

TOOLING INFORMATION

Tungsten Carbide End Mills

InchMax Series Vol.3



COMPLETE METALWORKING SOLUTIONS
(800) 991-4225 www.ahbinc.com
ISO Certified customerservice@ahbinc.com

new
IM-CFB

4 Flute Inch Size \emptyset .031 ~ .125
Ball End Mills



new
IM-CXERS

4 Flute Inch Size \emptyset .031 ~ .125
Radius End Mills



IM-CES 2000

2 Flute Inch Size \emptyset .010 ~ .125
Square End Mills



IM-CXES

4 Flute Inch Size \emptyset .010 ~ .125
Square End Mills



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U.S. UNION TOOL, INC.

New Series



Size $\phi 0.031'' \sim \phi 0.125''$

IM-CFB

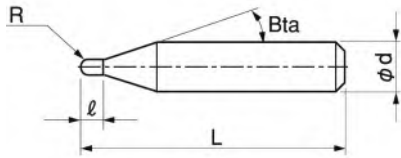


Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

Work Material																	
Carbon Steels S45C S55C	Alloy Steels SK / SCM SUS	Prehardened Steels NAK HPM	Hardened Steels					Cast Iron	Aluminum Alloys	Graphite	Copper	Plastics	Glass Filled Plastics	Titanium Alloys	Heat Resistant Alloys	Cemented Carbide	Hard Brittle (Non-Metallic) Materials
			~50HRC	~55HRC	~60HRC	~65HRC	~70HRC										
●	●	●	●	○				○			●			○	○		

Features

Achieves dramatically higher feed rates with 4flutes, shortening roughing time.
Offers highly efficient milling even for a slow-moving shape, with deep cut milling.



The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.

Unit (Inch)

Model Number	Outside Diameter ϕD	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd
IM-CFB 4031-093	0.031	0.093	16°	1-1/2	1/8
IM-CFB 4047-141	0.047	0.141			
IM-CFB 4062-186	0.062	0.186			
IM-CFB 4078-234	0.078	0.234			
IM-CFB 4093-279	0.093	0.279			
IM-CFB 4125-375	0.125	0.375			

IM-CFB

Work Material			CARBON STEELS S45C / S50C (~225HB)				STAINLESS STEELS Use water soluble or oil coolant			
Model Number	Outside Diameter (inch)	Length of Cut (inch)	Spindle Speed (min ⁻¹)	Feed Rate (Inch/min)	a _p Axial Depth (inch)	a _e Radial Depth (inch)	Spindle Speed (min ⁻¹)	Feed Rate (Inch/min)	a _p Axial Depth (inch)	a _e Radial Depth (inch)
4031-093	0.031	0.093	30,000	17.323	0.0004	0.0017	20,000	17.323	0.0008	0.0046
4047-141	0.047	0.141	30,000	23.622	0.0006	0.0025	20,000	23.622	0.0012	0.007
4062-186	0.062	0.186	30,000	34.252	0.0008	0.0033	20,600	34.252	0.0015	0.0091
4078-234	0.078	0.234	30,000	43.307	0.001	0.0042	23,800	43.307	0.0019	0.0115
4093-279	0.093	0.279	27,800	49.606	0.0093	0.0279	21,100	52.362	0.0046	0.0186
4125-375	0.125	0.375	23,000	52.362	0.0125	0.0375	15,300	52.362	0.0063	0.0271

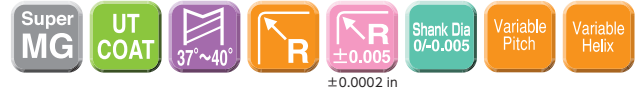
Note:
 *Recommend water soluble or oil coolant.
 *Recommend oil coolant for Titanium Alloys and Heat Resistant Alloys.

New Series



Size ϕ 0.031" ~ ϕ 0.125"

IM-CXERS

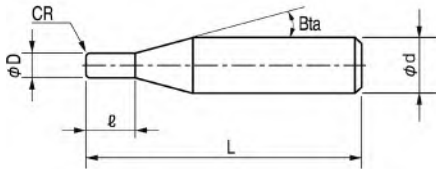


Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

Work Material																	
Carbon Steels S45C S55C	Alloy Steels SK / SCM SUS	Prehardened Steels NAK HPM	Hardened Steels					Cast Iron	Aluminum Alloys	Graphite	Copper	Plastics	Glass Filled Plastics	Titanium Alloys	Heat Resistant Alloys	Cemented Carbide	Hard Brittle (Non-Metallic) Materials
			~50HRC	~55HRC	~60HRC	~65HRC	~70HRC										
●	●	●	●	○				○			●			○	○		

Features

- Variable Division & Variable Helix design minimizes vibration and chattering.
- Selected carbide material with high toughness & high chip resistance.
- Excellent wear-resistance for the wide range of milling applications, from highly efficient milling to finishing.
- Low friction coating resulting in excellent chip evacuation and resistance to wear.
- Decreasing cutting resistance and offering stable milling by the original corner R design.



The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.

Unit (Inch)

Model Number	Outside Diameter ϕ D	Corner Radius CR	Length of Cut ℓ	Shank Taper Angle β ta	Overall Length L	Shank Diameter ϕ d
IM-CXERS 4031-093	0.031	0.010	0.093	16°	1-1/2	1/8
IM-CXERS 4047-141	0.047	0.010	0.141			
IM-CXERS 4062-186	0.062	0.010	0.186			
IM-CXERS 4078-234	0.078	0.010	0.234			
IM-CXERS 4093-279	0.093	0.010	0.279			
IM-CXERS 4125-375	0.125	0.010	0.375			

IM-CXERS

Work Material			CARBON STEELS S45C / S50C (~225HB)						STAINLESS STEELS Use water soluble or oil coolant					
Model Number	Outside Diameter (inch)	Length of Cut (inch)	Spindle Speed (min ⁻¹)	Slotting		Side Milling			Spindle Speed (min ⁻¹)	Slotting		Side Milling		
				Feed Rate (Inch/min)	a _p Axial Depth (inch)	Feed Rate (Inch/min)	a _p Axial Depth (inch)	a _e Radial Depth (inch)		Feed Rate (Inch/min)	a _p Axial Depth (inch)	Feed Rate (Inch/min)	a _p Axial Depth (inch)	a _e Radial Depth (inch)
4031-093	0.031	0.093	23,900	5.118	0.031	15.354	0.0775	0.0031	18,000	5.118	0.0155	7.874	0.0775	0.0031
4047-141	0.047	0.141	19,500	7.48	0.047	21.26	0.1175	0.0047	16,840	7.087	0.0235	10.24	0.1175	0.0047
4062-186	0.062	0.186	15,750	10.63	0.062	24.803	0.155	0.0062	15,760	7.48	0.031	10.63	0.155	0.0062
4078-234	0.078	0.234	13,310	14.173	0.078	29.134	0.195	0.0078	14,690	7.874	0.039	11.024	0.195	0.0078
4093-279	0.093	0.279	11,900	16.142	0.093	31.89	0.2325	0.0093	13,600	9.055	0.0465	14.173	0.2325	0.0093
4125-375	0.125	0.375	9,930	20.079	0.125	40.551	0.3125	0.0153	11,340	11.811	0.0625	21.654	0.3125	0.0125

Note:
 •Recommend water soluble or oil coolant.
 •Recommend oil coolant for Titanium Alloys and Heat Resistant Alloys.



Size $\phi 0.01'' \sim \phi 0.125''$

IM-CES2000

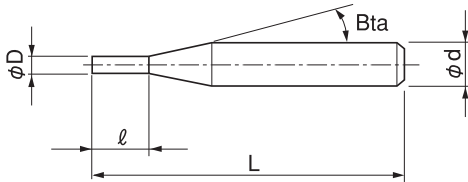


Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

Work Material																	
Carbon Steels S45C S55C	Alloy Steels SK / SCM SUS	Prehardened Steels NAK HPM	Hardened Steels					Cast Iron	Aluminum Alloys	Graphite	Copper	Plastics	Glass Filled Plastics	Titanium Alloys	Heat Resistant Alloys	Cemented Carbide	Hard Brittle (Non-Metallic) Materials
			~50HRC	~55HRC	~60HRC	~65HRC	~70HRC										
●	●	●	●	○				○			●			○	○		

Features

Broad application range from Copper and Carbon Steels up to Hardened steels (55HRC).
Excellent performance/quality to price ratio.



The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.

Unit (Inch)

Model Number	Outside Diameter ϕD	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd
IM-CES 2010-015	0.010	0.015	16°	1-1/2	1/8
IM-CES 2010-030		0.030			
IM-CES 2020-030	0.020	0.030			
IM-CES 2020-060		0.060			
IM-CES 2031-046	0.031	0.046			
IM-CES 2031-093		0.093			
IM-CES 2047-070	0.047	0.070			
IM-CES 2047-141		0.141			
IM-CES 2062-093	0.062	0.093			
IM-CES 2062-186		0.186			
IM-CES 2078-117	0.078	0.117			
IM-CES 2078-234		0.234			
IM-CES 2093-139	0.093	0.139			
IM-CES 2093-279		0.279			
IM-CES 2109-163	0.109	0.163			
IM-CES 2109-327		0.327			
IM-CES 2125-187	0.125	0.187	-		
IM-CES 2125-375		0.375			

Milling Conditions

IM-CES

Work Material			CARBON STEELS S45C / S50C (~225HB)					STAINLESS STEELS Use water soluble or oil coolant				
Model Number	Outside Diameter (inch)	Length of Cut (inch)	Spindle Speed (min ⁻¹)	Feed Rate (inch/min)	Slotting	Side Milling		Spindle Speed (min ⁻¹)	Feed Rate (inch/min)	Slotting	Side Milling	
					a_p Axial Depth (inch)	a_p Axial Depth (inch)	a_e Radial Depth (inch)			a_p Axial Depth (inch)	a_p Axial Depth (inch)	a_e Radial Depth (inch)
2010-015	0.010	0.015	30,000	3.937	0.0010	0.0150	0.0010	30,000	3.937	0.0010	0.0150	0.0010
2010-030		0.030	30,000	3.937	0.0005	0.0250	0.0005	30,000	3.937	0.0005	0.0250	0.0005
2020-030	0.020	0.030	30,000	4.724	0.0020	0.0300	0.0020	28,600	4.724	0.0020	0.0300	0.0020
2020-060		0.060	30,000	4.724	0.0010	0.0500	0.0010	28,600	4.724	0.0010	0.0500	0.0010
2031-046	0.031	0.046	24,400	4.724	0.0031	0.0460	0.0031	19,300	4.724	0.0031	0.0460	0.0031
2031-093		0.093	24,400	4.724	0.0016	0.0775	0.0016	19,300	4.724	0.0016	0.0775	0.0016
2047-070	0.047	0.070	16,800	5.118	0.0118	0.0700	0.0047	12,600	4.724	0.0118	0.0700	0.0047
2047-141		0.141	16,800	5.118	0.0059	0.1175	0.0024	12,600	4.724	0.0059	0.1175	0.0024
2062-093	0.062	0.093	13,000	5.118	0.0155	0.0930	0.0062	9,700	4.724	0.0155	0.0930	0.0062
2062-186		0.186	13,000	5.118	0.0078	0.1550	0.0031	9,700	4.724	0.0078	0.1550	0.0031
2078-117	0.078	0.117	11,000	5.118	0.0195	0.1170	0.0078	8,500	4.724	0.0195	0.1170	0.0078
2078-234		0.234	11,000	5.118	0.0098	0.1950	0.0039	8,500	4.724	0.0098	0.1950	0.0039
2093-139	0.093	0.139	9,400	7.087	0.0233	0.1390	0.0093	7,400	5.118	0.0233	0.1390	0.0093
2093-279		0.279	9,400	7.087	0.0116	0.2325	0.0047	7,400	5.118	0.0116	0.2325	0.0047
2109-163	0.109	0.163	8,000	7.874	0.0273	0.1630	0.0109	6,700	5.512	0.0273	0.1630	0.0109
2109-327		0.327	8,000	7.874	0.0136	0.2725	0.0055	6,700	5.512	0.0136	0.2725	0.0055
2125-187	0.125	0.187	7,100	7.874	0.0625	0.1870	0.0125	6,200	5.906	0.0625	0.1870	0.0125
2125-375		0.375	7,100	7.874	0.0375	0.3125	0.0063	6,200	5.906	0.0375	0.3125	0.0063

Note:

- Recommend water soluble or oil coolant.
- Recommend oil coolant for Titanium Alloys and Heat Resistant Alloys.



Size $\phi 0.01'' \sim \phi 0.125''$

IM-CXES

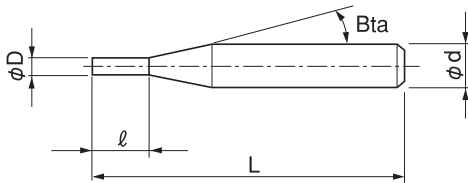


Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

Work Material																	
Carbon Steels S45C S55C	Alloy Steels SK / SCM SUS	Prehardened Steels NAK HPM	Hardened Steels					Cast Iron	Aluminum Alloys	Graphite	Copper	Plastics	Glass Filled Plastics	Titanium Alloys	Heat Resistant Alloys	Cemented Carbide	Hard Brittle (Non-Metallic) Materials
			~ 50HRC	~ 55HRC	~ 60HRC	~ 65HRC	~ 70HRC										
●	●	●	●	○				○			●			○	○		

Features

- Variable Division & Helix design minimizes vibration and chattering.
- Selected high toughness and chip resistant carbide material.
- Optimized flute design offers outstandingly high efficiency milling and fine finishing.
- Low friction coating resulting in excellent chip evacuation and resistance to wear.



The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.

Unit (Inch)

Model Number	Outside Diameter ϕD	Length of Cut ℓ	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd
IM-CXES 4010-015	0.010	0.015	16°	1-1/2	1/8
IM-CXES 4010-030		0.030			
IM-CXES 4015-022	0.015	0.022			
IM-CXES 4015-045		0.045			
IM-CXES 4020-030	0.020	0.030			
IM-CXES 4020-060		0.060			
IM-CXES 4025-037	0.025	0.037			
IM-CXES 4025-075		0.075			
IM-CXES 4030-045	0.030	0.045			
IM-CXES 4030-090		0.090			
IM-CXES 4031-046	0.031	0.046			
IM-CXES 4031-093		0.093			
IM-CXES 4035-052	0.035	0.052			
IM-CXES 4035-105		0.105			
IM-CXES 4040-060	0.040	0.060			
IM-CXES 4040-120		0.120			
IM-CXES 4047-070	0.047	0.070			
IM-CXES 4047-141		0.141			

UTCOAT 4 Flutes Square End Mills

Unit (Inch)

Model Number	Outside Diameter ϕD	Length of Cut ϕ	Shank Taper Angle Bta	Overall Length L	Shank Diameter ϕd
IM-CXES 4050-075	0.050	0.075	16°	1-1/2	1/8
IM-CXES 4050-150		0.150			
IM-CXES 4055-082	0.055	0.082			
IM-CXES 4055-165		0.165			
IM-CXES 4060-090	0.060	0.090			
IM-CXES 4060-180		0.180			
IM-CXES 4062-093	0.062	0.093			
IM-CXES 4062-186		0.186			
IM-CXES 4070-105	0.070	0.105			
IM-CXES 4070-210		0.210			
IM-CXES 4078-117	0.078	0.117			
IM-CXES 4078-234		0.234			
IM-CXES 4093-139	0.093	0.139			
IM-CXES 4093-279		0.279			
IM-CXES 4100-150	0.100	0.150			
IM-CXES 4100-300		0.300			
IM-CXES 4109-163	0.109	0.163			
IM-CXES 4109-327		0.327			
IM-CXES 4125-187	0.125	0.187	—		
IM-CXES 4125-375		0.375			

Milling Conditions

IM-CXES

Work Material			CARBON STEELS S45C / S50C (~225HB)						STAINLESS STEELS Use water soluble or oil coolant					
Model Number	Outside Diameter (inch)	Length of Cut (inch)	Spindle Speed (min ⁻¹)	Slotting		Side Milling			Spindle Speed (min ⁻¹)	Slotting		Side Milling		
				Feed Rate (inch/min)	a_p Axial Depth (inch)	Feed Rate (inch/min)	a_p Axial Depth (inch)	a_e Radial Depth (inch)		Feed Rate (inch/min)	a_p Axial Depth (inch)	a_e Radial Depth (inch)		
4010-015	0.010	0.015	30,000	4.724	0.0010	11.024	0.0150	0.0010	30,000	4.724	0.0010	10.236	0.0150	0.0010
4010-030		0.030	30,000	4.331	0.0005	11.024	0.0300	0.0002	30,000	4.331	0.0005	9.843	0.0300	0.0002
4015-022	0.015	0.022	30,000	5.512	0.0015	13.386	0.0220	0.0015	27,400	5.512	0.0015	10.630	0.0220	0.0015
4015-045		0.045	30,000	5.118	0.0008	13.386	0.0450	0.0002	27,300	5.118	0.0008	10.236	0.0450	0.0002
4020-030	0.020	0.030	30,000	5.512	0.0020	15.748	0.0300	0.0020	24,700	5.512	0.0020	11.024	0.0300	0.0020
4020-060		0.060	30,000	5.118	0.0010	15.748	0.0600	0.0003	24,700	5.118	0.0010	10.630	0.0600	0.0003
4025-037	0.025	0.037	26,900	5.512	0.0025	17.717	0.0370	0.0025	22,100	5.512	0.0025	11.417	0.0370	0.0025
4025-075		0.075	26,900	5.118	0.0013	17.717	0.0750	0.0004	22,000	5.118	0.0013	11.024	0.0750	0.0004
4030-045	0.030	0.045	23,800	5.512	0.0030	20.079	0.0450	0.0030	19,400	5.512	0.0030	11.811	0.0450	0.0030
4030-090		0.090	23,800	5.118	0.0015	20.079	0.0900	0.0005	19,300	5.118	0.0015	11.417	0.0900	0.0005
4031-046	0.031	0.046	23,200	5.512	0.0031	20.472	0.0460	0.0031	18,900	5.512	0.0031	11.811	0.0460	0.0031
4031-093		0.093	23,200	5.118	0.0016	20.472	0.0930	0.0005	18,800	5.118	0.0016	11.417	0.0930	0.0005
4035-052	0.035	0.052	20,700	5.906	0.0035	22.441	0.0520	0.0035	16,800	5.512	0.0035	12.205	0.0520	0.0035
4035-105		0.105	20,700	5.512	0.0018	22.441	0.1050	0.0005	16,600	5.118	0.0018	11.811	0.1050	0.0005
4040-060	0.040	0.060	17,900	7.874	0.0400	24.409	0.0600	0.0080	14,500	8.661	0.0200	12.598	0.0600	0.0040
4040-120		0.120	17,900	7.480	0.0200	24.409	0.1200	0.0012	14,300	8.268	0.0100	12.205	0.1200	0.0006
4047-070	0.047	0.070	16,300	9.843	0.0470	26.772	0.0700	0.0094	14,000	9.055	0.0235	12.992	0.0700	0.0047
4047-141		0.141	16,300	9.449	0.0235	26.772	0.1410	0.0014	13,900	8.661	0.0118	12.598	0.1410	0.0007
4050-075	0.050	0.075	15,600	10.236	0.0500	27.559	0.0750	0.0100	13,900	9.055	0.0250	12.992	0.0750	0.0050
4050-150		0.150	15,600	10.236	0.0250	27.559	0.1500	0.0015	13,600	8.661	0.0125	12.598	0.1500	0.0008
4055-082	0.055	0.082	14,400	11.811	0.0550	29.134	0.0820	0.0110	13,500	9.449	0.0275	13.386	0.0820	0.0055
4055-165		0.165	14,400	11.417	0.0275	29.134	0.1650	0.0017	13,100	8.661	0.0138	12.598	0.1650	0.0008
4060-090	0.060	0.090	13,400	12.992	0.0600	30.709	0.0900	0.0120	13,200	9.449	0.0300	13.386	0.0900	0.0060
4060-180		0.180	13,400	12.598	0.0300	30.709	0.1800	0.0018	12,800	9.055	0.0150	12.992	0.1800	0.0009
4062-093	0.062	0.093	13,100	13.386	0.0620	31.102	0.0930	0.0124	13,100	9.449	0.0310	13.386	0.0930	0.0062
4062-186		0.186	13,100	12.992	0.0310	31.102	0.1860	0.0019	13,000	9.055	0.0155	12.992	0.1860	0.0009
4070-105	0.070	0.105	12,100	15.748	0.0700	33.858	0.1050	0.0140	12,700	9.843	0.0350	13.780	0.1050	0.0070
4070-210		0.210	12,100	14.961	0.0350	33.858	0.2100	0.0021	12,500	9.055	0.0175	12.992	0.2100	0.0011

Milling Conditions

IM-CXES

Work Material			CARBON STEELS S45C / S50C (~225HB)						STAINLESS STEELS Use water soluble or oil coolant					
Model Number	Outside Diameter (inch)	Length of Cut (inch)	Spindle Speed (min ⁻¹)	Slotting		Side Milling			Spindle Speed (min ⁻¹)	Slotting		Side Milling		
				Feed Rate (inch/min)	a _p Axial Depth (inch)	Feed Rate (inch/min)	a _p Axial Depth (inch)	a _e Radial Depth (inch)		Feed Rate (inch/min)	a _p Axial Depth (inch)	Feed Rate (inch/min)	a _p Axial Depth (inch)	a _e Radial Depth (inch)
4078-117	0.078	0.117	11,100	17.717	0.0780	36.221	0.1170	0.0156	12,200	10.236	0.0390	14.173	0.1170	0.0078
4078-234		0.234	11,100	17.323	0.0390	36.221	0.2340	0.0023	12,000	9.449	0.0195	13.386	0.2340	0.0012
4093-139	0.093	0.139	9,900	20.472	0.0930	40.158	0.1390	0.0186	11,300	11.811	0.0465	17.717	0.1390	0.0093
4093-279		0.279	9,900	18.898	0.0465	40.158	0.2790	0.0028	10,900	10.630	0.0233	16.929	0.2790	0.0014
4100-150	0.100	0.150	9,400	21.260	0.1000	42.126	0.1500	0.0200	10,900	12.205	0.0500	19.685	0.1500	0.0100
4100-300		0.300	9,400	19.685	0.0500	42.520	0.3000	0.0030	10,300	11.024	0.0250	18.504	0.3000	0.0015
4109-163	0.109	0.163	9,000	22.441	0.1090	44.882	0.1630	0.0218	10,500	13.386	0.0545	22.441	0.1630	0.0109
4109-327		0.327	9,000	20.472	0.0545	44.882	0.3270	0.0033	9,800	11.417	0.0273	20.472	0.3270	0.0016
4125-187	0.125	0.187	8,300	24.016	0.1250	48.425	0.1870	0.0250	9,600	14.567	0.0625	25.984	0.1870	0.0125
4125-375		0.375	8,300	22.047	0.1250	48.425	0.3750	0.0125	8,700	12.205	0.0625	23.228	0.3750	0.0063

Note:

- Decrease both spindle speed and feed rate proportionally in case of chattering.
- These milling parameters are calculated based on the shortest overhang length. Longer overhangs may require an adjustment to the milling parameters.
- Reduce the milling amount and feed rate in accordance with required milling precision.
- Every coolant offers stable milling.
- Recommend water soluble or oil coolant for Stainless Steels and Copper.
- Recommend oil coolant for Titanium Alloys and Heat Resistant Alloys.



Advisory for Safe Use of UNIMAX Tungsten Carbide End Mills

Correct application and operation is strongly advised to avoid clogging, abrasion, etc, that could cause serious accidents or injuries. Ignition or sparks generated during milling could lead to fire or extreme damage to the work piece.

End Mills are made with very sharp cutting edges and must be handled with extra care.

- Never touch the cutting edge with your bare hands, as this could cause serious injury. Special caution is required when opening the package.
- Dropping the tool could cause breakage or flying debris, leading to serious injury.
- During milling, unexpected impact or shock on the tool could cause breakage or flying debris. Ensure to use protective items such as safety glasses and a face guard.
- For best results, fine parameter adjustment may be required, depending on the materials; milling shape and strategy; machine rigidity and spindle capability.
- Use a machine that has high rigidity and generates a low level of vibration.
- Do not use flammable cutting oils.

Advisory for regrinding UNIMAX Tungsten Carbide End Mills

- Never regrind the tool without wearing safety glasses and a face guard.



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