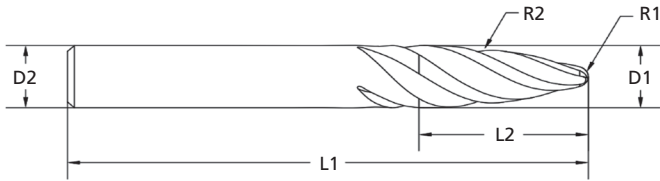
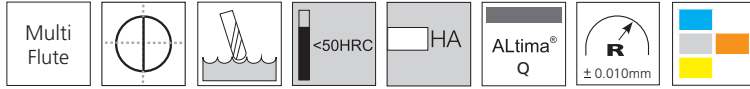


TuffCut® 3D Series XFO



Xtreme Finisher, Oval
 Designed for optimized cycle times & improved surface finishes in 5-axis finishing operations.

Features

- Multi-flute configurations
- Progressive helix & rake angles
- Enhanced edge preparation
- ALtima® Q coating

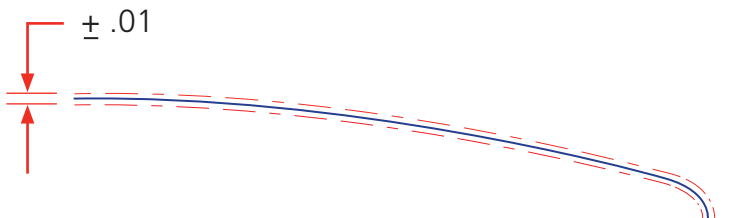
Benefits

- Allows for finishing & semi-finishing applications
- Smooth, vibration free finishing
- Increased strength & cutting-edge stabilization
- Optimal heat & wear resistance

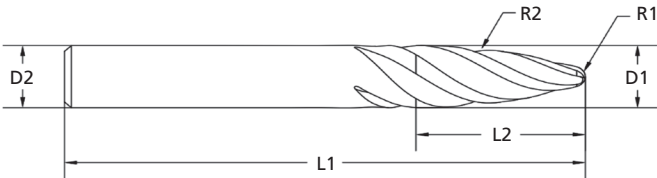
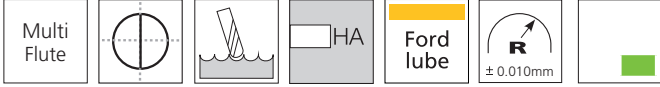
Tool No.	EDP	D1	D2 (h6)	L1	L2	R1	R2	No. of Flutes
XFO-4M06R95AQ	19904	6	6	64	20.8	1	95	4
XFO-4M08R90AQ	19905	8	8	64	24.5	1	90	4
XFO-4M10R85AQ	19906	10	10	72	24.7	2	85	4
XFO-6M10R85AQ	19907	10	10	72	24.7	2	85	6
XFO-4M12R80AQ	19908	12	12	84	27.3	2	80	4
XFO-6M12R80AQ	19909	12	12	84	27.3	2	80	6

Radius form tolerance

The XFO and XFO-AL series are held to a precision radius form tolerance of $\pm .010$ mm to ensure high accuracy finishing, and prevention of mis-match on component surfaces.



TuffCut® 3D Series XFO-AL



Xtreme Finisher, Oval - ALuminum
 Designed for optimized cycle times & improved surface finishes in 5-axis finishing operations.

Features

- Enhanced notch design
- Progressive helix & rake angles
- High shear action
- Fordlube coating

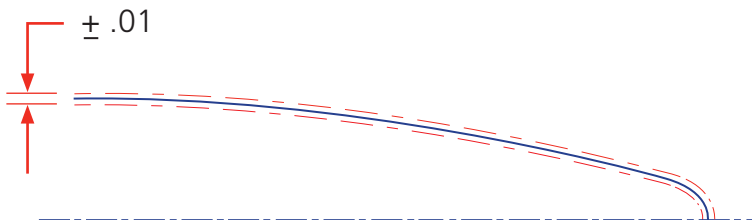
Benefits

- Allows for milling capabilities with full cutting-edge, including nose radius
- Smooth, vibration free finishing
- Optimal performance in aluminum alloys
- Increased wear resistance & lubricity

Tool No.	EDP	D1	D2 (h6)	L1	L2	R1	R2	No. of Flutes
XFO-AL3M06R95F	19900	6	6	64	20.8	1	95	3
XFO-AL3M08R90F	19901	8	8	64	24.5	1	90	3
XFO-AL4M10R85F	19902	10	10	72	24.7	2	85	4
XFO-AL4M12R80F	19903	12	12	84	27.3	2	80	4


Radius form tolerance

The XFO and XFO-AL series are held to a precision radius form tolerance of $\pm .010$ mm to ensure high accuracy finishing, and prevention of mis-match on component surfaces.



TuffCut® 3D Series XFO

Recommended Speeds Cutting Data - Inch

Recommended Speeds by Material Group		Stock Allowance 			Finishing	Semi-Finishing	
Workpiece Material Group	Material Type	Coolant			.01-.03 x D	.05-.07 x D	
		Emulsion	Air	MQL	Vc-SFM		
Steels	P	Low Carbon	●	●	●	1480	1150
		Medium Carbon	●	●	●	1130	900
		Alloy Steels	●	●	●	1030	840
		Die / Tool Steels (≤ 45 HRC)	●	●	●	900	720
Stainless Steels	M	Free Machining	●	X	○	670	540
		Austenitic	●	X	○	520	430
		Difficult Stainless	●	X	○	410	330
		PH Stainless (≤ 45 HRC)	●	X	○	520	430
		Cobalt Chrome Alloys	●	X	○	410	330
		Duplex (22%)	●	X	○	250	200
		Super Duplex (25%)	●	X	○	200	160
Special Alloys	S	High Temp Alloys	●	X	X	150	100
		Titanium Alloys	●	X	X	360	300

● Preferred ○ Possible X Not Possible

Recommended Feeds Cutting Data - Inch


Recommended Feeds by Material Group		Tool Diameter								
Workpiece Material Group	Material Type	.2362		.3150		.3937		.4724		
		Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	
		Fz - in/tooth								
Steels	P	Low Carbon	.0019	.0012	.0025	.0016	.0031	.0020	.0038	.0024
		Medium Carbon	.0019	.0012	.0025	.0016	.0031	.0020	.0038	.0024
		Alloy Steels	.0019	.0012	.0025	.0016	.0031	.0020	.0038	.0024
		Die / Tool Steels (≤ 45 HRC)	.0014	.0009	.0019	.0013	.0024	.0016	.0028	.0019
Stainless Steels	M	Free Machining	.0019	.0012	.0025	.0016	.0031	.0020	.0038	.0024
		Austenitic	.0019	.0012	.0025	.0016	.0031	.0020	.0038	.0024
		Difficult Stainless	.0019	.0012	.0025	.0016	.0031	.0020	.0038	.0024
		PH Stainless (≤ 45 HRC)	.0014	.0009	.0019	.0013	.0024	.0016	.0028	.0019
		Cobalt Chrome Alloys	.0014	.0009	.0019	.0013	.0024	.0016	.0028	.0019
		Duplex (22%)	.0014	.0009	.0019	.0013	.0024	.0016	.0028	.0019
		Super Duplex (25%)	.0014	.0009	.0019	.0013	.0024	.0016	.0028	.0019
Special Alloys	S	High Temp Alloys	.0014	.0009	.0019	.0013	.0024	.0016	.0028	.0019
		Titanium Alloys	.0017	.0012	.0022	.0016	.0028	.0020	.0033	.0024

Notes:

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application.
- To prevent chip evacuation issues, utilize 4-flute tools for semi-finishing operations & avoid cutting with the tip of the tool wherever possible.
- Reduced feeds required when cutting with the tip of the tool.

TuffCut® 3D Series XFO

Recommended Speeds Cutting Data - **Metric**

Recommended Speeds by Material Group		Stock Allowance 			Finishing	Semi-Finishing	
Workpiece Material Group	Material Type	Coolant			.01-.03 x D	.05-.07 x D	
		Emulsion	Air	MQL	Vc - M/Min		
Steels	P	Low Carbon	●	●	●	450	350
		Medium Carbon	●	●	●	345	275
		Alloy Steels	●	●	●	315	255
		Die / Tool Steels (≤ 45 HRC)	●	●	●	275	220
Stainless Steels	M	Free Machining	●	X	○	205	165
		Austenitic	●	X	○	160	130
		Difficult Stainless	●	X	○	125	100
		PH Stainless (≤ 45 HRC)	●	X	○	160	130
		Cobalt Chrome Alloys	●	X	○	125	100
		Duplex (22%)	●	X	○	75	60
		Super Duplex (25%)	●	X	○	60	50
Special Alloys	S	High Temp Alloys	●	X	X	45	30
		Titanium Alloys	●	X	X	110	90

● Preferred ○ Possible X Not Possible

Recommended Feeds Cutting Data - **Metric**


Recommended Feeds by Material Group		Tool Diameter								
Workpiece Material Group	Material Type	6		8		10		12		
		Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	
		Fz - mm/tooth								
Steels	P	Low Carbon	.048	.030	.064	.040	.080	.050	.096	.060
		Medium Carbon	.048	.030	.064	.040	.080	.050	.096	.060
		Alloy Steels	.048	.030	.064	.040	.080	.050	.096	.060
		Die / Tool Steels (≤ 45 HRC)	.036	.024	.048	.032	.060	.040	.072	.048
Stainless Steels	M	Free Machining	.048	.030	.064	.040	.080	.050	.096	.060
		Austenitic	.048	.030	.064	.040	.080	.050	.096	.060
		Difficult Stainless	.048	.030	.064	.040	.080	.050	.096	.060
		PH Stainless (≤ 45 HRC)	.036	.024	.048	.032	.060	.040	.072	.048
		Cobalt Chrome Alloys	.036	.024	.048	.032	.060	.040	.072	.048
		Duplex (22%)	.036	.024	.048	.032	.060	.040	.072	.048
		Super Duplex (25%)	.036	.024	.048	.032	.060	.040	.072	.048
Special Alloys	S	High Temp Alloys	.036	.024	.048	.032	.060	.040	.072	.048
		Titanium Alloys	.042	.030	.056	.040	.070	.050	.084	.060

Notes:

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application.
- To prevent chip evacuation issues, utilize 4-flute tools for semi-finishing operations & avoid cutting with the tip of the tool wherever possible.
- Reduced feeds required when cutting with the tip of the tool.

TuffCut® 3D Series XFO-AL

Recommended Speeds Cutting Data - Inch


Recommended Speeds by Material Group					Finishing	Semi-Finishing	
Workpiece Material Group	Material Type	Stock Allowance 			.01-.03 x D	.05-.07 x D	
		Coolant			Vc-SFM		
		Emulsion	Air	MQL			
Aluminum	N	Wrought (≤ 10% Si)	●	X	○	2000	1900
		Cast (> 10% Si)	●	X	○	1710	1610

● Preferred ○ Possible X Not Possible

Recommended Feeds Cutting Data - Inch

Recommended Feeds by Material Group		Tool Diameter								
Workpiece Material Group	Material Type	.2362		.3150		.3937		.4724		
		Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	
		Fz - in/tooth								
Aluminum	N	Wrought (≤ 10% Si)	.0024	.0015	.0032	.0020	.0039	.0026	.0047	.0031
		Cast (> 10% Si)	.0024	.0015	.0032	.0020	.0039	.0026	.0047	.0031

Recommended Speeds Cutting Data - Metric

Recommended Speeds by Material Group					Finishing	Semi-Finishing	
Workpiece Material Group	Material Type	Stock Allowance 			.01-.03 x D	.05-.07 x D	
		Coolant			Vc - M/Min		
		Emulsion	Air	MQL			
Aluminum	N	Wrought (≤ 10% Si)	●	X	○	610	580
		Cast (> 10% Si)	●	X	○	520	490

● Preferred ○ Possible X Not Possible

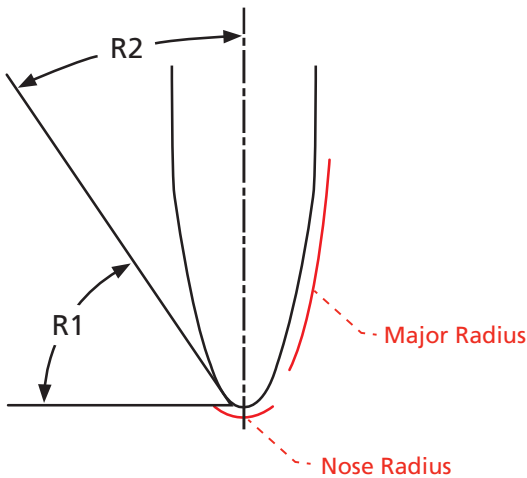
Recommended Feeds Cutting Data - Metric

Recommended Feeds by Material Group		Tool Diameter								
Workpiece Material Group	Material Type	6		8		10		12		
		Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	
		Fz - mm/tooth								
Aluminum	N	Wrought (≤ 10% Si)	.060	.039	.080	.052	.100	.065	.120	.078
		Cast (> 10% Si)	.060	.039	.080	.052	.100	.065	.120	.078

Notes:

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application.
- To prevent chip evacuation issues, avoid cutting with the tip of the tool wherever possible.
- Reduced feeds required when cutting with the tip of the tool.

TuffCut® 3D Series XFO / XFO-AL



Effective Angles

Tool Ø		Nose Radius		Major Radius	
D1	R1	Effective Angle (Max.)		R2	Effective Angle (Max.)
6	1	78.2°		95	11.8°
8	1	75.1°		90	14.9°
10	2	74.6°		85	15.4°
12	2	71.6°		80	18.4°

*Numbers above represent maximum angle values.

Stepover Distance by Cusp Height - Inch

Tool Ø (mm)		Cusp Height (Inch)	.0001	.0002	.0003	.0004	.0005
D1	R2						
6	95	Stepover (Inch)	.059	.077	.097	.109	.124
8	90		.058	.075	.094	.106	.120
10	85		.056	.072	.092	.103	.117
12	80		.054	.070	.089	.100	.113

Stepover Distance by Cusp Height - Metric

Tool Ø (mm)		Cusp Height (mm)	0.003	0.005	0.008	0.010	0.013
D1	R2						
6	95	Stepover (mm)	1.50	1.95	2.46	2.76	3.14
8	90		1.47	1.90	2.40	2.69	3.06
10	85		1.43	1.84	2.33	2.61	2.97
12	80		1.38	1.79	2.26	2.53	2.88

Safety Note

Always wear the appropriate personal protective equipment such as safety glasses and protective clothing when using solid carbide or HSS cutting tools. Machines should be fully guarded.

⚠ WARNING: This product can expose you to chemicals including cobalt, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.