NEW PREMIUM TOOL LINE!

CYCLONE MX™

HIGH FEED & HIGH HARDNESS MILLING

AMERICAN MADE

GLOBALLY RENOWNED

HIGH PERFORMANCE END MILLS

FOR AGGRESSIVE MACHINING OF FERROUS AND HARDENED MATERIALS

GLOBAL™ CUTTING TOOLS

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CYCLONE MX™

HIGH FEED & HIGH HARDNESS MILLING

AGRESSIVE MACHINING

OF FERROUS & HARDENED MATERIALS

FEATURES & BENEFITS

The Cyclone MX exceeds at milling difficult to machine materials. The massive core increases stability and reduces tool deflection, while the rugged high strength six and eight flute design, maximizes the relationship between flute engagement and chip evacuation. Engineered with an advanced variable geometry, the Cyclone MX performs high speed, high efficiency machining of light to medium cuts. Its versatility allows the tool to be used either wet or dry.

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GLOBAL™
CUTTING TOOLS

SERIES: CMX

For high performance milling of difficult to machine materials to improve chip evacuation while light to medium roughing or finishing; wet or dry; hardened tool steel > 48 HRc; stainless steel; high temp alloys; and titanium < 65HRc.

Square end option to create sharp corners in finishing operations

Coated for heat resistance, wear resistance and increased lubricity

Improved tool stability through multi-flute flute design keeps more cutting edges engaged, creating a superior surface finish

High helix angle reduces cutting forces by creating a higher shearing plane for better efficiencies, chip management and longer tool life

High strength flutes reduce edge chipping, built up edge and extends tool life

Corner radius protects corners during tool entry and roughing operations in difficult to machine materials by preventing corner chipping and tool failure

Engineered flute relief allows for superior chip evacuation without compromising flute integrity

Reduced neck option increases stability and reduces tool deflection while maintaining overall reach

Premium micro-grain carbide substrate resists chipping, tool deflection, and has a high transverse rupture strength for greater feeds and speeds

Edge prep drag finishing increases tool life by improving the surface quality in the flute and radiusing the cutting edge of the tool, reducing the potential for premature failure

Post polishing is performed after the tools are coated to remove surface inconsistencies and increase lubricity. This also increases feed rates and allows for smoother operations. The tool runs cooler and performs longer

TIP & END

SHANK & LENGTH

S R L X N

FLUTE CONFIGURATION

MATERIAL

COATING

RESULTS

At the end of the day, you will have relied on the quality of the tool to do the work for you and maintain profitability. The Cyclone MX ensures reductions in edge chipping, built up edge and guarantees extended tool life. A higher helix angle reduces cutting forces by creating a higher shearing plane, which again results in efficiencies and even longer tool life. The advantage of using a few quality end mills, instead of many less expensive ones, is more than just added profit; its quality you can trust.

Series CMX: Micro-Grain Carbide, 6 & 8 Flute, Advanced Variable Geometry, AlTiN/Si3N4 Coated SubSeries: CMXSR, CMXSL, CMXSN, CMXCR, CMXCL, CMXCN
Configuration: Varying Diameters; Regular, Long, Extra-Long and Reduced Neck Lengths; 44/45/46° Variable Helix; Square End & Corner Radius

CYCLONE MX

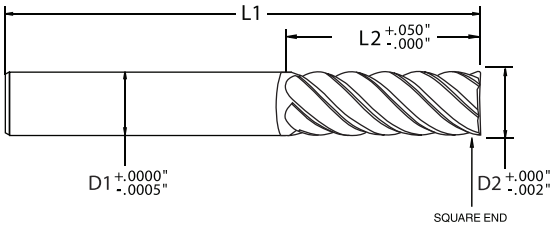
GLOBAL™

SERIES CMX - *CARBIDE, 6 & 8 FLUTE, 44/45/46° VARIABLE HELIX*

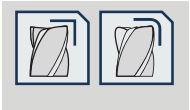
AGGRESIVE CUTTING

The Cyclone MX has a staged, multi-flute design and AlTiN/Si3N4 coating, to give you the aggressive cutting needed for hardened tool steels, stainless steels, high temp alloys and titanium.

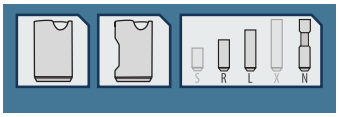
- Square end option to create sharp corners in finishing operations
- Coated for heat resistance, wear resistance and increased lubricity
- Improved tool stability through multi-flute flute design keeps more cutting edges engaged, creating a superior surface finish
- High helix angle reduces cutting forces by creating a higher shearing plane for better efficiencies, chip management and longer tool life



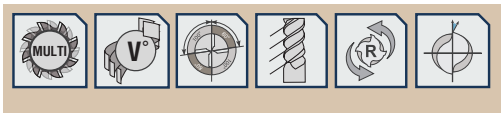
TIP & END



SHANK & LENGTH



FLUTE CONFIGURATION



MATERIAL

COATING

SERIES CMXSR - *SQUARE END, REGULAR LENGTH*

SHANK DIAMETER (D1)		CUTTER DIAMETER (D2)		FLUTE LENGTH (L2)		OVERALL LENGTH (L1)		# OF FLUTES	PLAIN SHANK PART #	PLAIN SHANK EDP #	WELDON SHANK PART #	WELDON SHANK EDP #
1/8	0.125	1/8	0.125	5/8	0.625	2 1/2	2.500	6	CMX-0210-SQ	C201S	—	—
3/16	0.188	3/16	0.188	5/8	0.625	2 1/2	2.500		CMX-0310-SQ	C202S	—	—
1/4	0.250	1/4	0.250	5/8	0.625	2 1/2	2.500		CMX-0410-SQ	C203S	—	—
5/16	0.313	5/16	0.313	7/8	0.875	3	3.000		CMX-0514-SQ	C204S	—	—
3/8	0.375	3/8	0.375	5/8	0.625	2 1/2	2.500		CMX-0610-SQ	C205S	CMX-0610-SQ-W	C214S
				7/8	0.875	3	3.000		CMX-0614-SQ	C206S	CMX-0614-SQ-W	C215S
7/16	0.438	7/16	0.438	1 1/8	1.125	3	3.000		CMX-0718-SQ	C207S	CMX-0718-SQ-W	C216S
1/2	0.500	1/2	0.500	7/8	0.875	3 1/2	3.500		CMX-0814-SQ	C208S	CMX-0814-SQ-W	C217S
				1 3/8	1.375	3 1/2	3.500		CMX-0822-SQ	C209S	CMX-0822-SQ-W	C218S
5/8	0.625	5/8	0.625	7/8	0.875	3	3.000		CMX-1014-SQ	C210S	CMX-1014-SQ-W	C219S
				1 3/8	1.375	3 1/2	3.500		CMX-1022-SQ	C211S	CMX-1022-SQ-W	C220S
3/4	0.750	3/4	0.750	1 5/8	1.625	4	4.000	8	CMX-1226-SQ	C212S	CMX-1226-SQ-W	C221S
1	1.000	1	1.000	1 7/8	1.875	4	4.000		CMX-1630-SQ	C213S	CMX-1630-SQ-W	C222S

SERIES CMXSL - *SQUARE END, LONG LENGTH*

SHANK DIAMETER (D1)		CUTTER DIAMETER (D2)		FLUTE LENGTH (L2)		OVERALL LENGTH (L1)		# OF FLUTES	PLAIN SHANK PART #	PLAIN SHANK EDP #	WELDON SHANK PART #	WELDON SHANK EDP #
1/8	0.125	1/8	0.125	7/8	0.875	3	3.000	6	CMX-0214-SQ	C301S	—	—
3/16	0.188	3/16	0.188	7/8	0.875	3	3.000		CMX-0314-SQ	C302S	—	—
1/4	0.250	1/4	0.250	1 1/8	1.125	4	4.000		CMX-0418-SQ	C303S	—	—
5/16	0.313	5/16	0.313	1 5/8	1.625	4	4.000		CMX-0526-SQ	C304S	—	—
3/8	0.375	3/8	0.375	1 7/8	1.875	4	4.000		CMX-0630-SQ	C305S	CMX-0630-SQ-W	C313S
7/16	0.438	7/16	0.438	2 1/8	2.125	4	4.000		CMX-0734-SQ	C306S	CMX-0734-SQ-W	C314S
1/2	0.500	1/2	0.500	2 1/8	2.125	4	4.000		CMX-0834-SQ	C307S	CMX-0834-SQ-W	C315S
5/8	0.625	5/8	0.625	2 5/8	2.625	5	5.000		CMX-1042-SQ	C308S	CMX-1042-SQ-W	C316S
3/4	0.750	3/4	0.750	2 5/8	2.625	5	5.000	8	CMX-1242-SQ	C309S	CMX-1242-SQ-W	C317S
				3 3/8	3.375	6	6.000		CMX-1254-SQ	C310S	CMX-1254-SQ-W	C318S
				4 3/8	4.375	7	7.000		CMX-1270-SQ	C311S	CMX-1270-SQ-W	C319S
1	1.000	1	1.000	4 3/8	4.375	7	7.000		CMX-1670-SQ	C312S	CMX-1670-SQ-W	C320S

CYCLONE MX

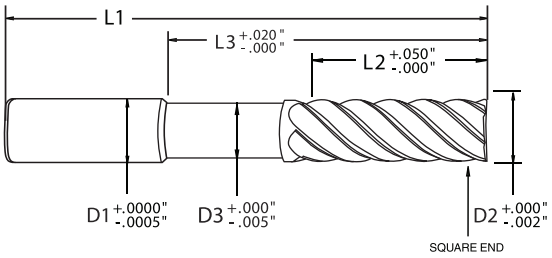
GLOBAL™

SERIES CMX - *CARBIDE, 6 & 8 FLUTE, 44/45/46° VARIABLE HELIX*

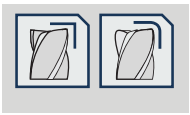
UNMATCHED PERFORMANCE

When searching for an end mill with unmatched performance, search no more. The unique design balances tool engagement and chip evacuation to dramatically improve machine times and tool life.

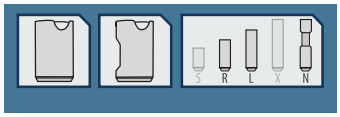
- Reduced neck option increases stability and reduces tool deflection while maintaining overall reach
- High strength flutes reduce edge chipping, built up edge and extends tool life
- Engineered flute relief allows for superior chip evacuation without compromising flute integrity



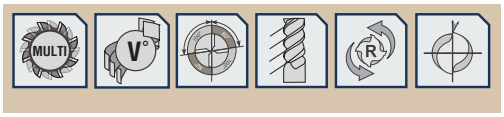
TIP & END



SHANK & LENGTH



FLUTE CONFIGURATION



MATERIAL

COATING

SERIES CMXSN - *SQUARE END, REDUCED NECK*

SHANK DIAMETER (D1)		CUTTER DIAMETER (D2)		FLUTE LENGTH (L2)		OVERALL LENGTH (L1)		NECK LBS (L3)		NECK DIAMETER (D3)	# OF FLUTES	PLAIN SHANK PART #	PLAIN SHANK EDP #	WELDON SHANK PART #	WELDON SHANK EDP #
1/8	0.125	1/8	0.125	1/4	0.250	2	2.000	1/2	0.500	0.118	6	CMX-0204-RN1-SQ	C501S	—	—
						3	3.000	1 1/2	1.500			CMX-0204-RN2-SQ	C502S	—	—
3/16	0.188	3/16	0.188	5/16	0.313	2	2.000	9/16	0.563	0.176		CMX-0305-RN1-SQ	C503S	—	—
						3	3.000	1 9/16	1.563			CMX-0305-RN2-SQ	C504S	—	—
1/4	0.250	1/4	0.250	3/8	0.375	2 1/2	2.500	1 1/8	1.125	0.235		CMX-0406-RN1-SQ	C505S	—	—
						3 1/2	3.500	2 1/8	2.125			CMX-0406-RN2-SQ	C506S	—	—
5/16	0.313	5/16	0.313	1/2	0.500	3	3.000	1 1/8	1.125	0.298		CMX-0508-RN1-SQ	C507S	—	—
						4	4.000	2 1/8	2.125			CMX-0508-RN2-SQ	C508S	—	—
3/8	0.375	3/8	0.375	1/2	0.500	3	3.000	1 1/8	1.125	0.355		CMX-0608-RN1-SQ	C509S	CMX-0608-RN1-SQ-W	C521S
						4	4.000	2 1/8	2.125			CMX-0608-RN2-SQ	C510S	CMX-0608-RN2-SQ-W	C522S
7/16	0.438	7/16	0.438	5/8	0.625	3	3.000	1 3/8	1.375	0.418		CMX-0710-RN1-SQ	C511S	CMX-0710-RN1-SQ-W	C523S
						4	4.000	2 3/8	2.375			CMX-0710-RN2-SQ	C512S	CMX-0710-RN2-SQ-W	C524S
1/2	0.500	1/2	0.500	5/8	0.625	3 1/2	3.500	1 3/8	1.375	0.475		CMX-0810-RN1-SQ	C513S	CMX-0810-RN1-SQ-W	C525S
						4 1/2	4.500	2 3/8	2.375			CMX-0810-RN2-SQ	C514S	CMX-0810-RN2-SQ-W	C526S
5/8	0.625	5/8	0.625	3/4	0.750	3 1/2	3.500	1 1/2	1.500	0.590		CMX-1012-RN1-SQ	C515S	CMX-1012-RN1-SQ-W	C527S
						5	5.000	2 1/2	2.500			CMX-1012-RN2-SQ	C516S	CMX-1012-RN2-SQ-W	C528S
3/4	0.750	3/4	0.750	1	1.000	4	4.000	1 3/4	1.750	0.715	8	CMX-1216-RN1-SQ	C517S	CMX-1216-RN1-SQ-W	C529S
						5	5.000	2 3/4	2.750			CMX-1216-RN2-SQ	C518S	CMX-1216-RN2-SQ-W	C530S
						6	6.000	3 3/4	3.750			CMX-1216-RN3-SQ	C519S	CMX-1216-RN3-SQ-W	C533S
1	1.000	1	1.000	1 1/8	1.125	4	4.000	1 7/8	1.875	0.960		CMX-1618-RN1-SQ	C519S	CMX-1618-RN1-SQ-W	C531S
						5	5.000	2 7/8	2.875			CMX-1618-RN2-SQ	C520S	CMX-1618-RN2-SQ-W	C532S
						6	6.000	3 7/8	3.875			CMX-1618-RN3-SQ	C522S	CMX-1618-RN3-SQ-W	C536S

CYCLONE MX

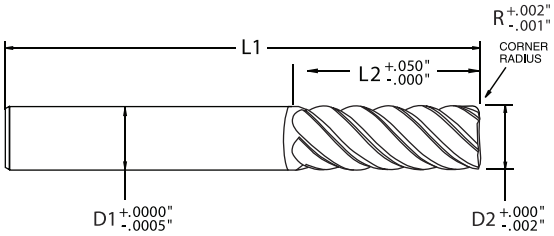
GLOBAL™

SERIES CMX - *CARBIDE, 6 & 8 FLUTE, 44/45/46° VARIABLE HELIX*

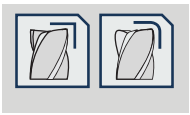
PRECISION MACHINING

Engineered for precision machining of hard and difficult to machine materials, while minimizing tool deflection and taking heavy cuts, the Cyclone MX simply performs.

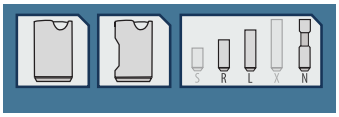
- Corner radius protects corners during tool entry and roughing operations in difficult to machine materials by preventing corner chipping and tool failure
- Premium micro-grain carbide substrate resists chipping, tool deflection, and has a high transverse rupture strength for greater feeds and speeds
- Large core design for increased stability; higher speeds & feeds; and reduced tool deflection in difficult to machine materials



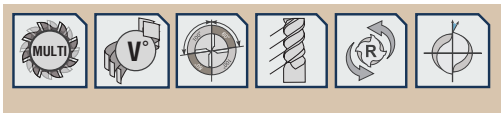
TIP & END



SHANK & LENGTH



FLUTE CONFIGURATION



MATERIAL

COATING

SERIES CMXCR - *CORNER RADIUS, REGULAR LENGTH*

SHANK DIAMETER (D1)		CUTTER DIAMETER (D2)		FLUTE LENGTH (L2)		OVERALL LENGTH (L1)		# OF FLUTES	CORNER RADIUS (R)	PLAIN SHANK PART #	PLAIN SHANK EDP #	WELDON SHANK PART #	WELDON SHANK EDP #
1/8	0.125	1/8	0.125	5/8	0.625	2 1/2	2.500	6	0.015	CMX-0210-R1	C2011	—	—
3/16	0.188	3/16	0.188	5/8	0.625	2 1/2	2.500		0.015	CMX-0310-R1	C2021	—	—
1/4	0.250	1/4	0.250	5/8	0.625	2 1/2	2.500		0.020	CMX-0410-R2	C2032	—	—
5/16	0.313	5/16	0.313	7/8	0.875	3	3.000		0.030	CMX-0514-R3	C2043	—	—
3/8	0.375	3/8	0.375	5/8	0.625	2 1/2	2.500		0.030	CMX-0610-R3	C2053	CMX-0610-R3-W	C2143
				7/8	0.875	3	3.000		0.030	CMX-0614-R3	C2063	CMX-0614-R3-W	C2153
7/16	0.438	7/16	0.438	1 1/8	1.125	3	3.000		0.030	CMX-0718-R3	C2073	CMX-0718-R3-W	C2163
1/2	0.500	1/2	0.500	7/8	0.875	3 1/2	3.500		0.030	CMX-0814-R3	C2083	CMX-0814-R3-W	C2173
				1 3/8	1.375	3 1/2	3.500		0.030	CMX-0822-R3	C2093	CMX-0822-R3-W	C2183
5/8	0.625	5/8	0.625	7/8	0.875	3	3.000		0.040	CMX-1014-R4	C2104	CMX-1014-R4-W	C2194
				1 3/8	1.375	3 1/2	3.500		0.040	CMX-1022-R4	C2114	CMX-1022-R4-W	C2204
3/4	0.750	3/4	0.750	1 5/8	1.625	4	4.000	8	0.050	CMX-1226-R5	C2125	CMX-1226-R5-W	C2215
1	1.000	1	1.000	1 7/8	1.875	4	4.000		0.060	CMX-1630-R6	C2136	CMX-1630-R6-W	C2226

SERIES CMXCL - *CORNER RADIUS, LONG LENGTH*

SHANK DIAMETER (D1)		CUTTER DIAMETER (D2)		FLUTE LENGTH (L2)		OVERALL LENGTH (L1)		# OF FLUTES	CORNER RADIUS (R)	PLAIN SHANK PART #	PLAIN SHANK EDP #	WELDON SHANK PART #	WELDON SHANK EDP #
1/8	0.125	1/8	0.125	7/8	0.875	3	3.000	6	0.015	CMX-0214-R1	C3011	—	—
3/16	0.188	3/16	0.188	7/8	0.875	3	3.000		0.015	CMX-0314-R1	C3021	—	—
1/4	0.250	1/4	0.250	1 1/8	1.125	4	4.000		0.020	CMX-0418-R2	C3032	—	—
5/16	0.313	5/16	0.313	1 5/8	1.625	4	4.000		0.030	CMX-0526-R3	C3043	—	—
3/8	0.375	3/8	0.375	1 7/8	1.875	4	4.000		0.030	CMX-0630-R3	C3053	CMX-0630-R3-W	C3133
7/16	0.438	7/16	0.438	2 1/8	2.125	4	4.000		0.030	CMX-0734-R3	C3063	CMX-0734-R3-W	C3143
1/2	0.500	1/2	0.500	2 1/8	2.125	4	4.000		0.030	CMX-0834-R3	C3073	CMX-0834-R3-W	C3153
5/8	0.625	5/8	0.625	2 5/8	2.625	5	5.000		0.040	CMX-1042-R4	C3084	CMX-1042-R4-W	C3164
3/4	0.750	3/4	0.750	2 5/8	2.625	5	5.000	8	0.050	CMX-1242-R5	C3095	CMX-1242-R5-W	C3175
				3 3/8	3.375	6	6.000		0.050	CMX-1254-R5	C3105	CMX-1254-R5-W	C3185
				4 3/8	4.375	7	7.000		0.050	CMX-1270-R5	C3115	CMX-1270-R5-W	C3195
1	1.000	1	1.000	4 3/8	4.375	7	7.000		0.060	CMX-1670-R6	C3126	CMX-1670-R6-W	C3206

CYCLONE MX

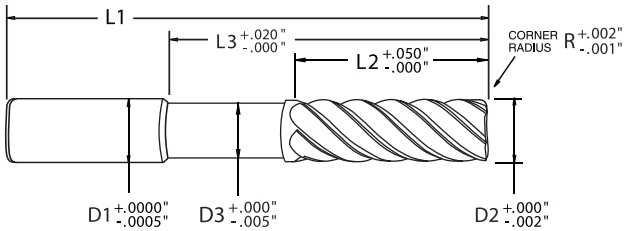
GLOBAL™

SERIES CMX - *CARBIDE, 6 & 8 FLUTE, 44/45/46° VARIABLE HELIX*

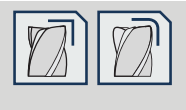
INCREASED STABILITY

The massive core increases stability and reduces tool deflection, while the rugged high strength six and eight flute design, maximizes the relationship between flute engagement and chip evacuation.

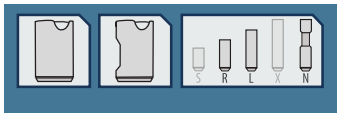
- Reduced neck option increases stability and reduces tool deflection while maintaining overall reach
- High strength flutes reduce edge chipping, built up edge and extends tool life
- Engineered flute relief allows for superior chip evacuation without compromising flute integrity



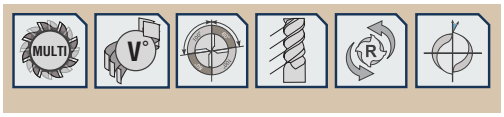
TIP & END



SHANK & LENGTH



FLUTE CONFIGURATION



MATERIAL

COATING

SERIES CMXCN - *CORNER RADIUS, REDUCED NECK*

SHANK DIAMETER (D1)	CUTTER DIAMETER (D2)	FLUTE LENGTH (L2)	OVERALL LENGTH (L1)	NECK LBS (L3)	NECK DIAMETER (L3)	# OF FLUTES	CORNER RADIUS (R)	PLAIN SHANK PART #	PLAIN SHANK EDP #	WELDON SHANK PART #	WELDON SHANK EDP #
1/8 0.125	1/8 0.125	1/4 0.250	2 2.000	1/2 0.500	0.118	6	0.015	CMX-0204-RN1-R1	C5011	—	—
			3 3.000	1 1/2 1.500				CMX-0204-RN2-R1	C5021	—	—
3/16 0.188	3/16 0.188	5/16 0.313	2 2.000	9/16 0.563	0.176		0.015	CMX-0305-RN1-R1	C5031	—	—
			3 3.000	1 9/16 1.563				CMX-0305-RN2-R1	C5041	—	—
1/4 0.250	1/4 0.250	3/8 0.375	2 1/2 2.500	1 1/8 1.125	0.235		0.020	CMX-0406-RN1-R2	C5052	—	—
			3 1/2 3.500	2 1/8 2.125				CMX-0406-RN2-R2	C5062	—	—
5/16 0.313	5/16 0.313	1/2 0.500	3 3.000	1 1/8 1.125	0.298		0.030	CMX-0508-RN1-R3	C5073	—	—
			4 4.000	2 1/8 2.125				CMX-0508-RN2-R3	C5083	—	—
3/8 0.375	3/8 0.375	1/2 0.500	3 3.000	1 1/8 1.125	0.355		0.030	CMX-0608-RN1-R3	C5093	CMX-0608-RN1-R3-W	C5213
			4 4.000	2 1/8 2.125				CMX-0608-RN2-R3	C5103	CMX-0608-RN2-R3-W	C5223
7/16 0.438	7/16 0.438	5/8 0.625	3 3.000	1 3/8 1.375	0.418		0.030	CMX-0710-RN1-R3	C5113	CMX-0710-RN1-R3-W	C5233
			4 4.000	2 3/8 2.375				CMX-0710-RN2-R3	C5123	CMX-0710-RN2-R3-W	C5243
1/2 0.500	1/2 0.500	5/8 0.625	3 1/2 3.500	1 3/8 1.375	0.475		0.030	CMX-0810-RN1-R3	C5133	CMX-0810-RN1-R3-W	C5253
			4 1/2 4.500	2 3/8 2.375				CMX-0810-RN2-R3	C5143	CMX-0810-RN2-R3-W	C5263
5/8 0.625	5/8 0.625	3/4 0.750	3 1/2 3.500	1 1/2 1.500	0.590		0.040	CMX-1012-RN1-R4	C5154	CMX-1012-RN1-R4-W	C5274
			5 5.000	2 1/2 2.500				CMX-1012-RN2-R4	C5164	CMX-1012-RN2-R4-W	C5284
3/4 0.750	3/4 0.750	1 1.000	4 4.000	1 3/4 1.750	0.715	8	0.050	CMX-1216-RN1-R5	C5175	CMX-1216-RN1-R5-W	C5295
			5 5.000	2 3/4 2.750				CMX-1216-RN2-R5	C5185	CMX-1216-RN2-R5-W	C5305
			6 6.000	3 3/4 3.750				CMX-1216-RN3-R5	C5195	CMX-1216-RN3-R5-W	C5335
1 1.000	1 1.000	1 1/8 1.125	4 4.000	1 7/8 1.875	0.960		0.060	CMX-1618-RN1-R6	C5196	CMX-1618-RN1-R6-W	C5316
			5 5.000	2 7/8 2.875				CMX-1618-RN2-R6	C5206	CMX-1618-RN2-R6-W	C5326
			6 6.000	3 7/8 3.875				CMX-1618-RN3-R6	C5226	CMX-1618-RN3-R6-W	C5366

CMX APPLICATION GUIDE • SPEEDS & FEEDS

	WORK MATERIAL	TYPE OF CUT	AXIAL DOC	RADIAL DOC	NO. OF FLUTES	SPEED (SFM)	FEED (INCHES PER TOOTH) 1/8" (6 FL)	1/4" (6 FL)	3/8" (6 FL)	1/2" (6 FL)	5/8" (6 FL)	3/4" (8 FL)	1" (8 FL)
CARBON STEEL	LOW CARBON STEELS ≤ 38 HRc 10xx; 11xx; 12xx; 12Lxx, 15xx	Slotting	1 x D	1 x D	6 / 8	255 - 290	0.0005 - 0.0007	0.0009 - 0.0013	0.0014 - 0.0020	0.0018 - 0.0026	0.0022 - 0.0032	0.0027 - 0.0039	0.0036 - 0.0052
		Roughing	1.5 x D	.5 x D	6 / 8	295 - 335	0.0006 - 0.0010	0.0011 - 0.0016	0.0016 - 0.0024	0.0022 - 0.0032	0.0027 - 0.0040	0.0033 - 0.0048	0.0043 - 0.0064
		High Effeciency (HEM)	2 x D	.2 x D	6 / 8	425 - 475	0.0009 - 0.0012	0.0017 - 0.0023	0.0025 - 0.0035	0.0033 - 0.0046	0.0041 - 0.0058	0.0050 - 0.0069	0.0066 - 0.0093
		Finishing	1.5 x D	.015 x D	6 / 8	400 - 440	0.0008 - 0.0012	0.0015 - 0.0020	0.0023 - 0.0030	0.0030 - 0.0039	0.0038 - 0.0049	0.0045 - 0.0059	0.0060 - 0.0079
	MEDIUM CARBON STEELS ≤ 38 HRc 13xx; 41xx; 43xx; 86xx, 92xx; 93xx; Chromoly	Slotting	1 x D	1 x D	6 / 8	260 - 295	0.0005 - 0.0007	0.0009 - 0.0013	0.0014 - 0.0020	0.0018 - 0.0026	0.0022 - 0.0032	0.0027 - 0.0039	0.0036 - 0.0052
		Roughing	1.5 x D	.5 x D	6 / 8	280 - 320	0.0006 - 0.0010	0.0011 - 0.0016	0.0016 - 0.0024	0.0022 - 0.0032	0.0027 - 0.0040	0.0033 - 0.0048	0.0043 - 0.0064
		High Effeciency (HEM)	2 x D	.2 x D	6 / 8	405 - 450	0.0009 - 0.0012	0.0017 - 0.0023	0.0025 - 0.0035	0.0033 - 0.0046	0.0041 - 0.0058	0.0050 - 0.0069	0.0066 - 0.0093
		Finishing	1.5 x D	.015 x D	6 / 8	380 - 415	0.0008 - 0.0012	0.0015 - 0.0020	0.0023 - 0.0030	0.0030 - 0.0039	0.0038 - 0.0049	0.0045 - 0.0059	0.0060 - 0.0079
TOOL STEEL	TOOL & DIE STEELS ≤ 38 HRc A2; A3; D2; H11; H13; M1; O-1; S-7; NAK 55	Slotting	1 x D	1 x D	6 / 8	200 - 230	0.0006 - 0.0008	0.0010 - 0.0014	0.0016 - 0.0022	0.0020 - 0.0028	0.0024 - 0.0034	0.0030 - 0.0042	0.0040 - 0.0056
		Roughing	1.5 x D	.5 x D	6 / 8	335 - 385	0.0006 - 0.0010	0.0011 - 0.0016	0.0016 - 0.0024	0.0022 - 0.0032	0.0027 - 0.0040	0.0033 - 0.0048	0.0043 - 0.0064
		High Effeciency (HEM)	2 x D	.2 x D	6 / 8	450 - 500	0.0009 - 0.0012	0.0017 - 0.0023	0.0025 - 0.0035	0.0033 - 0.0046	0.0041 - 0.0058	0.0050 - 0.0069	0.0066 - 0.0093
		Finishing	1.5 x D	.015 x D	6 / 8	425 - 465	0.0008 - 0.0012	0.0015 - 0.0020	0.0023 - 0.0030	0.0030 - 0.0039	0.0038 - 0.0049	0.0045 - 0.0059	0.0060 - 0.0079
	TOOL & DIE STEELS 39 to 48 HRc P20; P21; S-136; PX-5; NAK 80	Slotting	.75 x D	1 x D	6 / 8	190 - 215	0.0005 - 0.0007	0.0009 - 0.0013	0.0014 - 0.0020	0.0018 - 0.0026	0.0022 - 0.0032	0.0027 - 0.0039	0.0036 - 0.0052
		Roughing	1.5 x D	.3 x D	6 / 8	295 - 335	0.0006 - 0.0010	0.0011 - 0.0016	0.0016 - 0.0024	0.0022 - 0.0032	0.0027 - 0.0040	0.0033 - 0.0048	0.0043 - 0.0064
		High Effeciency (HEM)	2 x D	.15 x D	6 / 8	425 - 475	0.0008 - 0.0011	0.0015 - 0.0021	0.0022 - 0.0032	0.0029 - 0.0042	0.0036 - 0.0053	0.0044 - 0.0063	0.0058 - 0.0085
		Finishing	1.5 x D	.015 x D	6 / 8	400 - 440	0.0007 - 0.0011	0.0013 - 0.0018	0.0020 - 0.0027	0.0026 - 0.0035	0.0033 - 0.0044	0.0039 - 0.0053	0.0052 - 0.0071
HARDENED STEEL	HARDENED STEELS 48 to 57 HRc	Slotting	1 x D	1 x D	6 / 8	100 - 115	0.0004 - 0.0006	0.0007 - 0.0011	0.0011 - 0.0017	0.0014 - 0.0022	0.0017 - 0.0027	0.0021 - 0.0033	0.0028 - 0.0044
		Roughing	1.5 x D	.5 x D	6 / 8	170 - 195	0.0005 - 0.0009	0.0009 - 0.0014	0.0013 - 0.0021	0.0018 - 0.0028	0.0022 - 0.0035	0.0027 - 0.0042	0.0035 - 0.0056
		High Effeciency (HEM)	2 x D	.2 x D	6 / 8	345 - 385	0.0006 - 0.0009	0.0011 - 0.0017	0.0016 - 0.0026	0.0021 - 0.0034	0.0026 - 0.0043	0.0032 - 0.0051	0.0042 - 0.0069
		Finishing	1.5 x D	.015 x D	6 / 8	330 - 360	0.0005 - 0.0009	0.0009 - 0.0014	0.0014 - 0.0021	0.0018 - 0.0027	0.0023 - 0.0034	0.0027 - 0.0041	0.0036 - 0.0055
	HARDENED STEELS 58 to 65HRc	Slotting	.75 x D	1 x D	6 / 8	90 - 100	0.0004 - 0.0006	0.0007 - 0.0011	0.0011 - 0.0017	0.0014 - 0.0022	0.0017 - 0.0027	0.0021 - 0.0033	0.0028 - 0.0044
		Roughing	1.5 x D	.3 x D	6 / 8	160 - 180	0.0005 - 0.0009	0.0009 - 0.0014	0.0013 - 0.0021	0.0018 - 0.0028	0.0022 - 0.0035	0.0027 - 0.0042	0.0035 - 0.0056
		High Effeciency (HEM)	2 x D	.15 x D	6 / 8	365 - 410	0.0005 - 0.0008	0.0009 - 0.0015	0.0013 - 0.0023	0.0017 - 0.0030	0.0021 - 0.0038	0.0026 - 0.0045	0.0034 - 0.0061
		Finishing	1.5 x D	.015 x D	6 / 8	330 - 360	0.0005 - 0.0009	0.0009 - 0.0014	0.0014 - 0.0021	0.0018 - 0.0027	0.0023 - 0.0034	0.0027 - 0.0041	0.0036 - 0.0055
STAINLESS STEEL	EASY TO MACHINE 72 - 85 HRb 410; 416; 420; 430F; 440C; 302; 303	Slotting	.75 x D	1 x D	6 / 8	190 - 215	0.0004 - 0.0006	0.0007 - 0.0011	0.0011 - 0.0017	0.0014 - 0.0022	0.0017 - 0.0027	0.0021 - 0.0033	0.0028 - 0.0044
		Roughing	1.25 x D	.3 x D	6 / 8	265 - 300	0.0005 - 0.0009	0.0009 - 0.0014	0.0013 - 0.0021	0.0018 - 0.0028	0.0022 - 0.0035	0.0027 - 0.0042	0.0035 - 0.0056
		High Effeciency (HEM)	2 x D	.15 x D	6 / 8	410 - 460	0.0006 - 0.0009	0.0011 - 0.0017	0.0016 - 0.0026	0.0021 - 0.0034	0.0026 - 0.0043	0.0032 - 0.0051	0.0042 - 0.0069
		Finishing	1.5 x D	.015 x D	6 / 8	400 - 440	0.0006 - 0.0010	0.0011 - 0.0016	0.0017 - 0.0024	0.0022 - 0.0031	0.0028 - 0.0039	0.0033 - 0.0047	0.0044 - 0.0063
	MODERATELY DIFFICULT 79 - 85 HRb; 25 - 41 HRc 304; 304L; 316; 316L; 320; 321; 347; Invar 36; Kovar	Slotting	.75 x D	1 x D	6 / 8	190 - 215	0.0005 - 0.0007	0.0009 - 0.0013	0.0014 - 0.0020	0.0018 - 0.0026	0.0022 - 0.0032	0.0027 - 0.0039	0.0036 - 0.0052
		Roughing	1.25 x D	.3 x D	6 / 8	220 - 250	0.0007 - 0.0011	0.0013 - 0.0018	0.0019 - 0.0027	0.0026 - 0.0036	0.0032 - 0.0045	0.0039 - 0.0054	0.0051 - 0.0072
		High Effeciency (HEM)	2 x D	.1 x D	6 / 8	320 - 360	0.0010 - 0.0013	0.0019 - 0.0025	0.0028 - 0.0038	0.0037 - 0.0050	0.0046 - 0.0063	0.0056 - 0.0075	0.0074 - 0.0101
		Finishing	1.5 x D	.01 x D	6 / 8	305 - 335	0.0008 - 0.0012	0.0015 - 0.0020	0.0023 - 0.0030	0.0030 - 0.0039	0.0038 - 0.0049	0.0045 - 0.0059	0.0060 - 0.0079
	DIFFICULT TO MACHINE 31 - 50 HRc 13-8 PH; 15-5 PH; 17-4 PH; Carpenter; Custo 465; Invar	Slotting	.5 x D	1 x D	6 / 8	185 - 210	0.0005 - 0.0007	0.0009 - 0.0013	0.0014 - 0.0020	0.0018 - 0.0026	0.0022 - 0.0032	0.0027 - 0.0039	0.0036 - 0.0052
		Roughing	1.25 x D	.3 x D	6 / 8	235 - 270	0.0006 - 0.0010	0.0011 - 0.0016	0.0016 - 0.0024	0.0022 - 0.0032	0.0027 - 0.0040	0.0033 - 0.0048	0.0043 - 0.0064
		High Effeciency (HEM)	1.5 x D	.1 x D	6 / 8	315 - 350	0.0011 - 0.0014	0.0021 - 0.0027	0.0031 - 0.0041	0.0041 - 0.0054	0.0051 - 0.0068	0.0062 - 0.0081	0.0082 - 0.0109
		Finishing	1.5 x D	.01 x D	6 / 8	285 - 310	0.0007 - 0.0011	0.0013 - 0.0018	0.0020 - 0.0027	0.0026 - 0.0035	0.0033 - 0.0044	0.0039 - 0.0053	0.0052 - 0.0071
CAST IRON	GRAY 100 - 200 HRb	Slotting	1 x D	1 x D	6 / 8	275 - 315	0.0006 - 0.0008	0.0011 - 0.0015	0.0017 - 0.0023	0.0022 - 0.0030	0.0027 - 0.0037	0.0033 - 0.0045	0.0044 - 0.0060
		Roughing	1.5 x D	.5 x D	6 / 8	340 - 390	0.0007 - 0.0011	0.0013 - 0.0018	0.0019 - 0.0027	0.0026 - 0.0036	0.0032 - 0.0045	0.0039 - 0.0054	0.0051 - 0.0072
		High Effeciency (HEM)	2 x D	.2 x D	6 / 8	425 - 475	0.0009 - 0.0012	0.0017 - 0.0023	0.0025 - 0.0035	0.0033 - 0.0046	0.0041 - 0.0058	0.0050 - 0.0069	0.0066 - 0.0093
		Finishing	1.5 x D	.015 x D	6 / 8	400 - 440	0.0009 - 0.0013	0.0017 - 0.0022	0.0026 - 0.0033	0.0034 - 0.0043	0.0043 - 0.0054	0.0051 - 0.0065	0.0068 - 0.0087
	DUCTILE 150 - 300 HRb	Slotting	1 x D	1 x D	6 / 8	275 - 315	0.0006 - 0.0008	0.0011 - 0.0015	0.0017 - 0.0023	0.0022 - 0.0030	0.0027 - 0.0037	0.0033 - 0.0045	0.0044 - 0.0060
		Roughing	1.5 x D	.5 x D	6 / 8	340 - 390	0.0007 - 0.0011	0.0013 - 0.0018	0.0019 - 0.0027	0.0026 - 0.0036	0.0032 - 0.0045	0.0039 - 0.0054	0.0051 - 0.0072
		High Effeciency (HEM)	2 x D	.2 x D	6 / 8	425 - 475	0.0009 - 0.0012	0.0017 - 0.0023	0.0025 - 0.0035	0.0033 - 0.0046	0.0041 - 0.0058	0.0050 - 0.0069	0.0066 - 0.0093
		Finishing	1.5 x D	.015 x D	6 / 8	400 - 440	0.0009 - 0.0013	0.0017 - 0.0022	0.0026 - 0.0033	0.0034 - 0.0043	0.0043 - 0.0054	0.0051 - 0.0065	0.0068 - 0.0087
	MALLEABLE 150 - 310 HRb	Slotting	.75 x D	1 x D	6 / 8	240 - 275	0.0005 - 0.0007	0.0009 - 0.0013	0.0014 - 0.0020	0.0018 - 0.0026	0.0022 - 0.0032	0.0027 - 0.0039	0.0036 - 0.0052
		Roughing	1.5 x D	.5 x D	6 / 8	280 - 320	0.0007 - 0.0011	0.0013 - 0.0018	0.0019 - 0.0027	0.0026 - 0.0036	0.0032 - 0.0045	0.0039 - 0.0054	0.0051 - 0.0072
		High Effeciency (HEM)	2 x D	.2 x D	6 / 8	405 - 450	0.0009 - 0.0012	0.0017 - 0.0023	0.0025 - 0.0035	0.0033 - 0.0046	0.0041 - 0.0058	0.0050 - 0.0069	0.0066 - 0.0093
		Finishing	1.5 x D	.015 x D	6 / 8	380 - 415	0.0008 - 0.0012	0.0015 - 0.0020	0.0023 - 0.0030	0.0030 - 0.0039	0.0038 - 0.0049	0.0045 - 0.0059	0.0060 - 0.0079
ALLOYS	TITANIUM ALLOYS 70 - 100 HRb; 25 - 36 HRc Ti61AL4V; Grades 5-38	Slotting	.5 x D	1 x D	6 / 8	170 - 195	0.0004 - 0.0006	0.0007 - 0.0011	0.0011 - 0.0017	0.0014 - 0.0022	0.0017 - 0.0027	0.0021 - 0.0033	0.0028 - 0.0044
		Roughing	1.25 x D	.3 x D	6 / 8	220 - 250	0.0006 - 0.0010	0.0011 - 0.0016	0.0016 - 0.0024	0.0022 - 0.0032	0.0027 - 0.0040	0.0033 - 0.0048	0.0043 - 0.0064
		High Effeciency (HEM)	1.5 x D	.1 x D	6 / 8	315 - 350	0.0011 - 0.0014	0.0021 - 0.0027	0.0031 - 0.0041	0.0041 - 0.0054	0.0051 - 0.0068	0.0062 - 0.0081	0.0082 - 0.0109
		Finishing	1.5 x D	.01 x D	6 / 8	235 - 255	0.0007 - 0.0011	0.0013 - 0.0018	0.0020 - 0.0027	0.0026 - 0.0035	0.0033 - 0.0044	0.0039 - 0.0053	0.0052 - 0.0071
	HIGH TEMP ALLOYS 83 - 99 HRb; 30 - 52 HRc Inconel; Monel; A286; Rene; Stelite; Haynes; Waspalloy; Hastalloy; etc	Slotting	.25 x D	1 x D	6 / 8	60 - 65	0.0004 - 0.0006	0.0007 - 0.0011	0.0011 - 0.0017	0.0014 - 0.0022	0.0017 - 0.0027	0.0021 - 0.0033	0.0028 - 0.0044
		Roughing	1.25 x D	.25 x D	6 / 8	75 - 85	0.0005 - 0.0009	0.0009 - 0.0014	0.0013 - 0.0021	0.0018 - 0.0028	0.0022 - 0.0035	0.0027 - 0.0042	0.0035 - 0.0056
		High Effeciency (HEM)	1.5 x D	.1 x D	6 / 8	155 - 175	0.0005 - 0.0008	0.0009 - 0.0015	0.0013 - 0.0023	0.0017 - 0.0030	0.0021 - 0.0038	0.0026 - 0.0045	0.0034 - 0.0061
		Finishing	1.5 x D	.01 x D	6 / 8	115 - 125	0.0005 - 0.0009	0.0009 - 0.0014	0.0014 - 0.0021	0.0018 - 0.0027	0.0023 - 0.0034	0.0027 - 0.0041	0.0036 - 0.0055

D = tool diameter • Reduce feed rates by 20% when using long length tools • Use reduced neck tooling for long reach slotting • Starting parameters shown