1/2	2	C60212	3454786	C80212	3457084
5/16	.3125	7.94	3/8 *	3/4	3 1/2	2	C60213	3454787	C80213	3457085
3/8	.3750	9.53	3/8 *	3/4	3 1/2	2	C60214	3454788	C80214	3457086
7/16	.4375	11.11	1/2 *	7/8	4	2	C60215	3454789	C80215	3457087
1/2	.5000	12.70	1/2 *	1	4	2	C60216	3454790	C80216	3457088

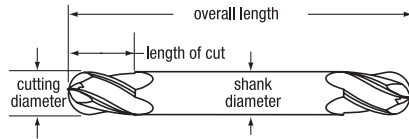
*Weldon shank; all others plain shank

Series CEM-DE4B

Applications |



Features |



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	order number			
fractional	decimal	metric					bright		TiAlN	
							Cleveland	Fastenal	Cleveland	Fastenal
1/16	.0625	1.59	1/8	1/8	1 1/2	4	C60305	3454815	C80305	3457109
3/32	.0938	2.38	1/8	3/16	1 1/2	4	C60306	3454816	C80306	3457110
1/8	.1250	3.18	3/8 *	3/8	3	4	C60307	3454817	C80307	3457111
5/32	.1562	3.97	3/8 *	7/16	3	4	C60308	3454818	C80308	3457112
3/16	.1875	4.76	3/8 *	1/2	3	4	C60309	3454819	C80309	3457113
7/32	.2188	5.56	3/8 *	9/16	3 1/2	4	C60310	3454820	C80310	3457114
1/4	.2500	6.35	3/8 *	5/8	3 1/2	4	C60311	3454821	C80311	3457115
9/32	.2812	7.14	3/8 *	11/16	3 1/2	4	C60312	3454822	C80312	3457116
5/16	.3125	7.94	3/8 *	3/4	3 1/2	4	C60313	3454823	C80313	3457117
3/8	.3750	9.53	3/8 *	3/4	3 1/2	4	C60314	3454824	C80314	3457118
7/16	.4375	11.11	1/2 *	7/8	4	4	C60315	3454825	C80315	3457119
1/2	.5000	12.70	1/2 *	1	4	4	C60316	3454826	C80316	3457120

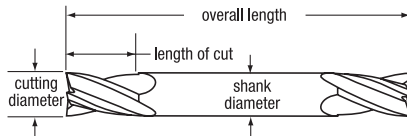
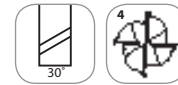
*Weldon shank; all others plain shank

Series CEM-DE4

Applications |



Features |



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiAlN	
								Cleveland	Fastenal	Cleveland	Fastenal
1/16	.0625	1.59	1/8	1/8	1 1/2	4	0.000	C60269	3454795	C80269	3457089
3/32	.0938	2.38	1/8	3/16	1 1/2	4	0.000	C60270	3454796	C80270	3457090
1/8	.1250	3.18	1/8	1/4	1 1/2	4	0.000	C60271	3454797	C80271	3457091
1/8	.1250	3.18	3/16	1/4	2	4	0.000	C60272	3454798	C80272	3457092
1/8	.1250	3.18	3/8 *	7/16	3	4	0.000	C60273	3454799	C80273	3457093
5/32	.1562	3.97	3/16	5/16	2	4	0.000	C60274	3454800	C80274	3457094
5/32	.1562	3.97	3/8 *	7/16	3	4	0.000	C60275	3454801	C80275	3457095
3/16	.1875	4.76	3/16	3/8	2	4	0.000	C60276	3454802	C80276	3457096
3/16	.1875	4.76	3/8 *	1/2	3	4	0.000	C60277	3454803	C80277	3457097
7/32	.2188	5.56	3/8 *	9/16	3 1/2	4	0.000	C60278	3454804	C80278	3457098
1/4	.2500	6.35	1/4	1/2	2 1/2	4	0.000	C60279	3454805	C80279	3457099
1/4	.2500	6.35	3/8 *	5/8	3 1/2	4	0.000	C60280	3454806	C80280	3457100
9/32	.2812	7.14	3/8 *	11/16	3 1/2	4	0.000	C60281	3454807	C80281	3457101
5/16	.3125	7.94	5/16	1/2	2 1/2	4	0.000	C60282	3454808	C80282	3457102
5/16	.3125	7.94	3/8 *	3/4	3 1/2	4	0.000	C60283	3454809	C80283	3457103
3/8	.3750	9.53	3/8	9/16	3	4	0.000	C60284	3454810	C80284	3457104
3/8	.3750	9.53	3/8 *	3/4	3 1/2	4	0.000	C60285	3454811	C80285	3457105
7/16	.4375	11.11	1/2 *	7/8	4	4	0.000	C60286	3454812	C80286	3457106
1/2	.5000	12.70	1/2	5/8	3	4	0.000	C60287	3454813	C80287	3457107
1/2	.5000	12.70	1/2 *	1	4	4	0.000	C60288	3454814	C80288	3457108

*Weldon shank; all others plain shank

Series **CEM-SE2**

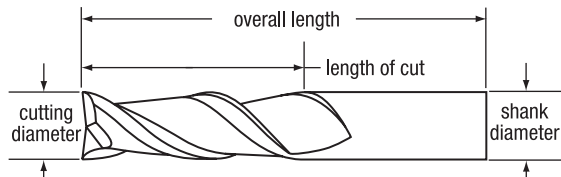
Applications |



Features |



CARBIDE END MILLS



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiAlN	
								Cleveland	Fastenal	Cleveland	Fastenal
1/32	.0312	0.79	1/8	1/8	1 1/2	2	0.000	C61001	3455149	C81001	3457348
3/64	.0469	1.19	1/8	1/8	1 1/2	2	0.000	C61002	3455150	C81002	3457349
1/16	.0625	1.59	1/8	1/8	1 1/2	2	0.000	C61003	3455151	C81003	3457350
1/16	.0625	1.59	1/8	3/16	1 1/2	2	0.000	C61004	3455152	C81004	3457351
5/64	.0781	1.98	1/8	3/16	1 1/2	2	0.000	C61005	3455153	C81005	3457352
3/32	.0938	2.38	1/8	3/16	1 1/2	2	0.000	C61006	3455154	C81006	3457353
3/32	.0938	2.38	1/8	3/8	1 1/2	2	0.000	C61007	3455155	C81007	3457354
7/64	.1094	2.78	1/8	3/8	1 1/2	2	0.000	C61008	3455156	C81008	3457355
1/8	.1250	3.18	1/8	1/4	1 1/2	2	0.000	C61009	3455157	C81009	3457356
1/8	.1250	3.18	1/8	1/2	1 1/2	2	0.000	C61010	3455158	C81010	3457357
1/8	.1250	3.18	1/8	1/2	1 1/2	2	0.010	C61011	3455159	C81011	3457358
1/8	.1250	3.18	1/8	3/4	2 1/4	2	0.000	C61012	3455160	C81012	3457359
1/8	.1250	3.18	1/8	1	3	2	0.000	C61013	3455161	C81013	3457360
9/64	.1406	3.57	3/16	9/16	2	2	0.000	C61014	3455162	C81014	3457361
5/32	.1562	3.97	3/16	9/16	2	2	0.000	C61015	3455163	C81015	3457362
11/64	.1719	4.37	3/16	5/8	2	2	0.000	C61016	3455164	C81016	3457363
3/16	.1875	4.76	3/16	5/16	2	2	0.000	C61017	3455165	C81017	3457364
3/16	.1875	4.76	3/16	5/8	2	2	0.000	C61018	3455166	C81018	3457365
3/16	.1875	4.76	3/16	5/8	2	2	0.010	C61019	3455167	C81019	3457366
3/16	.1875	4.76	3/16	3/4	2 1/2	2	0.000	C61020	3455168	C81020	3457367
3/16	.1875	4.76	3/16	1 1/8	3	2	0.000	C61021	3455169	C81021	3457368
13/64	.2031	5.16	1/4	5/8	2 1/2	2	0.000	C61022	3455170	C81022	3457369
7/32	.2188	5.56	1/4	5/8	2 1/2	2	0.000	C61023	3455171	C81023	3457370
15/64	.2344	5.95	1/4	3/4	2 1/2	2	0.000	C61024	3455172	C81024	3457371
1/4	.2500	6.35	1/4	1/2	2	2	0.000	C61025	3455173	C81025	3457372
1/4	.2500	6.35	1/4	3/4	2 1/2	2	0.000	C61026	3455174	C81026	3457373
1/4	.2500	6.35	1/4	3/4	2 1/2	2	0.020	C61027	3455175	C81027	3457374
1/4	.2500	6.35	1/4	3/4	2 1/2	2	0.030	C61028	3455176	C81028	3457375
1/4	.2500	6.35	1/4	1 1/8	3	2	0.000	C61029	3455177	C81029	3457376
1/4	.2500	6.35	1/4	1 1/2	4	2	0.000	C61030	3455178	C81030	3457377
1/4	.2500	6.35	1/4	1 1/2	6	2	0.000	C61031	3455179	C81031	3457378
17/64	.2656	6.75	5/16	3/4	2 1/2	2	0.000	C61032	3455180	C81032	3457379
9/32	.2812	7.14	5/16	3/4	2 1/2	2	0.000	C61033	3455181	C81033	3457380
5/16	.3125	7.94	5/16	1/2	2	2	0.000	C61034	3455182	C81034	3457381
5/16	.3125	7.94	5/16	13/16	2 1/2	2	0.000	C61035	3455183	C81035	3457382

continued on next page

Series CEM-SE2 (continued)

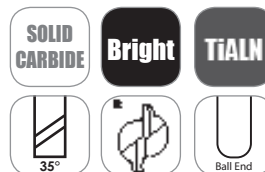
cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiAlN	
								Cleveland	Fastenal	Cleveland	Fastenal
5/16	.3125	7.94	5/16	13/16	2 1/2	2	0.020	C61036	3455184	C81036	3457383
5/16	.3125	7.94	5/16	13/16	2 1/2	2	0.030	C61037	3455185	C81037	3457384
5/16	.3125	7.94	5/16	1 1/8	3	2	0.000	C61038	3455186	C81038	3457385
5/16	.3125	7.94	5/16	1 5/8	4	2	0.000	C61039	3455187	C81039	3457386
3/8	.3750	9.53	3/8	5/8	2	2	0.000	C61040	3455188	C81040	3457387
3/8	.3750	9.53	3/8	1	2 1/2	2	0.000	C61041	3455189	C81041	3457388
3/8	.3750	9.53	3/8	1	2 1/2	2	0.020	C61042	3455190	C81042	3457389
3/8	.3750	9.53	3/8	1	2 1/2	2	0.030	C61043	3455191	C81043	3457390
3/8	.3750	9.53	3/8	1	2 1/2	2	0.045	C61044	3455192	C81044	3457391
3/8	.3750	9.53	3/8	1 1/8	3	2	0.000	C61045	3455193	C81045	3457392
3/8	.3750	9.53	3/8	1 3/4	4	2	0.000	C61046	3455194	C81046	3457393
3/8	.3750	9.53	3/8	1 1/2	6	2	0.000	C61047	3455195	C81047	3457394
7/16	.4375	11.11	7/16	5/8	2 1/2	2	0.000	C61048	3455196	C81048	3457395
7/16	.4375	11.11	7/16	1	2 1/2	2	0.000	C61049	3455197	C81049	3457396
7/16	.4375	11.11	7/16	2	4	2	0.000	C61050	3455198	C81050	3457397
7/16	.4375	11.11	7/16	3	6	2	0.000	C61051	3455199	C81051	3457398
1/2	.5000	12.70	1/2	5/8	2 1/2	2	0.000	C61052	3455200	C81052	3457399
1/2	.5000	12.70	1/2	1	3	2	0.000	C61053	3455201	C81053	3457400
1/2	.5000	12.70	1/2	1	3	2	0.030	C61054	3455202	C81054	3457401
1/2	.5000	12.70	1/2	1	3	2	0.060	C61055	3455203	C81055	3457402
1/2	.5000	12.70	1/2	1	3	2	0.090	C61056	3455204	C81056	3457403
1/2	.5000	12.70	1/2	2	4	2	0.000	C61057	3455205	C81057	3457404
1/2	.5000	12.70	1/2	1 1/2	6	2	0.000	C61058	3455206	C81058	3457405
1/2	.5000	12.70	1/2	3	6	2	0.000	C61059	3455207	C81059	3457406
9/16	.5625	14.29	9/16	1 1/4	3 1/2	2	0.000	C61060	3455208	C81060	3457407
5/8	.6250	15.88	5/8	3/4	3	2	0.000	C61061	3455209	C81061	3457408
5/8	.6250	15.88	5/8	1 1/4	3 1/2	2	0.000	C61062	3455210	C81062	3457409
5/8	.6250	15.88	5/8	1 1/4	3 1/2	2	0.030	C61063	3455211	C81063	3457410
5/8	.6250	15.88	5/8	1 1/4	3 1/2	2	0.060	C61064	3455212	C81064	3457411
5/8	.6250	15.88	5/8	1 1/4	3 1/2	2	0.090	C61065	3455213	C81065	3457412
5/8	.6250	15.88	5/8	2 1/4	5	2	0.000	C61066	3455214	C81066	3457413
5/8	.6250	15.88	5/8	3	6	2	0.000	C61067	3455215	C81067	3457414
3/4	.7500	19.05	3/4	1	3	2	0.000	C61068	3455216	C81068	3457415
3/4	.7500	19.05	3/4	1 1/2	4	2	0.000	C61069	3455217	C81069	3457416
3/4	.7500	19.05	3/4	1 1/2	4	2	0.030	C61070	3455218	C81070	3457417
3/4	.7500	19.05	3/4	1 1/2	4	2	0.060	C61071	3455219	C81071	3457418
3/4	.7500	19.05	3/4	1 1/2	4	2	0.090	C61072	3455220	C81072	3457419
3/4	.7500	19.05	3/4	2 1/4	5	2	0.000	C61073	3455221	C81073	3457420
3/4	.7500	19.05	3/4	3	6	2	0.000	C61074	3455222	C81074	3457421
7/8	.8750	22.23	7/8	1 1/2	4	2	0.000	C61075	3455223	C81075	3457422
7/8	.8750	22.23	7/8	2 1/4	5	2	0.000	C61076	3455224	C81076	3457423
7/8	.8750	22.23	7/8	3	6	2	0.000	C61077	3455225	C81077	3457424
1	1.0000	25.40	1	1 1/2	4	2	0.000	C61078	3455226	C81078	3457425
1	1.0000	25.40	1	1 1/2	4	2	0.030	C61079	3455227	C81079	3457426
1	1.0000	25.40	1	1 1/2	4	2	0.060	C61080	3455228	C81080	3457427
1	1.0000	25.40	1	1 1/2	4	2	0.090	C61081	3455229	C81081	3457428
1	1.0000	25.40	1	2 1/4	5	2	0.000	C61082	3455230	C81082	3457429
1	1.0000	25.40	1	3	6	2	0.000	C61083	3455231	C81083	3457430

Series **CEM-SE2B**

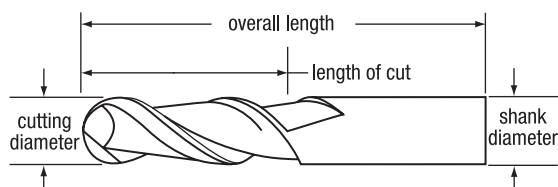
Applications |



Features |



CARBIDE END MILLS



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	order number			
fractional	decimal	metric					bright		TiAlN	
							Cleveland	Fastenal	Cleveland	Fastenal
1/32	.0312	0.79	1/8	1/8	1 1/2	2	C60914	3455088	C80914	3457287
3/64	.0469	1.19	1/8	1/8	1 1/2	2	C60915	3455089	C80915	3457288
1/16	.0625	1.59	1/8	1/8	1 1/2	2	C60916	3455090	C80916	3457289
1/16	.0625	1.59	1/8	3/16	1 1/2	2	C60917	3455091	C80917	3457290
5/64	.0781	1.98	1/8	3/16	1 1/2	2	C60918	3455092	C80918	3457291
3/32	.0938	2.38	1/8	3/8	1 1/2	2	C60919	3455093	C80919	3457292
7/64	.1094	2.78	1/8	3/8	1 1/2	2	C60920	3455094	C80920	3457293
1/8	.1250	3.18	1/8	1/4	1 1/2	2	C60921	3455095	C80921	3457294
1/8	.1250	3.18	1/8	1/2	1 1/2	2	C60922	3455096	C80922	3457295
1/8	.1250	3.18	1/8	3/4	2 1/4	2	C60923	3455097	C80923	3457296
1/8	.1250	3.18	1/8	1	3	2	C60924	3455098	C80924	3457297
9/64	.1406	3.57	3/16	9/16	2	2	C60925	3455099	C80925	3457298
5/32	.1562	3.97	3/16	9/16	2	2	C60926	3455100	C80926	3457299
11/64	.1719	4.37	3/16	5/8	2	2	C60927	3455101	C80927	3457300
3/16	.1875	4.76	3/16	5/16	2	2	C60928	3455102	C80928	3457301
3/16	.1875	4.76	3/16	5/8	2	2	C60929	3455103	C80929	3457302
3/16	.1875	4.76	3/16	3/4	2 1/2	2	C60930	3455104	C80930	3457303
3/16	.1875	4.76	3/16	1 1/8	3	2	C60931	3455105	C80931	3457304
13/64	.2031	5.16	1/4	5/8	2 1/2	2	C60932	3455106	C80932	3457305
7/32	.2188	5.56	1/4	5/8	2 1/2	2	C60933	3455107	C80933	3457306
15/64	.2344	5.95	1/4	3/4	2 1/2	2	C60934	3455108	C80934	3457307
1/4	.2500	6.35	1/4	1/2	2	2	C60935	3455109	C80935	3457308
1/4	.2500	6.35	1/4	3/4	2 1/2	2	C60936	3455110	C80936	3457309
1/4	.2500	6.35	1/4	1 1/8	3	2	C60937	3455111	C80937	3457310
1/4	.2500	6.35	1/4	1 1/2	4	2	C60938	3455112	C80938	3457311
1/4	.2500	6.35	1/4	1 1/2	6	2	C60939	3455113	C80939	3457312
17/64	.2656	6.75	5/16	3/4	2 1/2	2	C60940	3455114	C80940	3457313
9/32	.2812	7.14	5/16	3/4	2 1/2	2	C60941	3455115	C80941	3457314
5/16	.3125	7.94	5/16	1/2	2	2	C60942	3455116	C80942	3457315
5/16	.3125	7.94	5/16	13/16	2 1/2	2	C60943	3455117	C80943	3457316
5/16	.3125	7.94	5/16	1 1/8	3	2	C60944	3455118	C80944	3457317
5/16	.3125	7.94	5/16	1 5/8	4	2	C60945	3455119	C80945	3457318
3/8	.3750	9.53	3/8	5/8	2	2	C60946	3455120	C80946	3457319
3/8	.3750	9.53	3/8	1	2 1/2	2	C60947	3455121	C80947	3457320

continued on next page

Series CEM-SE2B (continued)

cutting diameter			shank diameter	length of cut	overall length	no. of flutes	order number			
fractional	decimal	metric					bright		TiALN	
							Cleveland	Fastenal	Cleveland	Fastenal
3/8	.3750	9.53	3/8	1 1/8	3	2	C60948	3455122	C80948	3457321
3/8	.3750	9.53	3/8	1 3/4	4	2	C60949	3455123	C80949	3457322
3/8	.3750	9.53	3/8	1 1/2	6	2	C60950	3455124	C80950	3457323
7/16	.4375	11.11	7/16	5/8	2 1/2	2	C60951	3455125	C80951	3457324
7/16	.4375	11.11	7/16	7/8	2 1/2	2	C60952	3455126	C80952	3457325
7/16	.4375	11.11	7/16	2	4	2	C60953	3455127	C80953	3457326
7/16	.4375	11.11	7/16	3	6	2	C60954	3455128	C80954	3457327
1/2	.5000	12.70	1/2	5/8	2 1/2	2	C60955	3455129	C80955	3457328
1/2	.5000	12.70	1/2	1	3	2	C60956	3455130	C80956	3457329
1/2	.5000	12.70	1/2	2	4	2	C60957	3455131	C80957	3457330
1/2	.5000	12.70	1/2	3	6	2	C60958	3455132	C80958	3457331
1/2	.5000	12.70	1/2	1 1/2	6	2	C60959	3455133	C80959	3457332
9/16	.5625	14.29	9/16	1 1/4	3 1/2	2	C60960	3455134	C80960	3457333
5/8	.6250	15.88	5/8	3/4	3	2	C60961	3455135	C80961	3457334
5/8	.6250	15.88	5/8	1 1/4	3 1/2	2	C60962	3455136	C80962	3457335
5/8	.6250	15.88	5/8	2 1/4	5	2	C60963	3455137	C80963	3457336
5/8	.6250	15.88	5/8	3	6	2	C60964	3455138	C80964	3457337
3/4	.7500	19.05	3/4	1	3	2	C60965	3455139	C80965	3457338
3/4	.7500	19.05	3/4	1 1/2	4	2	C60966	3455140	C80966	3457339
3/4	.7500	19.05	3/4	2 1/4	5	2	C60967	3455141	C80967	3457340
3/4	.7500	19.05	3/4	3	6	2	C60968	3455142	C80968	3457341
7/8	.8750	22.23	7/8	1 1/2	4	2	C60969	3455143	C80969	3457342
7/8	.8750	22.23	7/8	2 1/4	5	2	C60970	3455144	C80970	3457343
7/8	.8750	22.23	7/8	3	6	2	C60971	3455145	C80971	3457344
1	1.0000	25.40	1	1 1/2	4	2	C60972	3455146	C80972	3457345
1	1.0000	25.40	1	2 1/4	5	2	C60973	3455147	C80973	3457346
1	1.0000	25.40	1	3	6	2	C60974	3455148	C80974	3457347

CARBIDE END MILLS

Series **CEM-SE3**

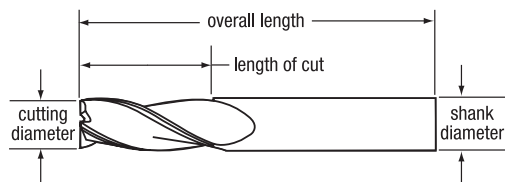
Applications |



Features |



CARBIDE END MILLS



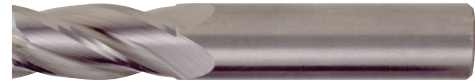
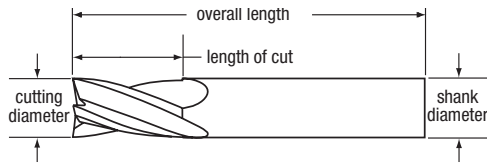
								order number			
cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	bright		TiAlN	
fractional	decimal	metric						Cleveland	Fastenal	Cleveland	Fastenal
1/16	.0625	1.59	1/8	3/16	1 1/2	3	0.000	C61657	3455254	C81657	3457431
5/64	.0781	1.98	1/8	3/16	1 1/2	3	0.000	C61658	3455255	C81658	3457432
3/32	.0938	2.38	1/8	3/8	1 1/2	3	0.000	C61659	3455256	C81659	3457433
7/64	.1094	2.78	1/8	3/8	1 1/2	3	0.000	C61660	3455257	C81660	3457434
1/8	.1250	3.18	1/8	1/2	1 1/2	3	0.000	C61661	3455258	C81661	3457435
1/8	.1250	3.18	1/8	1/2	1 1/2	3	0.010	C61662	3455259	C81662	3457436
9/64	.1406	3.57	3/16	9/16	2	3	0.000	C61663	3455260	C81663	3457437
5/32	.1562	3.97	3/16	9/16	2	3	0.000	C61664	3455261	C81664	3457438
11/64	.1719	4.37	3/16	5/8	2	3	0.000	C61665	3455262	C81665	3457439
3/16	.1875	4.76	3/16	5/8	2	3	0.000	C61666	3455263	C81666	3457440
3/16	.1875	4.76	3/16	5/8	2	3	0.010	C61667	3455264	C81667	3457441
13/64	.2031	5.16	1/4	5/8	2 1/2	3	0.000	C61668	3455265	C81668	3457442
7/32	.2188	5.56	1/4	5/8	2 1/2	3	0.000	C61669	3455266	C81669	3457443
15/64	.2344	5.95	1/4	3/4	2 1/2	3	0.000	C61670	3455267	C81670	3457444
1/4	.2500	6.35	1/4	3/4	2 1/2	3	0.000	C61671	3455268	C81671	3457445
1/4	.2500	6.35	1/4	3/4	2 1/2	3	0.020	C61672	3455269	C81672	3457446
1/4	.2500	6.35	1/4	3/4	2 1/2	3	0.030	C61673	3455270	C81673	3457447
17/64	.2656	6.75	5/16	3/4	2 1/2	3	0.000	C61674	3455271	C81674	3457448
9/32	.2812	7.14	5/16	3/4	2 1/2	3	0.000	C61675	3455272	C81675	3457449
5/16	.3125	7.94	5/16	13/16	2 1/2	3	0.000	C61676	3455273	C81676	3457450
5/16	.3125	7.94	5/16	13/16	2 1/2	3	0.020	C61677	3455274	C81677	3457451
5/16	.3125	7.94	5/16	13/16	2 1/2	3	0.030	C61678	3455275	C81678	3457452
3/8	.3750	9.53	3/8	7/8	2 1/2	3	0.000	C61679	3455276	C81679	3457453
3/8	.3750	9.53	3/8	7/8	2 1/2	3	0.020	C61680	3455277	C81680	3457454
3/8	.3750	9.53	3/8	7/8	2 1/2	3	0.030	C61681	3455278	C81681	3457455
3/8	.3750	9.53	3/8	7/8	2 1/2	3	0.045	C61682	3455279	C81682	3457456
7/16	.4375	11.11	7/16	7/8	2 1/2	3	0.000	C61683	3455280	C81683	3457457
1/2	.5000	12.70	1/2	1	3	3	0.000	C61684	3455281	C81684	3457458
1/2	.5000	12.70	1/2	1	3	3	0.030	C61685	3455282	C81685	3457459
1/2	.5000	12.70	1/2	1	3	3	0.060	C61686	3455283	C81686	3457460
1/2	.5000	12.70	1/2	1	3	3	0.090	C61687	3455284	C81687	3457461
9/16	.5625	14.29	9/16	1 1/4	3 1/2	3	0.000	C61688	3455285	C81688	3457462
5/8	.6250	15.88	5/8	1 1/4	3 1/2	3	0.000	C61689	3455286	C81689	3457463
5/8	.6250	15.88	5/8	1 1/4	3 1/2	3	0.030	C61690	3455287	C81690	3457464
5/8	.6250	15.88	5/8	1 1/4	3 1/2	3	0.060	C61691	3455288	C81691	3457465
5/8	.6250	15.88	5/8	1 1/4	3 1/2	3	0.090	C61692	3455289	C81692	3457466
3/4	.7500	19.05	3/4	1 1/2	4	3	0.000	C61693	3455290	C81693	3457467
3/4	.7500	19.05	3/4	1 1/2	4	3	0.030	C61694	3455291	C81694	3457468
3/4	.7500	19.05	3/4	1 1/2	4	3	0.060	C61695	3455292	C81695	3457469
3/4	.7500	19.05	3/4	1 1/2	4	3	0.090	C61696	3455293	C81696	3457470
7/8	.8750	22.23	7/8	1 1/2	4	3	0.000	C61697	3455294	C81697	3457471
1	1.0000	25.40	1	1 1/2	4	3	0.000	C61698	3455295	C81698	3457472
1	1.0000	25.40	1	1 1/2	4	3	0.030	C61699	3455296	C81699	3457473
1	1.0000	25.40	1	1 1/2	4	3	0.060	C61700	3455297	C81700	3457474
1	1.0000	25.40	1	1 1/2	4	3	0.090	C61701	3455298	C81701	3457475

Series CEM-SE4

Applications |



Features |



CARBIDE END MILLS

cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiAlN	
								Cleveland	Fastenal	Cleveland	Fastenal
1/32	.0312	0.79	1/8	1/16	1 1/2	4	0.000	C61805	3455299	C81805	3457476
1/32	.0312	0.79	1/8	1/8	1 1/2	4	0.000	C61806	3455300	C81806	3457477
3/64	.0469	1.19	1/8	1/8	1 1/2	4	0.000	C61807	3455301	C81807	3457478
1/16	.0625	1.59	1/8	1/8	1 1/2	4	0.000	C61808	3455302	C81808	3457479
1/16	.0625	1.59	1/8	3/16	1 1/2	4	0.000	C61809	3455303	C81809	3457480
1/16	.0625	1.59	1/8	1/4	1 1/2	4	0.010	C61810	3455304	C81810	3457481
5/64	.0781	1.98	1/8	3/16	1 1/2	4	0.000	C61811	3455305	C81811	3457482
3/32	.0938	2.38	1/8	3/16	1 1/2	4	0.000	C61812	3455306	C81812	3457483
3/32	.0938	2.38	1/8	3/8	1 1/2	4	0.000	C61813	3455307	C81813	3457484
3/32	.0938	2.38	1/8	3/8	1 1/2	4	0.010	C61814	3455308	C81814	3457485
3/32	.0938	2.38	1/8	3/8	1 1/2	4	0.020	C61815	3455309	C81815	3457486
7/64	.1094	2.78	1/8	1/4	1 1/2	4	0.000	C61816	3455310	C81816	3457487
7/64	.1094	2.78	1/8	3/8	1 1/2	4	0.000	C61817	3455311	C81817	3457488
1/8	.1250	3.18	1/8	1/4	1 1/2	4	0.000	C61818	3455312	C81818	3457489
1/8	.1250	3.18	1/8	1/2	1 1/2	4	0.000	C61819	3455313	C81819	3457490
1/8	.1250	3.18	1/8	1/2	1 1/2	4	0.010	C61820	3455314	C81820	3457491
1/8	.1250	3.18	1/8	1/2	1 1/2	4	0.015	C61821	3455315	C81821	3457492
1/8	.1250	3.18	1/8	1/2	1 1/2	4	0.020	C61822	3455316	C81822	3457493
1/8	.1250	3.18	1/8	3/4	2 1/4	4	0.000	C61824	3455317	C81824	3457494
1/8	.1250	3.18	1/8	1	3	4	0.000	C61825	3455318	C81825	3457495
9/64	.1406	3.57	3/16	9/16	2	4	0.000	C61827	3455319	C81827	3457497
5/32	.1562	3.97	3/16	5/16	2	4	0.000	C61828	3455320	C81828	3457498
5/32	.1562	3.97	3/16	9/16	2	4	0.000	C61829	3455321	C81829	3457499
11/64	.1719	4.37	3/16	5/8	2	4	0.000	C61830	3455322	C81830	3457500
3/16	.1875	4.76	3/16	5/16	2	4	0.000	C61831	3455323	C81831	3457501
3/16	.1875	4.76	3/16	5/8	2	4	0.000	C61832	3455324	C81832	3457502
3/16	.1875	4.76	3/16	5/8	2	4	0.010	C61833	3455325	C81833	3457503
3/16	.1875	4.76	3/16	5/8	2	4	0.015	C61834	3455326	C81834	3457504
3/16	.1875	4.76	3/16	5/8	2	4	0.020	C61835	3455327	C81835	3457505
3/16	.1875	4.76	3/16	5/8	2	4	0.030	C61836	3455328	C81836	3457506
3/16	.1875	4.76	3/16	3/4	2 1/2	4	0.000	C61837	3455329	C81837	3457507
3/16	.1875	4.76	3/16	1	3	4	0.000	C61838	3455330	C81838	3457508
3/16	.1875	4.76	3/16	1	3	4	0.045	C61839	3455331	C81839	3457509
3/16	.1875	4.76	3/16	1 1/8	3	4	0.000	C61840	3455332	C81840	3457510
3/16	.1875	4.76	3/16	1	4	4	0.000	C61841	3455333	C81841	3457511
3/16	.1875	4.76	3/16	1	4	4	0.045	C61842	3455334	C81842	3457512
13/64	.2031	5.16	1/4	5/8	2 1/2	4	0.000	C61843	3455335	C81843	3457513
7/32	.2188	5.56	1/4	5/8	2 1/2	4	0.000	C61844	3455336	C81844	3457514
15/64	.2344	5.95	1/4	3/4	2 1/2	4	0.000	C61845	3455337	C81845	3457515

continued on next page

Series **CEM-SE4** (continued)

CARBIDE END MILLS

cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiAlN	
								Cleveland	Fastenal	Cleveland	Fastenal
1/4	.2500	6.35	1/4	1/2	2	4	0.000	C61846	3455338	C81846	3457516
1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.000	C61847	3455339	C81847	3457517
1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.010	C61848	3455340	C81848	3457518
1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.015	C61849	3455341	C81849	3457519
1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.020	C61850	3455342	C81850	3457520
1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.030	C61851	3455343	C81851	3457521
1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.045	C61852	3455344	C81852	3457522
1/4	.2500	6.35	1/4	3/4	2 1/2	4	0.060	C61853	3455345	C81853	3457523
1/4	.2500	6.35	1/4	1 1/8	3	4	0.000	C61854	3455346	C81854	3457524
1/4	.2500	6.35	1/4	1 1/2	4	4	0.000	C61855	3455347	C81855	3457525
1/4	.2500	6.35	1/4	1 1/2	6	4	0.000	C61856	3455348	C81856	3457526
17/64	.2656	6.75	5/16	3/4	2 1/2	4	0.000	C61857	3455349	C81857	3457527
9/32	.2812	7.14	5/16	3/4	2 1/2	4	0.000	C61858	3455350	C81858	3457528
19/64	.2969	7.54	5/16	7/8	2 1/2	4	0.000	C61859	3455351	C81859	3457529
5/16	.3125	7.94	5/16	1/2	2	4	0.000	C61860	3455352	C81860	3457530
5/16	.3125	7.94	5/16	13/16	2 1/2	4	0.000	C61861	3455353	C81861	3457531
5/16	.3125	7.94	5/16	13/16	2 1/2	4	0.020	C61862	3455354	C81862	3457532
5/16	.3125	7.94	5/16	13/16	2 1/2	4	0.030	C61863	3455355	C81863	3457533
5/16	.3125	7.94	5/16	1	3	4	0.000	C61864	3455356	C81864	3457534
5/16	.3125	7.94	5/16	1 1/8	3	4	0.000	C61865	3455357	C81865	3457535
5/16	.3125	7.94	5/16	1 5/8	4	4	0.000	C61866	3455358	C81866	3457536
21/64	.3281	8.33	3/8	7/8	2 1/2	4	0.000	C61867	3455359	C81867	3457537
11/32	.3438	8.73	3/8	7/8	2 1/2	4	0.000	C61868	3455360	C81868	3457538
23/64	.3594	9.13	3/8	7/8	2 1/2	4	0.000	C61869	3455361	C81869	3457539
3/8	.3750	9.53	3/8	5/8	2	4	0.000	C61870	3455362	C81870	3457540
3/8	.3750	9.53	3/8	1	2 1/2	4	0.000	C61871	3455363	C81871	3457541
3/8	.3750	9.53	3/8	1	2 1/2	4	0.010	C61872	3455364	C81872	3457542
3/8	.3750	9.53	3/8	1	2 1/2	4	0.015	C61873	3455365	C81873	3457543
3/8	.3750	9.53	3/8	1	2 1/2	4	0.020	C61874	3455366	C81874	3457544
3/8	.3750	9.53	3/8	1	2 1/2	4	0.030	C61875	3455367	C81875	3457545
3/8	.3750	9.53	3/8	1	2 1/2	4	0.045	C61876	3455368	C81876	3457546
3/8	.3750	9.53	3/8	1	2 1/2	4	0.060	C61877	3455369	C81877	3457547
3/8	.3750	9.53	3/8	1	4	4	0.000	C61879	3455370	C81879	3457548
3/8	.3750	9.53	3/8	1	4	4	0.020	C61880	3455371	C81880	3457549
3/8	.3750	9.53	3/8	1 1/8	3	4	0.000	C61878	3455372	C81878	3457550
3/8	.3750	9.53	3/8	1 3/4	4	4	0.000	C61881	3455373	C81881	3457551
3/8	.3750	9.53	3/8	1 1/2	6	4	0.000	C61882	3455374	C81882	3457552
25/64	.3906	9.92	7/16	7/8	2 3/4	4	0.000	C61883	3455375	C81883	3457553
13/32	.4062	10.32	7/16	7/8	2-3/4	4	0.000	C61884	3455376	C81884	3457554
27/64	.4218	10.71	7/16	7/8	2-3/4	4	0.000	C61885	3455377	C81885	3457555
7/16	.4375	11.11	7/16	5/8	2 1/2	4	0.000	C61886	3455378	C81886	3457556
7/16	.4375	11.11	7/16	1	2 1/2	4	0.000	C61887	3455379	C81887	3457557
7/16	.4375	11.11	7/16	2	4	4	0.000	C61888	3455380	C81888	3457558
7/16	.4375	11.11	7/16	3	6	4	0.000	C61889	3455381	C81889	3457559
29/64	.4531	11.51	1/2	1	3	4	0.000	C61890	3455382	C81890	3457560
15/32	.4688	11.91	1/2	1	3	4	0.000	C61891	3455383	C81891	3457561
31/64	.4844	12.30	1/2	1	3	4	0.000	C61892	3455384	C81892	3457562
1/2	.5000	12.70	1/2	5/8	2 1/2	4	0.000	C61893	3455385	C81893	3457563

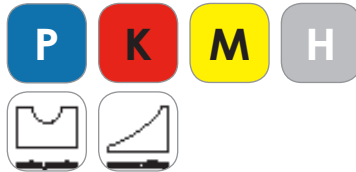
continued on next page

Series CEM-SE4 (continued)

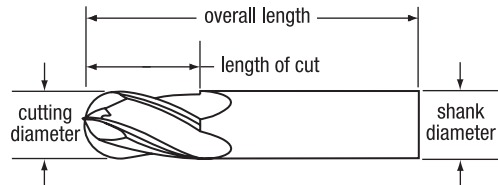
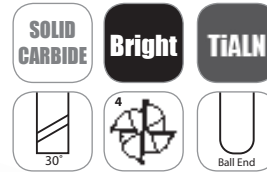
cutting diameter			shank diameter	length of cut	overall length	no. of flutes	corner radius	order number			
fractional	decimal	metric						bright		TiALN	
								Cleveland	Fastenal	Cleveland	Fastenal
1/2	.5000	12.70	1/2	1	3	4	0.000	C61894	3455386	C81894	3457564
1/2	.5000	12.70	1/2	1	3	4	0.015	C61895	3455387	C81895	3457565
1/2	.5000	12.70	1/2	1	3	4	0.020	C61896	3455388	C81896	3457566
1/2	.5000	12.70	1/2	1	3	4	0.030	C61897	3455389	C81897	3457567
1/2	.5000	12.70	1/2	1	3	4	0.045	C61898	3455390	C81898	3457568
1/2	.5000	12.70	1/2	1	3	4	0.060	C61899	3455391	C81899	3457569
1/2	.5000	12.70	1/2	1	3	4	0.090	C61900	3455392	C81900	3457570
1/2	.5000	12.70	1/2	1	3	4	0.125	C61901	3455393	C81901	3457571
1/2	.5000	12.70	1/2	2	4	4	0.000	C61902	3455394	C81902	3457572
1/2	.5000	12.70	1/2	3	6	4	0.000	C61903	3455395	C81903	3457573
1/2	.5000	12.70	1/2	1 1/2	6	4	0.000	C61904	3455396	C81904	3457574
9/16	.5625	14.29	9/16	1 1/4	3 1/2	4	0.000	C61905	3455397	C81905	3457575
5/8	.6250	15.88	5/8	3/4	3	4	0.000	C61906	3455398	C81906	3457576
5/8	.6250	15.88	5/8	1 1/4	3 1/2	4	0.000	C61907	3455399	C81907	3457577
5/8	.6250	15.88	5/8	1 1/4	3 1/2	4	0.030	C61908	3455400	C81908	3457578
5/8	.6250	15.88	5/8	1 1/4	3 1/2	4	0.060	C61909	3455401	C81909	3457579
5/8	.6250	15.88	5/8	1 1/4	3 1/2	4	0.090	C61910	3455402	C81910	3457580
5/8	.6250	15.88	5/8	2 1/4	5	4	0.000	C61911	3455403	C81911	3457581
5/8	.6250	15.88	5/8	3	6	4	0.000	C61912	3455404	C81912	3457582
3/4	.7500	19.05	3/4	1	3	4	0.000	C61913	3455405	C81913	3457583
3/4	.7500	19.05	3/4	1 1/2	4	4	0.000	C61914	3455406	C81914	3457584
3/4	.7500	19.05	3/4	1 1/2	4	4	0.030	C61915	3455407	C81915	3457585
3/4	.7500	19.05	3/4	1 1/2	4	4	0.060	C61916	3455408	C81916	3457586
3/4	.7500	19.05	3/4	1 1/2	4	4	0.090	C61917	3455409	C81917	3457587
3/4	.7500	19.05	3/4	2 1/4	5	4	0.000	C61918	3455410	C81918	3457588
3/4	.7500	19.05	3/4	3	6	4	0.000	C61919	3455411	C81919	3457589
7/8	.8750	22.23	7/8	1 1/2	4	4	0.000	C61920	3455412	C81920	3457590
7/8	.8750	22.23	7/8	2 1/4	5	4	0.000	C61921	3455413	C81921	3457591
7/8	.8750	22.23	7/8	3	6	4	0.000	C61922	3455414	C81922	3457592
1	1.0000	25.40	1	1 1/2	4	4	0.000	C61923	3455415	C81923	3457593
1	1.0000	25.40	1	1 1/2	4	4	0.030	C61924	3455416	C81924	3457594
1	1.0000	25.40	1	1 1/2	4	4	0.060	C61925	3455417	C81925	3457595
1	1.0000	25.40	1	1 1/2	4	4	0.090	C61926	3455418	C81926	3457596
1	1.0000	25.40	1	2 1/4	5	4	0.000	C61927	3455419	C81927	3457597
1	1.0000	25.40	1	3	6	4	0.000	C61928	3455420	C81928	3457598

Series **CEM-SE4B**

Applications |



Features |



cutting diameter			shank diameter	length of cut	overall length	no. of flutes	order number			
fractional	decimal	metric					bright		TiALN	
							Cleveland	Fastenal	Cleveland	Fastenal
1/32	.0312	0.79	1/8	1/16	1 1/2	4	C63509	3455421	C83509	3457599
1/32	.0312	0.79	1/8	1/8	1 1/2	4	C63510	3455422	C83510	3457600
1/32	.0312	0.79	1/8	3/32	1 1/2	4	C63511	3455423	C83511	3457601
3/64	.0469	1.19	1/8	1/8	1 1/2	4	C63512	3455424	C83512	3457602
1/16	.0625	1.59	1/8	1/8	1 1/2	4	C63513	3455425	C83513	3457603
1/16	.0625	1.59	1/8	3/16	1 1/2	4	C63514	3455426	C83514	3457604
5/64	.0781	1.98	1/8	3/16	1 1/2	4	C63515	3455427	C83515	3457605
3/32	.0938	2.38	1/8	3/8	1 1/2	4	C63516	3455428	C83516	3457606
3/32	.0938	2.38	1/8	3/16	1 1/2	4	C63517	3455429	C83517	3457607
7/64	.1094	2.78	1/8	3/8	1 1/2	4	C63518	3455430	C83518	3457608
1/8	.1250	3.18	1/8	1/4	1 1/2	4	C63519	3455431	C83519	3457609
1/8	.1250	3.18	1/8	1/2	1 1/2	4	C63520	3455432	C83520	3457610
1/8	.1250	3.18	1/8	5/8	2	4	C63521	3455433	C83521	3457611
1/8	.1250	3.18	1/8	3/4	2 1/4	4	C63522	3455434	C83522	3457612
1/8	.1250	3.18	1/8	1	3	4	C63523	3455435	C83523	3457613
9/64	.1406	3.57	3/16	9/16	2	4	C63524	3455436	C83524	3457614
5/32	.1562	3.97	3/16	5/16	2	4	C63525	3455437	C83525	3457615
5/32	.1562	3.97	3/16	9/16	2	4	C63526	3455438	C83526	3457616
11/64	.1719	4.37	3/16	5/8	2	4	C63527	3455439	C83527	3457617
3/16	.1875	4.76	3/16	5/16	2	4	C63528	3455440	C83528	3457618
3/16	.1875	4.76	3/16	5/8	2	4	C63529	3455441	C83529	3457619
3/16	.1875	4.76	3/16	3/4	2 1/2	4	C63530	3455442	C83530	3457620
3/16	.1875	4.76	3/16	1 1/8	3	4	C63531	3455443	C83531	3457621
13/64	.2031	5.16	1/4	5/8	2 1/2	4	C63532	3455444	C83532	3457622
7/32	.2188	5.56	1/4	5/8	2 1/2	4	C63533	3455445	C83533	3457623
15/64	.2344	5.95	1/4	3/4	2 1/2	4	C63534	3455446	C83534	3457624
1/4	.2500	6.35	1/4	1/2	2	4	C63535	3455447	C83535	3457625
1/4	.2500	6.35	1/4	3/4	2 1/2	4	C63536	3455448	C83536	3457626
1/4	.2500	6.35	1/4	1	4	4	C63537	3455449	C83537	3457627
1/4	.2500	6.35	1/4	1 1/8	3	4	C63538	3455450	C83538	3457628
1/4	.2500	6.35	1/4	1 1/2	4	4	C63539	3455451	C83539	3457629
1/4	.2500	6.35	1/4	1 1/2	6	4	C63540	3455452	C83540	3457630
17/64	.2656	6.75	5/16	3/4	2 1/2	4	C63541	3455453	C83541	3457631
9/32	.2812	7.14	5/16	3/4	2 1/2	4	C63542	3455454	C83542	3457632
5/16	.3125	7.94	5/16	1/2	2	4	C63543	3455455	C83543	3457633
5/16	.3125	7.94	5/16	13/16	2 1/2	4	C63544	3455456	C83544	3457634
5/16	.3125	7.94	5/16	1 1/8	3	4	C63545	3455457	C83545	3457635
5/16	.3125	7.94	5/16	1 5/8	4	4	C63546	3455458	C83546	3457636

continued on next page

Series **CEM-SE4B** (continued)

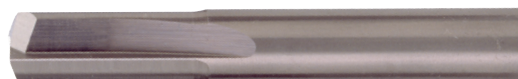
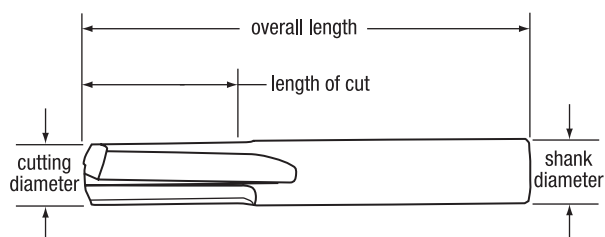
cutting diameter			shank diameter	length of cut	overall length	no. of flutes	order number			
fractional	decimal	metric					bright		TiALN	
							Cleveland	Fastenal	Cleveland	Fastenal
23/64	.3594	9.13	3/8	7/8	2 1/2	4	C63547	3455459	C83547	3457637
3/8	.3750	9.53	3/8	5/8	2	4	C63548	3455460	C83548	3457638
3/8	.3750	9.53	3/8	1	2 1/2	4	C63549	3455461	C83549	3457639
3/8	.3750	9.53	3/8	1 1/8	3	4	C63550	3455462	C83550	3457640
3/8	.3750	9.53	3/8	1 1/2	6	4	C63551	3455463	C83551	3457641
3/8	.3750	9.53	3/8	1 3/4	4	4	C63552	3455464	C83552	3457642
25/64	.3906	9.92	7/16	7/8	2-3/4	4	C63553	3455465	C83553	3457643
27/64	.4219	10.71	7/16	7/8	2 3/4	4	C63554	3455466	C83554	3457644
7/16	.4375	11.11	7/16	5/8	2 1/2	4	C63555	3455467	C83555	3457645
7/16	.4375	11.11	7/16	1	2 1/2	4	C63556	3455468	C83556	3457646
7/16	.4375	11.11	7/16	2	4	4	C63557	3455469	C83557	3457647
7/16	.4375	11.11	7/16	3	6	4	C63558	3455470	C83558	3457648
31/64	.4844	12.30	1/2	1	3	4	C63559	3455471	C83559	3457649
1/2	.5000	12.70	1/2	5/8	2 1/2	4	C63560	3455472	C83560	3457650
1/2	.5000	12.70	1/2	1	3	4	C63561	3455473	C83561	3457651
1/2	.5000	12.70	1/2	2	4	4	C63562	3455474	C83562	3457652
1/2	.5000	12.70	1/2	1 1/2	6	4	C63563	3455475	C83563	3457653
1/2	.5000	12.70	1/2	3	6	4	C63564	3455476	C83564	3457654
9/16	.5625	14.29	9/16	1 1/4	3 1/2	4	C63565	3455477	C83565	3457655
5/8	.6250	15.88	5/8	3/4	3	4	C63566	3455478	C83566	3457656
5/8	.6250	15.88	5/8	1 1/4	3 1/2	4	C63567	3455479	C83567	3457657
5/8	.6250	15.88	5/8	2 1/4	5	4	C63568	3455480	C83568	3457658
5/8	.6250	15.88	5/8	3	6	4	C63569	3455481	C83569	3457659
3/4	.7500	19.05	3/4	1	3	4	C63570	3455482	C83570	3457660
3/4	.7500	19.05	3/4	1 1/2	4	4	C63571	3455483	C83571	3457661
3/4	.7500	19.05	3/4	2 1/4	5	4	C63572	3455484	C83572	3457662
3/4	.7500	19.05	3/4	3	6	4	C63573	3455485	C83573	3457663
7/8	.8750	22.23	7/8	1 1/2	4	4	C63574	3455486	C83574	3457664
7/8	.8750	22.23	7/8	2 1/4	5	4	C63575	3455487	C83575	3457665
7/8	.8750	22.23	7/8	3	6	4	C63576	3455488	C83576	3457666
1	1.0000	25.40	1	1 1/2	4	4	C63577	3455489	C83577	3457667
1	1.0000	25.40	1	2 1/4	5	4	C63578	3455490	C83578	3457668
1	1.0000	25.40	1	3	6	4	C63579	3455491	C83579	3457669

Series **CEM-SEST2** • Straight Flutes

Applications |



Features |



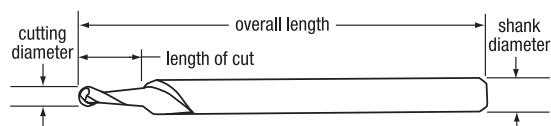
cutting diameter			shank diameter	length of cut	overall length	no. of flutes	order number			
fractional	decimal	metric					bright		TiAlN	
							Cleveland	Fastenal	Cleveland	Fastenal
1/16	.0625	1.59	1/8	3/16	1 1/2	2	C60649	3455068	C80649	3457280
1/8	.1250	3.18	1/8	1/2	1 1/2	2	C60650	3455069	C80650	3457281
3/16	.1875	4.76	3/16	5/8	2	2	C60651	3455070	C80651	3457282
1/4	.2500	6.35	1/4	3/4	2 1/2	2	C60652	3455071	C80652	3457283
5/16	.3125	7.94	5/16	13/16	2 1/2	2	C60653	3455072	C80653	3457284
3/8	.3750	9.53	3/8	7/8	2 1/2	2	C60654	3455073	C80654	3457285
1/2	.5000	12.70	1/2	1	3	2	C60655	3455074	C80655	3457286

Series **CEM-EG2** Engraving Tool

Applications |

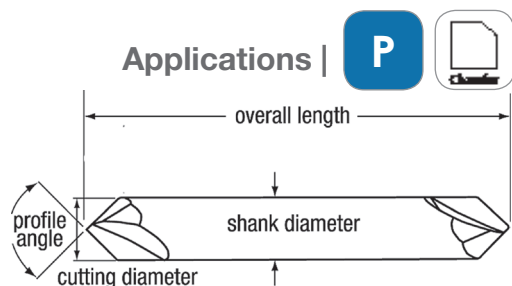


Features |



cutting diameter		shank diameter	length of cut	overall length	no. of flutes	order number	
decimal	metric					TiCN	
						Cleveland	Fastenal
.021	0.53	1/8	.040	1 1/2	2	C70374	3456846
.025	0.64	1/8	.040	1 1/2	2	C70375	3456847
.030	0.76	1/8	.040	1 1/2	2	C70376	3456848

Series CEM-CH2 Single End and CEM-CH2D Double End Chamfer Tool • 60°, 82°, 90°, & 120° point



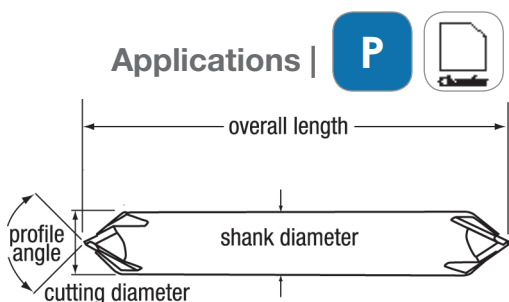
Features |



CARBIDE END MILLS

cutting diameter			shank diameter	overall length	no. of flutes	profile angle (°)	order number			
fractional	decimal	metric					single end		double end	
							Cleveland	Fastenal	Cleveland	Fastenal
1/8	.1250	3.18	1/8	1 1/2	2	60	C61112	3455232	-----	-----
1/8	.1250	3.18	1/8	1 1/2	2	82	C61113	3455233	-----	-----
1/8	.1250	3.18	1/8	1 1/2	2	90	C61114	3455234	C61226	3455248
3/16	.1875	4.76	3/16	2	2	90	C61115	3455235	C61227	3455249
1/4	.2500	6.35	1/4	2 1/2	2	60	C61116	3455236	-----	-----
1/4	.2500	6.35	1/4	2 1/2	2	82	C61117	3455237	-----	-----
1/4	.2500	6.35	1/4	2 1/2	2	90	C61118	3455238	C61228	3455250
3/8	.3750	9.53	3/8	2 1/2	2	60	C61119	3455239	-----	-----
3/8	.3750	9.53	3/8	2 1/2	2	82	C61120	3455240	-----	-----
3/8	.3750	9.53	3/8	2 1/2	2	90	C61121	3455241	C61229	3455251
3/8	.3750	9.53	3/8	2 1/2	2	120	C61127	3455247	-----	-----
1/2	.5000	12.70	1/2	3	2	60	C61122	3455242	-----	-----
1/2	.5000	12.70	1/2	3	2	82	C61123	3455243	-----	-----
1/2	.5000	12.70	1/2	3	2	90	C61124	3455244	C61230	3455252
1/2	.5000	12.70	1/2	3	2	120	C61125	3455245	-----	-----
3/4	.7500	19.05	3/4	4	2	90	C61126	3455246	C61231	3455253

Series CEM-CH4 Single End and CEM-CHD Double End Chamfer Tool • 60°, 82°, 90°, & 120° point



Features |



cutting diameter			shank diameter	overall length	no. of flutes	profile angle (°)	order number			
fractional	decimal	metric					single end		double end	
							Cleveland	Fastenal	Cleveland	Fastenal
1/4	.2500	6.35	1/4	2 1/2	4	60	C66219	3455497	-----	-----
1/4	.2500	6.35	1/4	2 1/2	4	82	C66220	3455498	-----	-----
1/4	.2500	6.35	1/4	2 1/2	4	90	C66221	3455499	C60228	3454791
3/8	.3750	9.53	3/8	2 1/2	4	60	C66222	3455500	-----	-----
3/8	.3750	9.53	3/8	2 1/2	4	82	C66223	3455501	-----	-----
3/8	.3750	9.53	3/8	2 1/2	4	90	C66224	3455502	C60229	3454792
3/8	.3750	9.53	3/8	2 1/2	4	120	C66218	-----	-----	-----
1/2	.5000	12.70	1/2	3	4	60	C66225	3455503	-----	-----
1/2	.5000	12.70	1/2	3	4	82	C66226	3455504	-----	-----
1/2	.5000	12.70	1/2	3	4	90	C66227	3455505	C60230	3454793
1/2	.5000	12.70	1/2	3	4	120	C66228	3455506	-----	-----
3/4	.7500	19.05	3/4	4	4	90	C66229	3455507	C60231	3454794



Greenfield Industries is excited to announce the addition of solid carbide end mills and chamfering tools to the Cleveland brand. All end mills in the Cleveland line are designed to machine a broad range of materials and are manufactured out of premium grade carbide material.

This supplement shows the range of products to be added to the Cleveland line along with machining parameters. Various coatings are available for the end mill products designed for specific applications. The 2015 Cleveland catalog will be updated to include these products. This supplement is also available to download at our website, www.gfii.com.

More positive changes are anticipated for the Cleveland brand over the next several months. Greenfield Industries intends to expand the Cleveland line with a broader offering of high performance taps. Watch for communications from GFII with the details.

A new Cleveland net pricing file is available upon request. For more information, contact Customer Service via telephone at 800-348-2885 or via email at standard.distributors@gfii.com, or visit the Greenfield Industries web site, www.gfii.com.



www.gfii.com

2501 Davis Creek Road
Seneca, SC 29678 USA
standard.distributors@gfii.com
Phone: 800.348.2885
Fax: 800.892.4290

