

ONSRUD

Milling Tools for Aluminum and Exotic Metals



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t h e
ONSRUD
a d v a n t a g e

Onsrud Cutter has provided tooling to the aerospace, medical and energy industries for over 60 years. As materials have changed so have our tool designs... from high-speed steel used in hand routing of aluminum sheet to sophisticated coated solid carbide and diamond for today's composite and exotic metal materials.

The manufacturing facility in Libertyville Illinois, which houses the latest CNC grinding equipment, can provide special tooling within two weeks. Onsrud Cutter enhances state-of-the-art manufacturing with highly trained professional technicians who are available to evaluate your cutting tool needs.

When you want the right tool for the job, contact **The Performance Team** at Onsrud Cutter.



"O" Flute For
Aluminum

Aluminum Rougher/
Coolant Through

Aluminum 2 Flute

Aluminum 3 Flute/
Coolant Through

Exotic Metal
Rougher

Exotic Metal
Finisher

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Milling Tools for Aluminum Applications

Machining Aluminum Faster is what you get from Onsrud Cutter's line of tools for aluminum applications. The large "sweet spot" allows for chatter free machining at high RPM and heavy cuts. The resulting maximum metal removal rates mean maximum productivity in aluminum machining applications.

- 2 and 3 flute tools for both roughing and finishing applications
- 2 flute tools with open flute geometry optimized for slotting applications
- Polished flutes for better chip removal and low HP requirements
- 3 flute tools with large "sweet spot" for chatter free machining at high rpm and heavy cuts
- Efficient roughing metal removal rates up to 5 cubic inches per minute per HP
- Industry's largest selection of corner radii and neck and flute lengths
- Available coated and uncoated

If your machining center has **Coolant Through the Spindle** capabilities try the same 2 and 3 flute tools with Onsrud's unique coolant-through design that directs the coolant at the cutting edge. The coolant provides lubricant, dissipates heat and clears chips, which is especially important during deep cavity work, resulting in increased tool life and productivity levels.

Coolant at the cutting edge also contributes to superior finishes and prevents chips from adhering between the flutes. The unique design also maximizes the effect of "minimum quantity lubricant," or MQL, by ensuring that lubricant reaches the cutting edge of the tool. See page 19 thru 26 for our coolant through offering.



ONSRUD CUTTER

TECHNICAL DATA FOR ALUMINUM

Onsrud Cutter's aluminum tools are suitable for use in both low and high speed machining applications. Cutting recommendations listed below, either slotting or profiling, will assist in the reduction of chatter. Reduced chatter will increase tool life, produce a higher quality part, and optimize cutting efficiencies.

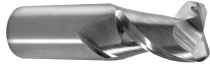
Optimized cutting combined with Onsrud's consistent quality from tool to tool will result in the lowest cost per part possible.



Aluminum Speeds & Feeds Chart								
Grade	Power Factor	S.F.P.M.	1/4	3/8	1/2	5/8	3/4	1
Aluminum 6061 / 7075	4	500 / 5000						
Slotting			.0034	.0051	.0068	.0085	.0102	.0136
Profiling 33% RDoC			.0042	.0063	.0084	.0104	.0125	.0167
Brass / Bronze	8	500 / 900						
Slotting			.0028	.0042	.0057	.0071	.0086	.0115
Profiling 33% RDoC			.0034	.0052	.0070	.0087	.0105	.0141
Copper Alloys	2	700 / 1000						
Slotting			.0028	.0042	.0057	.0071	.0086	.0115
Profiling 33% RDoC			.0034	.0052	.0070	.0087	.0105	.0141
Magnesium	4	500 / 900						
Slotting			.0028	.0042	.0057	.0071	.0086	.0115
Profiling 33% RDoC			.0034	.0052	.0070	.0087	.0105	.0141

Necessary Formulas	
S.F.P.M =	$3.14 \times \text{Diameter} \times \text{RPM} / 12$
Feed Rate (I.P.M) =	$F/T \times \# \text{ of Flutes} \times \text{RPM}$
Feed / Tooth =	$I.P.M / (\text{RPM} \times \# \text{ of Flutes})$
In ³ / Minute =	$I.P.M \times \text{ADoC} \times \text{RDoC}$
Horse Power Required =	$(\text{In}^3 / \text{Min}) / \text{Power Factor}$
Horse Power =	$1.341 \times \text{kW}$
Depths of Cut	
Profile Milling	ADoC = 1 to 1.5 x Endmill Diameter RDoC = .2 to .5 x Endmill Diameter
Slotting	ADoC = .5 to 1 x Endmill Diameter

Troubleshooting Cause & Effect	
Excessive Wear	Increase Feed Rate
	Decrease RPM
	Increase DoC
Chipping	Increase RPM
	Decrease Feed Rate
	Increase DoC
Build Up on Cutting Edge	Double Check Speeds & Feeds
	Adjust RPM
	Increase Feed Rate
	Increase DoC
Poor Finish / Chatter	Reduce Gauge Length
	Ensure Rigidly of Tool Holder
	Check Tool Run Out
	Check for Tool Wear
Tool Breakage @ Shank	Decrease DoC
	Decrease Feed Rate
	Shorten Gauge Length



Aluminum

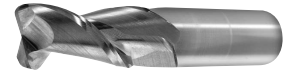
Standard Length 2 Flute

2 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	ZRN EDP #
AFS-20250	1/4	1/4	3/8	2	2	Square	AMC700102	AMC700103
						0.015	AMC700106	AMC700107
						0.030	AMC700110	AMC700111
						0.060	AMC700114	AMC700115
						0.090	AMC700118	AMC700119
						Ball	AMC700138	AMC700139
AFS-20375	3/8	3/8	1/2	2 1/2	2	Square	AMC700202	AMC700203
						0.015	AMC700206	AMC700207
						0.030	AMC700210	AMC700211
						0.060	AMC700214	AMC700215
						0.090	AMC700218	AMC700219
						0.120	AMC700222	AMC700223
						0.156	AMC700226	AMC700227
						Ball	AMC700238	AMC700239
AFS-20500	1/2	1/2	5/8	3	2	Square	AMC700302	AMC700303
						0.015	AMC700306	AMC700307
						0.030	AMC700310	AMC700311
						0.060	AMC700314	AMC700315
						0.090	AMC700318	AMC700319
						0.120	AMC700322	AMC700323
						0.156	AMC700326	AMC700327
						0.190	AMC700330	AMC700331
Ball	AMC700338	AMC700339						
AFS-20625	5/8	5/8	3/4	3	2	Square	AMC700402	AMC700403
						0.030	AMC700410	AMC700411
						0.060	AMC700414	AMC700415
						0.090	AMC700418	AMC700419
						0.120	AMC700422	AMC700423
						0.156	AMC700426	AMC700427
						0.190	AMC700430	AMC700431
						0.250	AMC700434	AMC700435
Ball	AMC700438	AMC700439						
AFS-20750	3/4	3/4	1	3	2	Square	AMC700502	AMC700503
						0.030	AMC700510	AMC700511
						0.060	AMC700514	AMC700515
						0.090	AMC700518	AMC700519
						0.120	AMC700522	AMC700523
						0.156	AMC700526	AMC700527
						0.190	AMC700530	AMC700531
						0.250	AMC700534	AMC700535
Ball	AMC700538	AMC700539						
AFS-21000	1	1	1 1/4	4	2	Square	AMC700602	AMC700603
						0.030	AMC700610	AMC700611
						0.060	AMC700614	AMC700615
						0.090	AMC700618	AMC700619
						0.120	AMC700622	AMC700623
						0.156	AMC700626	AMC700627
						0.190	AMC700630	AMC700631
						0.250	AMC700634	AMC700635
Ball	AMC700638	AMC700639						

Aluminum

Medium Length 2 Flute



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	ZRN EDP #
AFM-20250	1/4	1/4	3/4	2	2	Square	AMC700752	AMC700753
						0.015	AMC700756	AMC700757
						0.030	AMC700760	AMC700761
						0.060	AMC700764	AMC700765
						0.090	AMC700768	AMC700769
						Ball	AMC700788	AMC700789
AFM-20375	3/8	3/8	1	2 1/2	2	Square	AMC700852	AMC700853
						0.015	AMC700856	AMC700857
						0.030	AMC700860	AMC700861
						0.060	AMC700864	AMC700865
						0.090	AMC700868	AMC700869
						0.120	AMC700872	AMC700873
AFM-20500	1/2	1/2	1 1/4	3	2	Square	AMC700952	AMC700953
						0.015	AMC700956	AMC700957
						0.030	AMC700960	AMC700961
						0.060	AMC700964	AMC700965
						0.090	AMC700968	AMC700969
						0.120	AMC700972	AMC700973
AFM-20625	5/8	5/8	1 5/8	4	2	Square	AMC701052	AMC701053
						0.030	AMC701060	AMC701061
						0.060	AMC701064	AMC701065
						0.090	AMC701068	AMC701069
						0.120	AMC701072	AMC701073
						0.156	AMC701076	AMC701077
AFM-20750	3/4	3/4	1 5/8	4	2	Square	AMC701152	AMC701153
						0.030	AMC701160	AMC701161
						0.060	AMC701164	AMC701165
						0.090	AMC701168	AMC701169
						0.120	AMC701172	AMC701173
						0.156	AMC701176	AMC701177
AFM-21000	1	1	2 1/2	5	2	Square	AMC701252	AMC701253
						0.030	AMC701260	AMC701261
						0.060	AMC701264	AMC701265
						0.090	AMC701268	AMC701269
						0.120	AMC701272	AMC701273
						0.156	AMC701276	AMC701277
						0.190	AMC701280	AMC701281
						0.250	AMC701284	AMC701285
						Ball	AMC701288	AMC701289



Aluminum Long Length 2 Flute

2 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	ZRN EDP #
AFL-20250	1/4	1/4	1 1/4	2 1/2	2	Square	AMC701402	AMC701403
						0.015	AMC701406	AMC701407
						0.030	AMC701410	AMC701411
						0.060	AMC701414	AMC701415
						0.090	AMC701418	AMC701419
						Ball	AMC701438	AMC701439
AFL-20375	3/8	3/8	1 1/2	4	2	Square	AMC701502	AMC701503
						0.015	AMC701506	AMC701507
						0.030	AMC701510	AMC701511
						0.060	AMC701514	AMC701515
						0.090	AMC701518	AMC701519
						0.120	AMC701522	AMC701523
AFL-20500	1/2	1/2	2	4	2	Square	AMC701602	AMC701603
						0.015	AMC701606	AMC701607
						0.030	AMC701610	AMC701611
						0.060	AMC701614	AMC701615
						0.090	AMC701618	AMC701619
						0.120	AMC701622	AMC701623
AFL-20625	5/8	5/8	2 1/4	5	2	Square	AMC701702	AMC701703
						0.030	AMC701710	AMC701711
						0.060	AMC701714	AMC701715
						0.090	AMC701718	AMC701719
						0.120	AMC701722	AMC701723
						0.156	AMC701726	AMC701727
AFL-20750	3/4	3/4	2 1/2	5	2	Square	AMC701802	AMC701803
						0.030	AMC701810	AMC701811
						0.060	AMC701814	AMC701815
						0.090	AMC701818	AMC701819
						0.120	AMC701822	AMC701823
						0.156	AMC701826	AMC701827
AFL-21000	1	1	3 1/4	6	2	Square	AMC701902	AMC701903
						0.030	AMC701910	AMC701911
						0.060	AMC701914	AMC701915
						0.090	AMC701918	AMC701919
						0.120	AMC701922	AMC701923
						0.156	AMC701926	AMC701927
						0.190	AMC701930	AMC701931
						0.250	AMC701934	AMC701935
						Ball	AMC701938	AMC701939

Aluminum

Extra Long Length 2 Flute



2 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	ZRN EDP #
AFX-20500	1/2	1/2	3 1/8	6	2	Square	AMC702252	AMC702253
						0.015	AMC702256	AMC702257
						0.030	AMC702260	AMC702261
						0.060	AMC702264	AMC702265
						0.090	AMC702268	AMC702269
						0.120	AMC702272	AMC702273
						0.156	AMC702276	AMC702277
						0.190	AMC702280	AMC702281
						Ball	AMC702288	AMC702289
						AFX-20625	5/8	5/8
0.030	AMC702360	AMC702361						
0.060	AMC702364	AMC702365						
0.090	AMC702368	AMC702369						
0.120	AMC702372	AMC702373						
0.156	AMC702376	AMC702377						
0.190	AMC702380	AMC702381						
0.250	AMC702384	AMC702385						
Ball	AMC702388	AMC702389						
AFX-20750	3/4	3/4	3 1/4	6	2			
						0.030	AMC702460	AMC702461
						0.060	AMC702464	AMC702465
						0.090	AMC702468	AMC702469
						0.120	AMC702472	AMC702473
						0.156	AMC702476	AMC702477
						0.190	AMC702480	AMC702481
						0.250	AMC702484	AMC702485
						Ball	AMC702488	AMC702489
						AFX-21000	1	1
0.030	AMC702560	AMC702561						
0.060	AMC702564	AMC702565						
0.090	AMC702568	AMC702569						
0.120	AMC702572	AMC702573						
0.156	AMC702576	AMC702577						
0.190	AMC702580	AMC702581						
0.250	AMC702584	AMC702585						
Ball	AMC702588	AMC702589						



Aluminum - Necked Standard Length 2 Flute

2 Flute Necked

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFNS-20250	1/4	1/4	3/8	4	2	1 1/2	.236	Square	AMC706102	AMC706103
								0.015	AMC706106	AMC706107
								0.030	AMC706110	AMC706111
								0.060	AMC706114	AMC706115
								0.090	AMC706118	AMC706119
								Ball	AMC706138	AMC706139
AFNS-20375	3/8	3/8	1/2	4	2	1 3/4	.355	Square	AMC706202	AMC706203
								0.015	AMC706206	AMC706207
								0.030	AMC706210	AMC706211
								0.060	AMC706214	AMC706215
								0.090	AMC706218	AMC706219
								0.120	AMC706222	AMC706223
AFNS-20500	1/2	1/2	5/8	4	2	2 1/8	.470	Square	AMC706302	AMC706303
								0.015	AMC706306	AMC706307
								0.030	AMC706310	AMC706311
								0.060	AMC706314	AMC706315
								0.090	AMC706318	AMC706319
								0.120	AMC706322	AMC706323
AFNS-20625	5/8	5/8	3/4	4	2	2 1/8	.600	Square	AMC706402	AMC706403
								0.030	AMC706410	AMC706411
								0.060	AMC706414	AMC706415
								0.090	AMC706418	AMC706419
								0.120	AMC706422	AMC706423
								0.156	AMC706426	AMC706427
AFNS-20750	3/4	3/4	1	4	2	2 1/8	.715	Square	AMC706502	AMC706503
								0.030	AMC706510	AMC706511
								0.060	AMC706514	AMC706515
								0.090	AMC706518	AMC706519
								0.120	AMC706522	AMC706523
								0.156	AMC706526	AMC706527
AFNS-21000	1	1	1 1/4	5	2	2 1/8	.955	Square	AMC706602	AMC706603
								0.030	AMC706610	AMC706611
								0.060	AMC706614	AMC706615
								0.090	AMC706618	AMC706619
								0.120	AMC706622	AMC706623
								0.156	AMC706626	AMC706627
								0.190	AMC706630	AMC706631
								0.250	AMC706634	AMC706635
								Ball	AMC706638	AMC706639

Aluminum - Necked

Medium Length 2 Flute



2 Flute Necked

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFNM-20250	1/4	1/4	3/8	4	2	1 3/4	.236	Square	AMC706752	AMC706753
								0.015	AMC706756	AMC706757
								0.030	AMC706760	AMC706761
								0.060	AMC706764	AMC706765
								0.090	AMC706768	AMC706769
								Ball	AMC706788	AMC706789
AFNM-20375	3/8	3/8	1/2	4	2	2 1/4	.355	Square	AMC706852	AMC706853
								0.015	AMC706856	AMC706857
								0.030	AMC706860	AMC706861
								0.060	AMC706864	AMC706865
								0.090	AMC706868	AMC706869
								0.120	AMC706872	AMC706873
AFNM-20500	1/2	1/2	5/8	5	2	3 1/8	.470	Square	AMC706952	AMC706953
								0.015	AMC706956	AMC706957
								0.030	AMC706960	AMC706961
								0.060	AMC706964	AMC706965
								0.090	AMC706968	AMC706969
								0.120	AMC706972	AMC706973
AFNM-20625	5/8	5/8	3/4	5	2	3 1/8	.600	Square	AMC707052	AMC707053
								0.030	AMC707060	AMC707061
								0.060	AMC707064	AMC707065
								0.090	AMC707068	AMC707069
								0.120	AMC707072	AMC707073
								0.156	AMC707076	AMC707077
AFNM-20750	3/4	3/4	1	5	2	3 1/8	.715	Square	AMC707152	AMC707153
								0.030	AMC707160	AMC707161
								0.060	AMC707164	AMC707165
								0.090	AMC707168	AMC707169
								0.120	AMC707172	AMC707173
								0.156	AMC707176	AMC707177
AFNM-21000	1	1	1 1/4	6	2	3 1/8	.955	Square	AMC707252	AMC707253
								0.030	AMC707260	AMC707261
								0.060	AMC707264	AMC707265
								0.090	AMC707268	AMC707269
								0.120	AMC707272	AMC707273
								0.156	AMC707276	AMC707277
								0.190	AMC707280	AMC707281
								0.250	AMC707284	AMC707285
								Ball	AMC707288	AMC707289



Aluminum - Necked Long Length 2 Flute

2 Flute Necked

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFNL-20250	1/4	1/4	3/8	4	2	2 1/8	.236	Square	AMC707402	AMC707403
								0.015	AMC707406	AMC707407
								0.030	AMC707410	AMC707411
								0.060	AMC707414	AMC707415
								0.090	AMC707418	AMC707419
								Ball	AMC707438	AMC707439
								AFNL-20375	3/8	3/8
0.015	AMC707506	AMC707507								
0.030	AMC707510	AMC707511								
0.060	AMC707514	AMC707515								
0.090	AMC707518	AMC707519								
0.120	AMC707522	AMC707523								
0.156	AMC707526	AMC707527								
Ball	AMC707538	AMC707539								
AFNL-20500	1/2	1/2	5/8	6	2	4 1/8	.470	Square	AMC707602	AMC707603
								0.015	AMC707606	AMC707607
								0.030	AMC707610	AMC707611
								0.060	AMC707614	AMC707615
								0.090	AMC707618	AMC707619
								0.120	AMC707622	AMC707623
								0.156	AMC707626	AMC707627
0.190	AMC707630	AMC707631								
Ball	AMC707638	AMC707639								
AFNL-20625	5/8	5/8	3/4	6	2	4 1/8	.600	Square	AMC707702	AMC707703
								0.030	AMC707710	AMC707711
								0.060	AMC707714	AMC707715
								0.090	AMC707718	AMC707719
								0.120	AMC707722	AMC707723
								0.156	AMC707726	AMC707727
								0.190	AMC707730	AMC707731
0.250	AMC707734	AMC707735								
Ball	AMC707738	AMC707739								
AFNL-20750	3/4	3/4	1	6	2	4 1/8	.715	Square	AMC707802	AMC707803
								0.030	AMC707810	AMC707811
								0.060	AMC707814	AMC707815
								0.090	AMC707818	AMC707819
								0.120	AMC707822	AMC707823
								0.156	AMC707826	AMC707827
								0.190	AMC707830	AMC707831
0.250	AMC707834	AMC707835								
Ball	AMC707838	AMC707839								
AFNL-21000	1	1	1 1/4	7	2	4 1/8	.955	Square	AMC707902	AMC707903
								0.030	AMC707910	AMC707911
								0.060	AMC707914	AMC707915
								0.090	AMC707918	AMC707919
								0.120	AMC707922	AMC707923
								0.156	AMC707926	AMC707927
								0.190	AMC707930	AMC707931
0.250	AMC707934	AMC707935								
Ball	AMC707938	AMC707939								

Aluminum - Necked

Extra Long Length 2 Flute



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFNX-21000	1	1	1 1/4	7	2	4 5/8	.955	Square	AMC707952	AMC707953
								0.030	AMC707960	AMC707961
								0.060	AMC707964	AMC707965
								0.090	AMC707968	AMC707969
								0.120	AMC707972	AMC707973
								0.156	AMC707976	AMC707977
								0.190	AMC707980	AMC707981
								0.250	AMC707984	AMC707985
								Ball	AMC707988	AMC707989



Aluminum Finishers Standard Length 3 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	ZRN EDP #
AFS-30250	1/4	1/4	3/8	2	3	Square	AMC703102	AMC703103
						0.015	AMC703106	AMC703107
						0.030	AMC703110	AMC703111
						0.060	AMC703114	AMC703115
						0.090	AMC703118	AMC703119
						Ball	AMC703138	AMC703139
AFS-30375	3/8	3/8	1/2	2 1/2	3	Square	AMC703202	AMC703203
						0.015	AMC703206	AMC703207
						0.030	AMC703210	AMC703211
						0.060	AMC703214	AMC703215
						0.090	AMC703218	AMC703219
						0.120	AMC703222	AMC703223
						0.156	AMC703226	AMC703227
Ball	AMC703238	AMC703239						
AFS-30500	1/2	1/2	5/8	3	3	Square	AMC703302	AMC703303
						0.015	AMC703306	AMC703307
						0.030	AMC703310	AMC703311
						0.060	AMC703314	AMC703315
						0.090	AMC703318	AMC703319
						0.120	AMC703322	AMC703323
						0.156	AMC703326	AMC703327
						0.190	AMC703330	AMC703331
Ball	AMC703338	AMC703339						
AFS-30625	5/8	5/8	3/4	3	3	Square	AMC703402	AMC703403
						0.030	AMC703410	AMC703411
						0.060	AMC703414	AMC703415
						0.090	AMC703418	AMC703419
						0.120	AMC703422	AMC703423
						0.156	AMC703426	AMC703427
						0.190	AMC703430	AMC703431
						0.250	AMC703434	AMC703435
Ball	AMC703438	AMC703439						
AFS-30750	3/4	3/4	1	3	3	Square	AMC703502	AMC703503
						0.030	AMC703510	AMC703511
						0.060	AMC703514	AMC703515
						0.090	AMC703518	AMC703519
						0.120	AMC703522	AMC703523
						0.156	AMC703526	AMC703527
						0.190	AMC703530	AMC703531
						0.250	AMC703534	AMC703535
Ball	AMC703538	AMC703539						
AFS-31000	1	1	1 1/4	4	3	Square	AMC703602	AMC703603
						0.030	AMC703610	AMC703611
						0.060	AMC703614	AMC703615
						0.090	AMC703618	AMC703619
						0.120	AMC703622	AMC703623
						0.156	AMC703626	AMC703627
						0.190	AMC703630	AMC703631
						0.250	AMC703634	AMC703635
Ball	AMC703638	AMC703639						

3 Flute

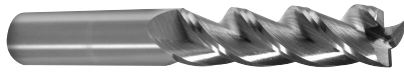
Aluminum Finishers

Medium Length 3 Flute



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	ZRN EDP #
AFM-30250	1/4	1/4	3/4	2	3	Square	AMC703752	AMC703753
						0.015	AMC703756	AMC703757
						0.030	AMC703760	AMC703761
						0.060	AMC703764	AMC703765
						0.090	AMC703768	AMC703769
						Ball	AMC703788	AMC703789
AFM-30375	3/8	3/8	1	2 1/2	3	Square	AMC703852	AMC703853
						0.015	AMC703856	AMC703857
						0.030	AMC703860	AMC703861
						0.060	AMC703864	AMC703865
						0.090	AMC703868	AMC703869
						0.120	AMC703872	AMC703873
AFM-30500	1/2	1/2	1 1/4	3	3	Square	AMC703952	AMC703953
						0.015	AMC703956	AMC703957
						0.030	AMC703960	AMC703961
						0.060	AMC703964	AMC703965
						0.090	AMC703968	AMC703969
						0.120	AMC703972	AMC703973
AFM-30625	5/8	5/8	1 5/8	4	3	Square	AMC704052	AMC704053
						0.030	AMC704060	AMC704061
						0.060	AMC704064	AMC704065
						0.090	AMC704068	AMC704069
						0.120	AMC704072	AMC704073
						0.156	AMC704076	AMC704077
AFM-30750	3/4	3/4	1 5/8	4	3	Square	AMC704152	AMC704153
						0.030	AMC704160	AMC704161
						0.060	AMC704164	AMC704165
						0.090	AMC704168	AMC704169
						0.120	AMC704172	AMC704173
						0.156	AMC704176	AMC704177
AFM-31000	1	1	2 1/2	5	3	Square	AMC704252	AMC704253
						0.030	AMC704260	AMC704261
						0.060	AMC704264	AMC704265
						0.090	AMC704268	AMC704269
						0.120	AMC704272	AMC704273
						0.156	AMC704276	AMC704277
						0.190	AMC704280	AMC704281
						0.250	AMC704284	AMC704285
						Ball	AMC704288	AMC704289

3 Flute



Aluminum Finishers Long Length 3 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	ZRN EDP #
AFL-30250	1/4	1/4	1 1/4	2 1/2	3	Square	AMC704402	AMC704403
						0.015	AMC704406	AMC704407
						0.030	AMC704410	AMC704411
						0.060	AMC704414	AMC704415
						0.090	AMC704418	AMC704419
						Ball	AMC704438	AMC704439
						AFL-30375	3/8	3/8
0.015	AMC704506	AMC704507						
0.030	AMC704510	AMC704511						
0.060	AMC704514	AMC704515						
0.090	AMC704518	AMC704519						
0.120	AMC704522	AMC704523						
0.156	AMC704526	AMC704527						
Ball	AMC704538	AMC704539						
AFL-30500	1/2	1/2	2	4	3	Square	AMC704602	AMC704603
						0.015	AMC704606	AMC704607
						0.030	AMC704610	AMC704611
						0.060	AMC704614	AMC704615
						0.090	AMC704618	AMC704619
						0.120	AMC704622	AMC704623
						0.156	AMC704626	AMC704627
0.190	AMC704630	AMC704631						
Ball	AMC704638	AMC704639						
AFL-30625	5/8	5/8	2 1/4	5	3	Square	AMC704702	AMC704703
						0.030	AMC704710	AMC704711
						0.060	AMC704714	AMC704715
						0.090	AMC704718	AMC704719
						0.120	AMC704722	AMC704723
						0.156	AMC704726	AMC704727
						0.190	AMC704730	AMC704731
0.250	AMC704734	AMC704735						
Ball	AMC704738	AMC704739						
AFL-30750	3/4	3/4	2 1/2	5	3	Square	AMC704802	AMC704803
						0.030	AMC704810	AMC704811
						0.060	AMC704814	AMC704815
						0.090	AMC704818	AMC704819
						0.120	AMC704822	AMC704823
						0.156	AMC704826	AMC704827
						0.190	AMC704830	AMC704831
0.250	AMC704834	AMC704835						
Ball	AMC704838	AMC704839						
AFL-31000	1	1	3 1/4	6	3	Square	AMC704902	AMC704903
						0.030	AMC704910	AMC704911
						0.060	AMC704914	AMC704915
						0.090	AMC704918	AMC704919
						0.120	AMC704922	AMC704923
						0.156	AMC704926	AMC704927
						0.190	AMC704930	AMC704931
0.250	AMC704934	AMC704935						
Ball	AMC704938	AMC704939						

3 Flute

Aluminum Finishers

Extra Long Length 3 Flute



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	ZRN EDP #
AFX-30500	1/2	1/2	3 1/8	6	3	Square	AMC705252	AMC705253
						0.015	AMC705256	AMC705257
						0.030	AMC705260	AMC705261
						0.060	AMC705264	AMC705265
						0.090	AMC705268	AMC705269
						0.120	AMC705272	AMC705273
						0.156	AMC705276	AMC705277
						0.190	AMC705280	AMC705281
						Ball	AMC705288	AMC705289
						AFX-30625	5/8	5/8
0.030	AMC705360	AMC705361						
0.060	AMC705364	AMC705365						
0.090	AMC705368	AMC705369						
0.120	AMC705372	AMC705373						
0.156	AMC705376	AMC705377						
0.190	AMC705380	AMC705381						
0.250	AMC705384	AMC705385						
Ball	AMC705388	AMC705389						
AFX-30750	3/4	3/4	3 1/4	6	3			
						0.030	AMC705460	AMC705461
						0.060	AMC705464	AMC705465
						0.090	AMC705468	AMC705469
						0.120	AMC705472	AMC705473
						0.156	AMC705476	AMC705477
						0.190	AMC705480	AMC705481
						0.250	AMC705484	AMC705485
						Ball	AMC705488	AMC705489
						AFX-31000	1	1
0.030	AMC705560	AMC705561						
0.060	AMC705564	AMC705565						
0.090	AMC705568	AMC705569						
0.120	AMC705572	AMC705573						
0.156	AMC705576	AMC705577						
0.190	AMC705580	AMC705581						
0.250	AMC705584	AMC705585						
Ball	AMC705588	AMC705589						

3 Flute



Aluminum Finishers - Necked

Standard Length 3 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFNS-30250	1/4	1/4	3/8	4	3	1 1/2	.236	Square	AMC709102	AMC709103
								0.015	AMC709106	AMC709107
								0.030	AMC709110	AMC709111
								0.060	AMC709114	AMC709115
								0.090	AMC709118	AMC709119
								Ball	AMC709138	AMC709139
								AFNS-30375	3/8	3/8
0.015	AMC709206	AMC709207								
0.030	AMC709210	AMC709211								
0.060	AMC709214	AMC709215								
0.090	AMC709218	AMC709219								
0.120	AMC709222	AMC709223								
0.156	AMC709226	AMC709227								
Ball	AMC709238	AMC709239								
AFNS-30500	1/2	1/2	5/8	4	3	2 1/8	.470	Square	AMC709302	AMC709303
								0.015	AMC709306	AMC709307
								0.030	AMC709310	AMC709311
								0.060	AMC709314	AMC709315
								0.090	AMC709318	AMC709319
								0.120	AMC709322	AMC709323
								0.156	AMC709326	AMC709327
0.190	AMC709330	AMC709331								
Ball	AMC709338	AMC709339								
AFNS-30625	5/8	5/8	3/4	4	3	2 1/8	.600	Square	AMC709402	AMC709403
								0.030	AMC709410	AMC709411
								0.060	AMC709414	AMC709415
								0.090	AMC709418	AMC709419
								0.120	AMC709422	AMC709423
								0.156	AMC709426	AMC709427
								0.190	AMC709430	AMC709431
0.250	AMC709434	AMC709435								
Ball	AMC709438	AMC709439								
AFNS-30750	3/4	3/4	1	4	3	2 1/8	.715	Square	AMC709502	AMC709503
								0.030	AMC709510	AMC709511
								0.060	AMC709514	AMC709515
								0.090	AMC709518	AMC709519
								0.120	AMC709522	AMC709523
								0.156	AMC709526	AMC709527
								0.190	AMC709530	AMC709531
0.250	AMC709534	AMC709535								
Ball	AMC709538	AMC709539								
AFNS-31000	1	1	1 1/4	5	3	2 1/8	.955	Square	AMC709602	AMC709603
								0.030	AMC709610	AMC709611
								0.060	AMC709614	AMC709615
								0.090	AMC709618	AMC709619
								0.120	AMC709622	AMC709623
								0.156	AMC709626	AMC709627
								0.190	AMC709630	AMC709631
0.250	AMC709634	AMC709635								
Ball	AMC709638	AMC709639								

3 Flute Necked

Aluminum Finishers - Necked

Medium Length 3 Flute



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFNM-30250	1/4	1/4	3/8	4	3	1 3/4	.236	Square	AMC709752	AMC709753
								0.015	AMC709756	AMC709757
								0.030	AMC709760	AMC709761
								0.060	AMC709764	AMC709765
								0.090	AMC709768	AMC709769
								Ball	AMC709788	AMC709789
AFNM-30375	3/8	3/8	1/2	4	3	2 1/4	.355	Square	AMC709852	AMC709853
								0.015	AMC709856	AMC709857
								0.030	AMC709860	AMC709861
								0.060	AMC709864	AMC709865
								0.090	AMC709868	AMC709869
								0.120	AMC709872	AMC709873
AFNM-30500	1/2	1/2	5/8	5	3	3 1/8	.470	Square	AMC709952	AMC709953
								0.015	AMC709956	AMC709957
								0.030	AMC709960	AMC709961
								0.060	AMC709964	AMC709965
								0.090	AMC709968	AMC709969
								0.120	AMC709972	AMC709973
AFNM-30625	5/8	5/8	3/4	5	3	3 1/8	.600	Square	AMC710052	AMC710053
								0.030	AMC710060	AMC710061
								0.060	AMC710064	AMC710065
								0.090	AMC710068	AMC710069
								0.120	AMC710072	AMC710073
								0.156	AMC710076	AMC710077
AFNM-30750	3/4	3/4	1	5	3	3 1/8	.715	Square	AMC710152	AMC710153
								0.030	AMC710160	AMC710161
								0.060	AMC710164	AMC710165
								0.090	AMC710168	AMC710169
								0.120	AMC710172	AMC710173
								0.156	AMC710176	AMC710177
AFNM-31000	1	1	1 1/4	6	3	3 1/8	.955	Square	AMC710252	AMC710253
								0.030	AMC710260	AMC710261
								0.060	AMC710264	AMC710265
								0.090	AMC710268	AMC710269
								0.120	AMC710272	AMC710273
								0.156	AMC710276	AMC710277
								0.190	AMC710180	AMC710181
								0.250	AMC710184	AMC710185
								Ball	AMC710188	AMC710189
								0.190	AMC710280	AMC710281
								0.250	AMC710284	AMC710285
								Ball	AMC710288	AMC710289

3 Flute Necked



Aluminum Finishers - Necked Long Length 3 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFNL-30250	1/4	1/4	3/8	4	3	2 1/8	.236	Square	AMC710402	AMC710403
								0.015	AMC710406	AMC710407
								0.030	AMC710410	AMC710411
								0.060	AMC710414	AMC710415
								0.090	AMC710418	AMC710419
								Ball	AMC710438	AMC710439
AFNL-30375	3/8	3/8	1/2	5	3	2 3/4	.355	Square	AMC710502	AMC710503
								0.015	AMC710506	AMC710507
								0.030	AMC710510	AMC710511
								0.060	AMC710514	AMC710515
								0.090	AMC710518	AMC710519
								0.120	AMC710522	AMC710523
AFNL-30500	1/2	1/2	5/8	6	3	4 1/8	.470	Square	AMC710602	AMC710603
								0.015	AMC710606	AMC710607
								0.030	AMC710610	AMC710611
								0.060	AMC710614	AMC710615
								0.090	AMC710618	AMC710619
								0.120	AMC710622	AMC710623
AFNL-30625	5/8	5/8	3/4	6	3	4 1/8	.600	Square	AMC710702	AMC710703
								0.030	AMC710710	AMC710711
								0.060	AMC710714	AMC710715
								0.090	AMC710718	AMC710719
								0.120	AMC710722	AMC710723
								0.156	AMC710726	AMC710727
AFNL-30750	3/4	3/4	1	6	3	4 1/8	.715	Square	AMC710802	AMC710803
								0.030	AMC710810	AMC710811
								0.060	AMC710814	AMC710815
								0.090	AMC710818	AMC710819
								0.120	AMC710822	AMC710823
								0.156	AMC710826	AMC710827
AFNL-31000	1	1	1 1/4	7	3	4 1/8	.955	Square	AMC710902	AMC710903
								0.030	AMC710910	AMC710911
								0.060	AMC710914	AMC710915
								0.090	AMC710918	AMC710919
								0.120	AMC710922	AMC710923
								0.156	AMC710926	AMC710927
								0.190	AMC710930	AMC710931
								0.250	AMC710934	AMC710935
								Ball	AMC710938	AMC710939

3 Flute Necked

Aluminum Finishers - Necked

Extra Long Length 3 Flute



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFNX-31000	1	1	1 1/4	7	3	4 5/8	.955	Square	AMC710952	AMC710953
								0.030	AMC710960	AMC710961
								0.060	AMC710964	AMC710965
								0.090	AMC710968	AMC710969
								0.120	AMC710972	AMC710973
								0.156	AMC710976	AMC710977
								0.190	AMC710980	AMC710981
								0.250	AMC710984	AMC710985
								Ball	AMC710988	AMC710989

3 Flute Necked



Aluminum Coolant Through Series - Necked Standard Length 2 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFCNS-20250	1/4	1/4	3/8	4	2	1 1/2	.236	Square	AMC712102	AMC712103
								0.015	AMC712106	AMC712107
								0.030	AMC712110	AMC712111
								0.060	AMC712114	AMC712115
								0.090	AMC712118	AMC712119
								Ball	AMC712138	AMC712139
								AFCNS-20375	3/8	3/8
0.015	AMC712206	AMC712207								
0.030	AMC712210	AMC712211								
0.060	AMC712214	AMC712215								
0.090	AMC712218	AMC712219								
0.120	AMC712222	AMC712223								
0.156	AMC712226	AMC712227								
Ball	AMC712238	AMC712239								
AFCNS-20500	1/2	1/2	5/8	4	2	2 1/8	.470	Square	AMC712302	AMC712303
								0.015	AMC712306	AMC712307
								0.030	AMC712310	AMC712311
								0.060	AMC712314	AMC712315
								0.090	AMC712318	AMC712319
								0.120	AMC712322	AMC712323
								0.156	AMC712326	AMC712327
0.190	AMC712330	AMC712331								
Ball	AMC712338	AMC712339								
AFCNS-20625	5/8	5/8	3/4	4	2	2 1/8	.600	Square	AMC712402	AMC712403
								0.030	AMC712410	AMC712411
								0.060	AMC712414	AMC712415
								0.090	AMC712418	AMC712419
								0.120	AMC712422	AMC712423
								0.156	AMC712426	AMC712427
								0.190	AMC712430	AMC712431
0.250	AMC712434	AMC712435								
Ball	AMC712438	AMC712439								
AFCNS-20750	3/4	3/4	1	4	2	2 1/8	.715	Square	AMC712502	AMC712503
								0.030	AMC712510	AMC712511
								0.060	AMC712514	AMC712515
								0.090	AMC712518	AMC712519
								0.120	AMC712522	AMC712523
								0.156	AMC712526	AMC712527
								0.190	AMC712530	AMC712531
0.250	AMC712534	AMC712535								
Ball	AMC712538	AMC712539								
AFCNS-21000	1	1	1 1/4	5	2	2 1/8	.955	Square	AMC712602	AMC712603
								0.030	AMC712610	AMC712611
								0.060	AMC712614	AMC712615
								0.090	AMC712618	AMC712619
								0.120	AMC712622	AMC712623
								0.156	AMC712626	AMC712627
								0.190	AMC712630	AMC712631
0.250	AMC712634	AMC712635								
Ball	AMC712638	AMC712639								

2 Flute Coolant Through

Aluminum Coolant Through Series - Necked

Medium Length 2 Flute



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFCNM-20250	1/4	1/4	3/8	4	2	1 3/4	.236	Square	AMC712752	AMC712753
								0.015	AMC712756	AMC712757
								0.030	AMC712760	AMC712761
								0.060	AMC712764	AMC712765
								0.090	AMC712768	AMC712769
								Ball	AMC712788	AMC712789
								AFCNM-20375	3/8	3/8
0.015	AMC712856	AMC712857								
0.030	AMC712860	AMC712861								
0.060	AMC712864	AMC712865								
0.090	AMC712868	AMC712869								
0.120	AMC712872	AMC712873								
0.156	AMC712876	AMC712877								
Ball	AMC712888	AMC712889								
AFCNM-20500	1/2	1/2	5/8	5	2	3 1/8	.470	Square	AMC712952	AMC712953
								0.015	AMC712956	AMC712957
								0.030	AMC712960	AMC712961
								0.060	AMC712964	AMC712965
								0.090	AMC712968	AMC712969
								0.120	AMC712972	AMC712973
								0.156	AMC712976	AMC712977
0.190	AMC712980	AMC712981								
Ball	AMC712988	AMC712989								
AFCNM-20625	5/8	5/8	3/4	6	2	3 1/8	.600	Square	AMC713052	AMC713053
								0.030	AMC713060	AMC713061
								0.060	AMC713064	AMC713065
								0.090	AMC713068	AMC713069
								0.120	AMC713072	AMC713073
								0.156	AMC713076	AMC713077
								0.190	AMC713080	AMC713081
0.250	AMC713084	AMC713085								
Ball	AMC713088	AMC713089								
AFCNM-20750	3/4	3/4	1	6	2	3 1/8	.715	Square	AMC713152	AMC713153
								0.030	AMC713160	AMC713161
								0.060	AMC713164	AMC713165
								0.090	AMC713168	AMC713169
								0.120	AMC713172	AMC713173
								0.156	AMC713176	AMC713177
								0.190	AMC713180	AMC713181
0.250	AMC713184	AMC713185								
Ball	AMC713188	AMC713189								
AFCNM-21000	1	1	1 1/4	6	2	3 1/8	.955	Square	AMC713252	AMC713253
								0.030	AMC713260	AMC713261
								0.060	AMC713264	AMC713265
								0.090	AMC713268	AMC713269
								0.120	AMC713272	AMC713273
								0.156	AMC713276	AMC713277
								0.190	AMC713280	AMC713281
0.250	AMC713284	AMC713285								
Ball	AMC713288	AMC713289								

2 Flute Coolant Through



Aluminum Coolant Through Series - Necked Long Length 2 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFCNL-20250	1/4	1/4	3/8	4	2	2 1/8	.236	Square	AMC713402	AMC713403
								0.015	AMC713406	AMC713407
								0.030	AMC713410	AMC713411
								0.060	AMC713414	AMC713415
								0.090	AMC713418	AMC713419
								Ball	AMC713438	AMC713439
								AFCNL-20375	3/8	3/8
0.015	AMC713506	AMC713507								
0.030	AMC713510	AMC713511								
0.060	AMC713514	AMC713515								
0.090	AMC713518	AMC713519								
0.120	AMC713522	AMC713523								
0.156	AMC713526	AMC713527								
AFCNL-20500	1/2	1/2	5/8	6	2	4 1/8	.470	Square	AMC713602	AMC713603
								0.015	AMC713606	AMC713607
								0.030	AMC713610	AMC713611
								0.060	AMC713614	AMC713615
								0.090	AMC713618	AMC713619
								0.120	AMC713622	AMC713623
								0.156	AMC713626	AMC713627
AFCNL-20625	5/8	5/8	3/4	6	2	4 1/8	.600	Square	AMC713702	AMC713703
								0.030	AMC713710	AMC713711
								0.060	AMC713714	AMC713715
								0.090	AMC713718	AMC713719
								0.120	AMC713722	AMC713723
								0.156	AMC713726	AMC713727
								0.190	AMC713730	AMC713731
AFCNL-20750	3/4	3/4	1	6	2	4 1/8	.715	Square	AMC713802	AMC713803
								0.030	AMC713810	AMC713811
								0.060	AMC713814	AMC713815
								0.090	AMC713818	AMC713819
								0.120	AMC713822	AMC713823
								0.156	AMC713826	AMC713827
								0.190	AMC713830	AMC713831
AFCNL-21000	1	1	1 1/4	7	2	4 1/8	.955	Square	AMC713902	AMC713903
								0.030	AMC713910	AMC713911
								0.060	AMC713914	AMC713915
								0.090	AMC713918	AMC713919
								0.120	AMC713922	AMC713923
								0.156	AMC713926	AMC713927
								0.190	AMC713930	AMC713931
								0.250	AMC713934	AMC713935
								Ball	AMC713938	AMC713939

2 Flute Coolant Through

Aluminum Coolant Through Series - Necked Extra Long Length 2 Flute



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFCNX-21000	1	1	1 1/4	7	2	4 5/8	.955	Square	AMC713952	AMC713953
								0.030	AMC713960	AMC713961
								0.060	AMC713964	AMC713965
								0.090	AMC713968	AMC713969
								0.120	AMC713972	AMC713973
								0.156	AMC713976	AMC713977
								0.190	AMC713980	AMC713981
								0.250	AMC713984	AMC713985
								Ball	AMC713988	AMC713989

2 Flute Coolant Through



Aluminum Coolant Through Series - Necked

Standard Length 3 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFCNS-30250	1/4	1/4	3/8	4	3	1 1/2	.236	Square	AMC715102	AMC715103
								0.015	AMC715106	AMC715107
								0.030	AMC715110	AMC715111
								0.060	AMC715114	AMC715115
								0.090	AMC715118	AMC715119
								Ball	AMC715138	AMC715139
								AFCNS-30375	3/8	3/8
0.015	AMC715206	AMC715207								
0.030	AMC715210	AMC715211								
0.060	AMC715214	AMC715215								
0.090	AMC715218	AMC715219								
0.120	AMC715222	AMC715223								
0.156	AMC715226	AMC715227								
Ball	AMC715238	AMC715239								
AFCNS-30500	1/2	1/2	5/8	4	3	2 1/8	.470	Square	AMC715302	AMC715303
								0.015	AMC715306	AMC715307
								0.030	AMC715310	AMC715311
								0.060	AMC715314	AMC715315
								0.090	AMC715318	AMC715319
								0.120	AMC715322	AMC715323
								0.156	AMC715326	AMC715327
0.190	AMC715330	AMC715331								
Ball	AMC715338	AMC715339								
AFCNS-30625	5/8	5/8	3/4	4	3	2 1/8	.600	Square	AMC715402	AMC715403
								0.030	AMC715410	AMC715411
								0.060	AMC715414	AMC715415
								0.090	AMC715418	AMC715419
								0.120	AMC715422	AMC715423
								0.156	AMC715426	AMC715427
								0.190	AMC715430	AMC715431
0.250	AMC715434	AMC715435								
Ball	AMC715438	AMC715439								
AFCNS-30750	3/4	3/4	1	4	3	2 1/8	.715	Square	AMC715502	AMC715503
								0.030	AMC715510	AMC715511
								0.060	AMC715514	AMC715515
								0.090	AMC715518	AMC715519
								0.120	AMC715522	AMC715523
								0.156	AMC715526	AMC715527
								0.190	AMC715530	AMC715531
0.250	AMC715534	AMC715535								
Ball	AMC715538	AMC715539								
AFCNS-31000	1	1	1 1/4	5	3	2 1/8	.955	Square	AMC715602	AMC715603
								0.030	AMC715610	AMC715611
								0.060	AMC715614	AMC715615
								0.090	AMC715618	AMC715619
								0.120	AMC715622	AMC715623
								0.156	AMC715626	AMC715627
								0.190	AMC715630	AMC715631
0.250	AMC715634	AMC715635								
Ball	AMC715638	AMC715639								

3 Flute Coolant Through

Aluminum Coolant Through Series - Necked

Medium Length 3 Flute



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFCNM-30250	1/4	1/4	3/8	4	3	1 3/4	.236	Square	AMC715752	AMC715753
								0.015	AMC715756	AMC715757
								0.030	AMC715760	AMC715761
								0.060	AMC715764	AMC715765
								0.090	AMC715768	AMC715769
								Ball	AMC715788	AMC715789
AFCNM-30375	3/8	3/8	1/2	4	3	2 1/4	.355	Square	AMC715852	AMC715853
								0.015	AMC715856	AMC715857
								0.030	AMC715860	AMC715861
								0.060	AMC715864	AMC715865
								0.090	AMC715868	AMC715869
								0.120	AMC715872	AMC715873
AFCNM-30500	1/2	1/2	5/8	5	3	3 1/8	.470	Square	AMC715952	AMC715953
								0.015	AMC715956	AMC715957
								0.030	AMC715960	AMC715961
								0.060	AMC715964	AMC715965
								0.090	AMC715968	AMC715969
								0.120	AMC715972	AMC715973
AFCNM-30625	5/8	5/8	3/4	6	3	3 1/8	.600	Square	AMC716052	AMC716053
								0.030	AMC716060	AMC716061
								0.060	AMC716064	AMC716065
								0.090	AMC716068	AMC716069
								0.120	AMC716072	AMC716073
								0.156	AMC716076	AMC716077
AFCNM-30750	3/4	3/4	1	6	3	3 1/8	.715	Square	AMC716152	AMC716153
								0.030	AMC716160	AMC716161
								0.060	AMC716164	AMC716165
								0.090	AMC716168	AMC716169
								0.120	AMC716172	AMC716173
								0.156	AMC716176	AMC716177
AFCNM-31000	1	1	1 1/4	6	3	3 1/8	.955	Square	AMC716252	AMC716253
								0.030	AMC716260	AMC716261
								0.060	AMC716264	AMC716265
								0.090	AMC716268	AMC716269
								0.120	AMC716272	AMC716273
								0.156	AMC716276	AMC716277
								0.190	AMC716280	AMC716281
								0.250	AMC716284	AMC716285
								Ball	AMC716288	AMC716289

3 Flute Coolant Through



Aluminum Coolant Through Series - Necked Long Length 3 Flute

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFCNL-30250	1/4	1/4	3/8	4	3	2 1/8	.236	Square	AMC716402	AMC716403
								0.015	AMC716406	AMC716407
								0.030	AMC716410	AMC716411
								0.060	AMC716414	AMC716415
								0.090	AMC716418	AMC716419
								Ball	AMC716438	AMC716439
AFCNL-30375	3/8	3/8	1/2	5	3	2 3/4	.355	Square	AMC716502	AMC716503
								0.015	AMC716506	AMC716507
								0.030	AMC716510	AMC716511
								0.060	AMC716514	AMC716515
								0.090	AMC716518	AMC716519
								0.120	AMC716522	AMC716523
AFCNL-30500	1/2	1/2	5/8	6	3	4 1/8	.470	Square	AMC716602	AMC716603
								0.015	AMC716606	AMC716607
								0.030	AMC716610	AMC716611
								0.060	AMC716614	AMC716615
								0.090	AMC716618	AMC716619
								0.120	AMC716622	AMC716623
AFCNL-30625	5/8	5/8	3/4	6	3	4 1/8	.600	Square	AMC716702	AMC716703
								0.030	AMC716710	AMC716711
								0.060	AMC716714	AMC716715
								0.090	AMC716718	AMC716719
								0.120	AMC716722	AMC716723
								0.156	AMC716726	AMC716727
AFCNL-30750	3/4	3/4	1	6	3	4 1/8	.715	Square	AMC716802	AMC716803
								0.030	AMC716810	AMC716811
								0.060	AMC716814	AMC716815
								0.090	AMC716818	AMC716819
								0.120	AMC716822	AMC716823
								0.156	AMC716826	AMC716827
AFCNL-31000	1	1	1 1/4	7	3	4 1/8	.955	Square	AMC716902	AMC716903
								0.030	AMC716910	AMC716911
								0.060	AMC716914	AMC716915
								0.090	AMC716918	AMC716919
								0.120	AMC716922	AMC716923
								0.156	AMC716926	AMC716927
								0.190	AMC716930	AMC716931
								0.250	AMC716934	AMC716935
								Ball	AMC716938	AMC716939

3 Flute Coolant Through

Aluminum Coolant Through Series - Necked

Extra Long Length 3 Flute



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	ZRN EDP #
AFCNX-31000	1	1	1 1/4	7	3	4 5/8	.955	Square	AMC716952	AMC716953
								0.030	AMC716960	AMC716961
								0.060	AMC716964	AMC716965
								0.090	AMC716968	AMC716969
								0.120	AMC716972	AMC716973
								0.156	AMC716976	AMC716977
								0.190	AMC716980	AMC716981
								0.250	AMC716984	AMC716985
								Ball	AMC716988	AMC716989

2 Flute Roughers with Traditional Roughing Geometry

81-800

An improved roughing pattern generates lower cutting forces and allows for increased feed rates. A good choice for lower HP machines. Coolant through holes exit at the bottom of the tool.

ALUMINUM COOLANT THROUGH ROUGHERS - STUB LENGTH

Part Number	Cutting DIA	SHK DIA	Flute LGTH	OAL	Neck LGTHS	Neck DIA	No of Flutes	Corner Radius
81-809	1/4	1/4	3/8	2	-	-	2	0.020
81-812	3/8	3/8	1/2	2 1/2	-	-	2	0.020
81-815	1/2	1/2	5/8	3	-	-	2	0.020
81-818	5/8	5/8	3/4	3	-	-	2	0.020
81-821	3/4	3/4	1 1/8	3	-	-	2	0.020
81-824	1	1	1 1/4	3	-	-	2	0.020

ALUMINUM COOLANT THROUGH ROUGHERS - STANDARD LENGTH

Part Number	Cutting DIA	SHK DIA	Flute LGTH	OAL	Neck LGTHS	Neck DIA	No of Flutes	Corner Radius
81-839	1/4	1/4	3/8	2 1/2	3/4	0.231	2	0.020
81-842	3/8	3/8	1/2	2 1/2	1 1/8	0.350	2	0.020
81-845	1/2	1/2	5/8	3	1 1/2	0.465	2	0.020
81-848	5/8	5/8	3/4	3 1/2	1 7/8	0.588	2	0.020
81-851	3/4	3/4	1	4	2 1/4	0.720	2	0.020
81-854	1	1	1 1/4	4	3	0.960	2	0.020

CUTTING DATA FOR 2 FLUTE ROUGHER

SHK DIA	Slotting			Profiling			
	SFM	Chipload	Axial DOC	SFM	Chipload	Axial DOC	Radial DOC
1/4	500 - 750	.003 - .005	.250	500 - 750	.003 - .007	.250	.125
3/8	500 - 750	.003 - .005	.375	500 - 1,200	.003 - .009	.375	.187
1/2	500 - 750	.003 - .006	.500	500 - 1,200	.003 - .009	.500	.250
5/8	500 - 750	.003 - .006	.625	500 - 1,200	.003 - .010	.625	.312
3/4	500 - 750	.003 - .007	.750	500 - 1,200	.003 - .011	.750	.375
1	500 - 750	.003 - .007	1.000	500 - 1,200	.003 - .011	1.000	.500

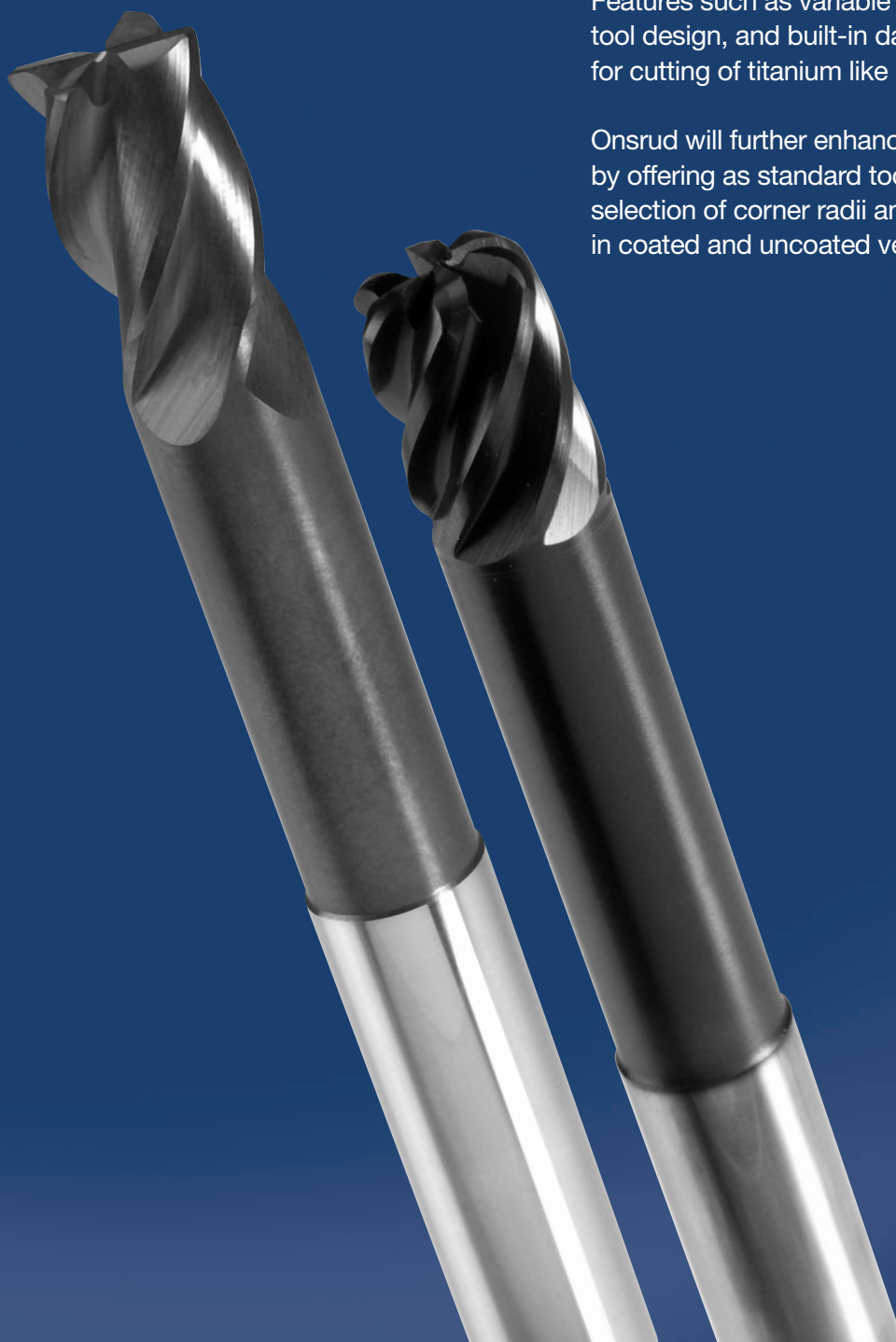


Milling Tools for Exotic Metals

Onsrud Cutter's new line of tooling designed for aerospace materials is optimized for deep pocket milling in all exotic materials.

Onsrud tools maximize output of your spindle while producing accurate and quality parts. Features such as variable flute indexing, rigid tool design, and built-in dampening effects allow for cutting of titanium like it was aluminum.

Onsrud will further enhance your productivity by offering as standard tools the industry's largest selection of corner radii and neck and flute lengths in coated and uncoated versions.



ONSRUD CUTTER

TECHNICAL DATA FOR EXOTIC METALS TITANIUM ROUGHERS

TV - Titanium Variable Index

TVN - Titanium Variable Index Necked

Roughers are optimized for high metal removal rates with addition of variable flute indexing that reduces chatter. Longer tool lengths incorporate a large core diameter that further prevents chatter caused by deflection. Tools, available coated or uncoated, range from square to full ball nose to meet aerospace industry requirements.



CHIP LOAD PER TOOTH

Material/Grade		Titanium Variable Index						
		SFPM	1/4	3/8	1/2	5/8	3/4	1
Titanium								
5553	Slotting	60 - 220	.0014	.0021	.0028	.0035	.0042	.0056
6Al-4V	Profiling 33% RDoC		.0018	.0027	.0036	.0044	.0053	.0072
Commercially Pure								
Cobalt Base								
Haynes 21/26	Slotting	40 - 100	.001	.0014	.002	.0026	.0031	.004
NASA CO-W-RE	Profiling 33% RDoC		.0012	.0018	.0026	.0031	.0038	.005
Stellite								
Iron Base								
A-286, Discoly	Slotting	50 - 100	.0012	.0021	.0025	.0031	.0038	.005
Incoly, Multimet	Profiling 33% RDoC		.0014	.0025	.003	.0038	.0045	.006
Timken 16-25-6								
Nickel Base								
Hastalloy, Waspalloy	Slotting	40 - 100	.001	.0014	.002	.0026	.0031	.004
Rene 41-95, Monel	Profiling 33% RDoC		.0012	.0018	.0026	.0031	.0038	.005
Inconel 625, 718								
Austenitic								
304, 310, 314	Slotting	100 - 350	.0013	.0021	.0028	.0035	.0042	.0056
316L	Profiling 33% RDoC		.0017	.0027	.0036	.0044	.0053	.0072
302, 304L								
Precipitation								
13-8PH, 15-5PH	Slotting	90 - 250	.0014	.0021	.0028	.0035	.0042	.0056
17-4PH	Profiling 33% RDoC		.0018	.0027	.0036	.0044	.0053	.0072
Martensitic								
420, 430F, 440	Slotting	100 - 250	.0014	.0021	.0028	.0035	.0042	.0056
403, 410, 416	Profiling 33% RDoC		.0018	.0027	.0036	.0044	.0053	.0072



Titanium Variable Index

Standard Length

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	AITIN EDP #
TVS-40250	1/4	1/4	3/8	2	4	Square	EMC601605	EMC601604
						0.015	EMC601735	EMC601734
						0.030	EMC601625	EMC601624
						0.060	EMC601641	EMC601640
						0.090	EMC601657	EMC601656
						Ball	EMC601715	EMC601714
TVS-40375	3/8	3/8	1/2	2	4	Square	EMC601609	EMC601608
						0.015	EMC601739	EMC601738
						0.030	EMC601629	EMC601628
						0.060	EMC601645	EMC601644
						0.090	EMC601661	EMC601660
						0.120	EMC601673	EMC601672
						0.156	EMC601685	EMC601684
Ball	EMC601719	EMC601718						
TVS-40500	1/2	1/2	5/8	2 1/2	4	Square	EMC601613	EMC601612
						0.015	EMC601743	EMC601742
						0.030	EMC601633	EMC601632
						0.060	EMC601649	EMC601648
						0.090	EMC601665	EMC601664
						0.120	EMC601677	EMC601676
						0.156	EMC601689	EMC601688
						0.190	EMC601697	EMC601696
Ball	EMC601723	EMC601722						
TVS-40625	5/8	5/8	3/4	3	4	Square	EMC601615	EMC601614
						0.030	EMC601635	EMC601634
						0.060	EMC601651	EMC601650
						0.090	EMC601667	EMC601666
						0.120	EMC601679	EMC601678
						0.156	EMC601691	EMC601690
						0.190	EMC601699	EMC601698
						0.250	EMC601705	EMC601704
Ball	EMC601725	EMC601724						
TVS-40750	3/4	3/4	1 1/8	3	4	Square	EMC601617	EMC601616
						0.030	EMC601637	EMC601636
						0.060	EMC601653	EMC601652
						0.090	EMC601669	EMC601668
						0.120	EMC601681	EMC601680
						0.156	EMC601693	EMC601692
						0.190	EMC601701	EMC601700
						0.250	EMC601707	EMC601706
Ball	EMC601727	EMC601726						
TVS-41000	1	1	1 1/4	3	4	Square	EMC601619	EMC601618
						0.030	EMC601639	EMC601638
						0.060	EMC601655	EMC601654
						0.090	EMC601671	EMC601670
						0.120	EMC601683	EMC601682
						0.156	EMC601695	EMC601694
						0.190	EMC601703	EMC601702
						0.250	EMC601709	EMC601708
Ball	EMC601729	EMC601728						

TWS

Titanium Variable Index

Medium Length



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	AITIN EDP #
TVM-40250	1/4	1/4	3/4	2 1/2	4	Square	EMC601905	EMC601904
						0.015	EMC602035	EMC602034
						0.030	EMC601925	EMC601924
						0.060	EMC601941	EMC601940
						0.090	EMC601957	EMC601956
						Ball	EMC602015	EMC602014
TVM-40375	3/8	3/8	1 1/8	2 1/2	4	Square	EMC601909	EMC601908
						0.015	EMC602039	EMC602038
						0.030	EMC601929	EMC601928
						0.060	EMC601945	EMC601944
						0.090	EMC601961	EMC601960
						0.120	EMC601973	EMC601972
						0.156	EMC601985	EMC601984
Ball	EMC602019	EMC602018						
TVM-40500	1/2	1/2	1 1/4	3	4	Square	EMC601913	EMC601912
						0.015	EMC602043	EMC602042
						0.030	EMC601933	EMC601932
						0.060	EMC601949	EMC601948
						0.090	EMC601965	EMC601964
						0.120	EMC601977	EMC601976
						0.156	EMC601989	EMC601988
						0.190	EMC601997	EMC601996
Ball	EMC602023	EMC602022						
TVM-40625	5/8	5/8	1 5/8	3 1/2	4	Square	EMC601915	EMC601914
						0.030	EMC601935	EMC601934
						0.060	EMC601951	EMC601950
						0.090	EMC601967	EMC601966
						0.120	EMC601979	EMC601978
						0.156	EMC601991	EMC601990
						0.190	EMC601999	EMC601998
						0.250	EMC602005	EMC602004
Ball	EMC602025	EMC602024						
TVM-40750	3/4	3/4	1 5/8	4	4	Square	EMC601917	EMC601916
						0.030	EMC601937	EMC601936
						0.060	EMC601953	EMC601952
						0.090	EMC601969	EMC601968
						0.120	EMC601981	EMC601980
						0.156	EMC601993	EMC601992
						0.190	EMC602001	EMC602000
						0.250	EMC602007	EMC602006
Ball	EMC602027	EMC602026						
TVM-41000	1	1	2	4	4	Square	EMC601919	EMC601918
						0.030	EMC601939	EMC601938
						0.060	EMC601955	EMC601954
						0.090	EMC601971	EMC601970
						0.120	EMC601983	EMC601982
						0.156	EMC601995	EMC601994
						0.190	EMC602003	EMC602002
						0.250	EMC602009	EMC602008
Ball	EMC602029	EMC602028						



Titanium Variable Index

Long Length

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	AlTiN EDP #
TVL-40250	1/4	1/4	1 1/8	3	4	Square	EMC602205	EMC602204
						0.015	EMC602335	EMC602334
						0.030	EMC602225	EMC602224
						0.060	EMC602241	EMC602240
						0.090	EMC602257	EMC602256
						Ball	EMC602315	EMC602314
TVL-40375	3/8	3/8	1 1/4	3	4	Square	EMC602209	EMC602208
						0.015	EMC602339	EMC602338
						0.030	EMC602229	EMC602228
						0.060	EMC602245	EMC602244
						0.090	EMC602261	EMC602260
						0.120	EMC602273	EMC602272
						0.156	EMC602285	EMC602284
						Ball	EMC602319	EMC602318
TVL-40500	1/2	1/2	1 5/8	4	4	Square	EMC602213	EMC602212
						0.015	EMC602343	EMC602342
						0.030	EMC602233	EMC602232
						0.060	EMC602249	EMC602248
						0.090	EMC602265	EMC602264
						0.120	EMC602277	EMC602276
						0.156	EMC602289	EMC602288
						0.190	EMC602297	EMC602296
TVL-40625	5/8	5/8	2 1/8	4	4	Square	EMC602215	EMC602214
						0.030	EMC602235	EMC602234
						0.060	EMC602251	EMC602250
						0.090	EMC602267	EMC602266
						0.120	EMC602279	EMC602278
						0.156	EMC602291	EMC602290
						0.190	EMC602299	EMC602298
						0.250	EMC602305	EMC602304
TVL-40750	3/4	3/4	2 1/4	5	4	Square	EMC602217	EMC602216
						0.030	EMC602237	EMC602236
						0.060	EMC602253	EMC602252
						0.090	EMC602269	EMC602268
						0.120	EMC602281	EMC602280
						0.156	EMC602293	EMC602292
						0.190	EMC602301	EMC602300
						0.250	EMC602307	EMC602306
TVL-41000	1	1	2 5/8	6	4	Square	EMC602219	EMC602218
						0.030	EMC602239	EMC602238
						0.060	EMC602255	EMC602254
						0.090	EMC602271	EMC602270
						0.120	EMC602283	EMC602282
						0.156	EMC602295	EMC602294
						0.190	EMC602303	EMC602302
						0.250	EMC602309	EMC602308
Ball	EMC602329	EMC602328						

TVL

Titanium Variable Index - Necked

Standard Length



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	AlTiN EDP #
TVNS-40250	1/4	1/4	3/8	4	4	2 1/8	.236	Square	EMC602505	EMC602504
								0.015	EMC602617	EMC602616
								0.030	EMC602523	EMC602522
								0.060	EMC602537	EMC602536
								0.090	EMC602551	EMC602550
								Ball	EMC602605	EMC602604
TVNS-40375	3/8	3/8	1/2	4	4	2 1/4	.355	Square	EMC602509	EMC602508
								0.015	EMC602621	EMC602620
								0.030	EMC602527	EMC602526
								0.060	EMC602541	EMC602540
								0.090	EMC602555	EMC602554
								0.120	EMC602565	EMC602564
TVNS-40500	1/2	1/2	5/8	4	4	2 3/8	.470	Square	EMC602513	EMC602512
								0.015	EMC602625	EMC602624
								0.030	EMC602531	EMC602530
								0.060	EMC602545	EMC602544
								0.090	EMC602559	EMC602558
								0.120	EMC602569	EMC602568
TVNS-40625	5/8	5/8	3/4	4	4	2 3/8	0.593	Square	EMC602633	EMC602632
								0.030	EMC602635	EMC602634
								0.060	EMC602637	EMC602636
								0.090	EMC602639	EMC602638
								0.120	EMC602641	EMC602640
								0.156	EMC602643	EMC602642
TVNS-40750	3/4	3/4	1 1/8	4	4	2 1/2	.715	Square	EMC602515	EMC602514
								0.030	EMC602533	EMC602532
								0.060	EMC602547	EMC602546
								0.090	EMC602561	EMC602560
								0.120	EMC602571	EMC602570
								0.156	EMC602581	EMC602580
TVNS-41000	1	1	1 1/4	5	4	2 1/2	.955	Square	EMC602517	EMC602516
								0.030	EMC602535	EMC602534
								0.060	EMC602549	EMC602548
								0.090	EMC602563	EMC602562
								0.120	EMC602573	EMC602572
								0.156	EMC602583	EMC602582
								0.190	EMC602595	EMC602594
								0.250	EMC602599	EMC602598
								Ball	EMC602611	EMC602610

TVNS



Titanium Variable Index - Necked Medium Length

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	AITIN EDP #
TVNM-40250	1/4	1/4	3/8	4	4	2 1/2	.236	Square	EMC602805	EMC602804
								0.015	EMC602917	EMC602916
								0.030	EMC602823	EMC602822
								0.060	EMC602837	EMC602836
								0.090	EMC602851	EMC602850
								Ball	EMC602899	EMC602898
TVNM-40375	3/8	3/8	1/2	4	4	2 5/8	.355	Square	EMC602809	EMC602808
								0.015	EMC602921	EMC602920
								0.030	EMC602827	EMC602826
								0.060	EMC602841	EMC602840
								0.090	EMC602855	EMC602854
								0.120	EMC602865	EMC602864
TVNM-40500	1/2	1/2	5/8	6	4	3 1/8	.470	Square	EMC602813	EMC602812
								0.015	EMC602925	EMC602924
								0.030	EMC602831	EMC602830
								0.060	EMC602845	EMC602844
								0.090	EMC602859	EMC602858
								0.120	EMC602869	EMC602868
TVNM-40625	5/8	5/8	3/4	6	4	3 1/8	0.593	Square	EMC602933	EMC602932
								0.030	EMC602935	EMC602934
								0.060	EMC602937	EMC602936
								0.090	EMC602939	EMC602938
								0.120	EMC602941	EMC602940
								0.156	EMC602943	EMC602942
TVNM-40750	3/4	3/4	1 1/8	6	4	3 1/8	.715	Square	EMC602815	EMC602814
								0.030	EMC602833	EMC602832
								0.060	EMC602847	EMC602846
								0.090	EMC602861	EMC602860
								0.120	EMC602871	EMC602870
								0.156	EMC602881	EMC602880
TVNM-41000	1	1	1 1/4	6	4	3 1/8	.955	Square	EMC602817	EMC602816
								0.030	EMC602835	EMC602834
								0.060	EMC602849	EMC602848
								0.090	EMC602863	EMC602862
								0.120	EMC602873	EMC602872
								0.156	EMC602883	EMC602882
								0.190	EMC602889	EMC602888
								0.250	EMC602893	EMC602892
								Ball	EMC602911	EMC602910

Titanium Variable Index - Necked

Long Length



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	AlTiN EDP #
TVNL-40250	1/4	1/4	3/8	4	4	3 1/8	.236	Square	EMC603205	EMC603204
								0.015	EMC603317	EMC603316
								0.030	EMC603223	EMC603222
								0.060	EMC603237	EMC603236
								0.090	EMC603251	EMC603250
								Ball	EMC603299	EMC603298
TVNL-40375	3/8	3/8	1/2	6	4	3 1/4	.355	Square	EMC603209	EMC603208
								0.015	EMC603321	EMC603320
								0.030	EMC603227	EMC603226
								0.060	EMC603241	EMC603240
								0.090	EMC603255	EMC603254
								0.120	EMC603265	EMC603264
								0.156	EMC603275	EMC603274
Ball	EMC603303	EMC603302								
TVNL-40500	1/2	1/2	5/8	6	4	4 1/8	.470	Square	EMC603213	EMC603212
								0.015	EMC603325	EMC603324
								0.030	EMC603231	EMC603230
								0.060	EMC603245	EMC603244
								0.090	EMC603259	EMC603258
								0.120	EMC603269	EMC603268
								0.156	EMC603279	EMC603278
								0.190	EMC603285	EMC603284
Ball	EMC603307	EMC603306								
TVNL-40625	5/8	5/8	3/4	6	4	4 1/8	.593	Square	EMC603333	EMC603332
								0.030	EMC603335	EMC603334
								0.060	EMC603337	EMC603336
								0.090	EMC603339	EMC603338
								0.120	EMC603341	EMC603340
								0.156	EMC603343	EMC603342
								0.190	EMC603345	EMC603344
								0.250	EMC603347	EMC603346
Ball	EMC603349	EMC603348								
TVNL-40750	3/4	3/4	1 1/8	6	4	4 1/8	.715	Square	EMC603215	EMC603214
								0.030	EMC603233	EMC603232
								0.060	EMC603247	EMC603246
								0.090	EMC603261	EMC603260
								0.120	EMC603271	EMC603270
								0.156	EMC603281	EMC603280
								0.190	EMC603287	EMC603286
								0.250	EMC603291	EMC603290
Ball	EMC603309	EMC603308								
TVNL-41000	1	1	1 1/4	7	4	4 1/8	.955	Square	EMC603217	EMC603216
								0.030	EMC603235	EMC603234
								0.060	EMC603249	EMC603248
								0.090	EMC603263	EMC603262
								0.120	EMC603273	EMC603272
								0.156	EMC603283	EMC603282
								0.190	EMC603289	EMC603288
								0.250	EMC603293	EMC603292
Ball	EMC603311	EMC603310								

TECHNICAL DATA FOR EXOTIC METALS

TITANIUM FINISHERS

TF - Titanium Finishers

TFN - Titanium Finishers Necked

Finishers produce accurate parts with superior surface finishes that meet, or exceed, demanding aerospace specifications. Shallow flute design combined with a large core diameter prevents deflection on even the longest length tools. Eccentric relief creates a dampening effect to further reduce chatter on both thin wall parts and floors. Corner radii range from square to .250" in coated and uncoated versions.



CHIP LOAD PER TOOTH

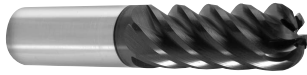
Material/Grade	Titanium Finishing Series (Note: All Cutting Data Is For Profile Finishing)						
	SFPM	1/4	3/8	1/2	5/8	3/4	1
Titanium							
5553	180	.0013	.0017	.002	.0023	.0028	.003
6Al-4V	400						
Commercially Pure	90 - 120						
Cobalt Base							
Haynes 21/26	40 - 80	.0011	.0013	.0014	.0017	.0021	.0029
NASA CO-W-RE	60 - 100						
Stellite							
Iron Base							
A-286, Discoly	50 - 80	.0015	.0017	.002	.0025	.003	.004
Incoly, Multimet	80 - 100						
Timken 16-25-6							
Nickel Base							
Hastalloy, Waspalloy	40 - 60	.0015	.0017	.002	.0025	.003	.004
Rene 41-95, Monel	45 - 100						
Inconel 625, 718							
Austenitic							
304, 310, 314	100 - 250	.001	.0013	.0014	.0017	.0021	.0028
316L	100 - 350						
302, 304L							
Precipitation							
13-8PH, 15-5PH	90 - 250	.001	.0013	.0014	.0017	.0021	.0028
17-4PH	100 - 350						
Martensitic							
420, 430F, 440	90 - 250	.001	.0013	.0014	.0017	.0021	.0028
403, 410, 416	100 - 250						

Titanium Finishers

Standard Length



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	AITIN EDP #	
TFS-60250	1/4	1/4	3/8	2	6	Square	EMC600901	EMC600900	
							0.015	EMC601105	EMC601104
							0.030	EMC600917	EMC600916
							0.060	EMC600933	EMC600932
							0.090	EMC600949	EMC600948
TFS-60375	3/8	3/8	1/2	2	6	Square	EMC600905	EMC600904	
							0.015	EMC601109	EMC601108
							0.030	EMC600921	EMC600920
							0.060	EMC600937	EMC600936
							0.090	EMC600953	EMC600952
							0.120	EMC600965	EMC600964
TFS-60500	1/2	1/2	5/8	2 1/2	6	Square	EMC600909	EMC600908	
							0.015	EMC601113	EMC601112
							0.030	EMC600925	EMC600924
							0.060	EMC600941	EMC600940
							0.090	EMC600957	EMC600956
							0.120	EMC600969	EMC600968
							0.156	EMC600981	EMC600980
TFS-60625	5/8	5/8	3/4	3	6	Square	EMC600911	EMC600910	
							0.030	EMC600927	EMC600926
							0.060	EMC600943	EMC600942
							0.090	EMC600959	EMC600958
							0.120	EMC600971	EMC600970
							0.156	EMC600983	EMC600982
							0.190	EMC600991	EMC600990
TFS-80750	3/4	3/4	1 1/8	3	8	Square	EMC600913	EMC600912	
							0.030	EMC600929	EMC600928
							0.060	EMC600945	EMC600944
							0.090	EMC600961	EMC600960
							0.120	EMC600973	EMC600972
							0.156	EMC600985	EMC600984
							0.190	EMC600993	EMC600992
TFS-101000	1	1	1 1/4	3	10	Square	EMC600915	EMC600914	
							0.030	EMC600931	EMC600930
							0.060	EMC600947	EMC600946
							0.090	EMC600963	EMC600962
							0.120	EMC600975	EMC600974
							0.156	EMC600987	EMC600986
0.190	EMC600995	EMC600994							
						0.250	EMC601001	EMC601000	



Titanium Finishers Medium Length

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	AITIN EDP #
TFM-60250	1/4	1/4	3/4	2 1/2	6	Square	EMC601003	EMC601002
						0.015	EMC601121	EMC601120
						0.030	EMC601019	EMC601018
						0.060	EMC601035	EMC601034
						0.090	EMC601051	EMC601050
TFM-60375	3/8	3/8	1 1/8	2 1/2	6	Square	EMC601007	EMC601006
						0.015	EMC601125	EMC601124
						0.030	EMC601023	EMC601022
						0.060	EMC601039	EMC601038
						0.090	EMC601055	EMC601054
						0.120	EMC601067	EMC601066
TFM-60500	1/2	1/2	1 1/4	3	6	Square	EMC601011	EMC601010
						0.015	EMC601129	EMC601128
						0.030	EMC601027	EMC601026
						0.060	EMC601043	EMC601042
						0.090	EMC601059	EMC601058
						0.120	EMC601071	EMC601070
						0.156	EMC601083	EMC601082
TFM-60625	5/8	5/8	1 5/8	3 1/2	6	Square	EMC601013	EMC601012
						0.030	EMC601029	EMC601028
						0.060	EMC601045	EMC601044
						0.090	EMC601061	EMC601060
						0.120	EMC601073	EMC601072
						0.156	EMC601085	EMC601084
						0.190	EMC601093	EMC601092
TFM-80750	3/4	3/4	1 5/8	4	8	Square	EMC601015	EMC601014
						0.030	EMC601031	EMC601030
						0.060	EMC601047	EMC601046
						0.090	EMC601063	EMC601062
						0.120	EMC601075	EMC601074
						0.156	EMC601087	EMC601086
						0.190	EMC601095	EMC601094
TFM-101000	1	1	2	4	10	Square	EMC601017	EMC601016
						0.030	EMC601033	EMC601032
						0.060	EMC601049	EMC601048
						0.090	EMC601065	EMC601064
						0.120	EMC601077	EMC601076
						0.156	EMC601089	EMC601088
						0.190	EMC601097	EMC601096
						0.250	EMC601103	EMC601102

TFM

Titanium Finishers

Long Length



Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Corner Radius	Uncoated EDP #	AITIN EDP #	
TFL-60250	1/4	1/4	1 1/8	3	6	Square	EMC601301	EMC601300	
							0.015	EMC601403	EMC601402
							0.030	EMC601317	EMC601316
							0.060	EMC601333	EMC601332
							0.090	EMC601349	EMC601348
TFL-60375	3/8	3/8	1 1/4	3	6	Square	EMC601305	EMC601304	
							0.015	EMC601407	EMC601406
							0.030	EMC601321	EMC601320
							0.060	EMC601337	EMC601336
							0.090	EMC601353	EMC601352
							0.120	EMC601365	EMC601364
TFL-60500	1/2	1/2	1 5/8	4	6	Square	EMC601309	EMC601308	
							0.015	EMC601411	EMC601410
							0.030	EMC601325	EMC601324
							0.060	EMC601341	EMC601340
							0.090	EMC601357	EMC601356
							0.120	EMC601369	EMC601368
							0.156	EMC601381	EMC601380
TFL-60625	5/8	5/8	2 1/8	4	6	Square	EMC601311	EMC601310	
							0.030	EMC601327	EMC601326
							0.060	EMC601343	EMC601342
							0.090	EMC601359	EMC601358
							0.120	EMC601371	EMC601370
							0.156	EMC601383	EMC601382
							0.190	EMC601391	EMC601390
TFL-80750	3/4	3/4	2 1/4	5	8	Square	EMC601313	EMC601312	
							0.030	EMC601329	EMC601328
							0.060	EMC601345	EMC601344
							0.090	EMC601361	EMC601360
							0.120	EMC601373	EMC601372
							0.156	EMC601385	EMC601384
							0.190	EMC601393	EMC601392
TFL-101000	1	1	2 5/8	6	10	Square	EMC601315	EMC601314	
							0.030	EMC601331	EMC601330
							0.060	EMC601347	EMC601346
							0.090	EMC601363	EMC601362
							0.120	EMC601375	EMC601374
							0.156	EMC601387	EMC601386
							0.190	EMC601395	EMC601394
							0.250	EMC601401	EMC601400

TFL



Titanium Finishers - Necked Standard Length

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	AITIN EDP #
TFNS-60250	1/4	1/4	3/8	4	6	2 1/8	.236	Square	EMC600003	EMC600002
								0.015	EMC600105	EMC600104
								0.030	EMC600019	EMC600018
								0.060	EMC600035	EMC600034
								0.090	EMC600051	EMC600050
TFNS-60375	3/8	3/8	1/2	4	6	2 1/4	.355	Square	EMC600007	EMC600006
								0.015	EMC600109	EMC600108
								0.030	EMC600023	EMC600022
								0.060	EMC600039	EMC600038
								0.090	EMC600055	EMC600054
								0.120	EMC600067	EMC600066
TFNS-60500	1/2	1/2	5/8	4	6	2 3/8	.470	Square	EMC600011	EMC600010
								0.015	EMC600113	EMC600112
								0.030	EMC600027	EMC600026
								0.060	EMC600043	EMC600042
								0.090	EMC600059	EMC600058
								0.120	EMC600071	EMC600070
								0.156	EMC600083	EMC600082
TFNS-60625	5/8	5/8	3/4	4	6	2 3/8	0.593	Square	EMC600013	EMC600012
								0.030	EMC600029	EMC600028
								0.060	EMC600045	EMC600044
								0.090	EMC600061	EMC600060
								0.120	EMC600073	EMC600072
								0.156	EMC600085	EMC600084
								0.190	EMC600093	EMC600092
TFNS-80750	3/4	3/4	1 1/8	4	8	2 1/2	.715	Square	EMC600015	EMC600014
								0.030	EMC600031	EMC600030
								0.060	EMC600047	EMC600046
								0.090	EMC600063	EMC600062
								0.120	EMC600075	EMC600074
								0.156	EMC600087	EMC600086
								0.190	EMC600095	EMC600094
TFNS-101000	1	1	1 1/4	5	10	2 1/2	.955	Square	EMC600017	EMC600016
								0.030	EMC600033	EMC600032
								0.060	EMC600049	EMC600048
								0.090	EMC600065	EMC600064
								0.120	EMC600077	EMC600076
								0.156	EMC600089	EMC600088
0.190	EMC600097	EMC600096								
								0.250	EMC600103	EMC600102

TFNS



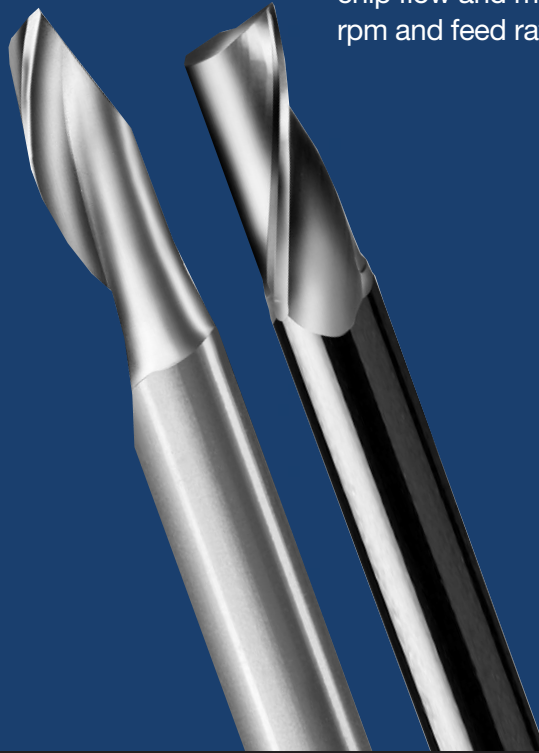
Titanium Finishers - Necked Long Length

TFNL

Description	Cutting DIA	SHK DIA	Flute LGTH	OAL	No of Flutes	Neck LGTHS	Neck DIA	Corner Radius	Uncoated EDP #	AITIN EDP #
TFNL-60250	1/4	1/4	3/8	4	6	3 1/8	.236	Square	EMC600601	EMC600600
								0.015	EMC600701	EMC600700
								0.030	EMC600617	EMC600616
								0.060	EMC600633	EMC600632
								0.090	EMC600649	EMC600648
TFNL-60375	3/8	3/8	1/2	6	6	3 1/4	.355	Square	EMC600605	EMC600604
								0.015	EMC600705	EMC600704
								0.030	EMC600621	EMC600620
								0.060	EMC600637	EMC600636
								0.090	EMC600653	EMC600652
TFNL-60500	1/2	1/2	5/8	6	6	4 1/8	.470	Square	EMC600609	EMC600608
								0.015	EMC600709	EMC600708
								0.030	EMC600625	EMC600624
								0.060	EMC600641	EMC600640
								0.090	EMC600657	EMC600656
TFNL-60625	5/8	5/8	3/4	6	6	4 1/8	.593	Square	EMC600611	EMC600610
								0.030	EMC600627	EMC600626
								0.060	EMC600643	EMC600642
								0.090	EMC600659	EMC600658
								0.120	EMC600671	EMC600670
TFNL-80750	3/4	3/4	1 1/8	6	8	4 1/8	.715	Square	EMC600613	EMC600612
								0.030	EMC600629	EMC600628
								0.060	EMC600645	EMC600644
								0.090	EMC600661	EMC600660
								0.120	EMC600673	EMC600672
TFNL-101000	1	1	1 1/4	7	10	4 1/8	.955	Square	EMC600615	EMC600614
								0.030	EMC600631	EMC600630
								0.060	EMC600647	EMC600646
								0.090	EMC600663	EMC600662
								0.120	EMC600675	EMC600674
								0.156	EMC600687	EMC600686
								0.190	EMC600695	EMC600694
								0.250	EMC600699	EMC600698

Routing Tools for Special Applications

Onsrud Cutter is a leading supplier of small diameter, high rpm tooling for CNC routing and milling of aluminum sheet, stacks and extrusions. Our unique single flute tool design features increased clearance resulting in maximum chip flow and maximum productivity at high rpm and feed rates.



SPECIALTY TOOL CHIPLOADS

DEPTH OF CUT: 1 x D Use recommended chip load
2 x D Reduce chip load by 25%
3 x D Reduce chip load by 50%

CHIP LOAD PER TOOTH

		Cutting Edge Diameter															
Series	Cut	1/16	3/32	1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1
40-000*	1 x D			.005 - .007		.005 - .007	.005 - .007	.006 - .008	.006 - .008	.007 - .009		.008 - .010					
49-000	1 x D							.004 - .006	.004 - .006	.006 - .008							
62-600	1 x D	.002 - .004		.002 - .004		.003 - .006		.003 - .006	.003 - .006	.004 - .008		.008 - .010					
62-900	1 x D	.002 - .004		.002 - .004		.003 - .006		.003 - .006	.003 - .006	.004 - .008		.008 - .010					
63-600	1 x D	.002 - .004		.002 - .004		.003 - .006		.003 - .006	.003 - .006	.004 - .008		.008 - .010					
63-900	1 x D	.002 - .004		.002 - .004		.003 - .006		.003 - .006	.003 - .006	.004 - .008		.008 - .010					
80-000	1 x D	.002 - .004		.002 - .004		.002 - .004											
81-000	1 x D							.002 - .004	.002 - .004	.003 - .005							
81-100	1 x D								.002 - .005	.003 - .008							

NOTE: When cutting soft aluminum a squirt of cutting fluid every now and then will help to eliminate chip rewelding and improve surface finish

FORMULAS: Chip Load = Feed Rate / (RPM x # of cutting edges)
Feed Rate (IPM) = RPM x # of cutting edges x chip load
Speed (RPM) = Feed Rate / (# of cutting edges x chip load)

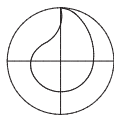
DEFINITIONS: IPM = Inches Per Minute
IPR = Inches Per Revolution

1 Flute - High Speed Steel Upcut Spiral

40-000

Designed for routing applications where speed and chip removal are primary considerations. They are also recommended when grooving, slotting or blind routing.

Usage Sheet and stacked aluminum



Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL
40-001	1/8	3/8	1/4	2 5/8
40-003	3/16	5/8	1/4	2 7/8
40-053	7/32	7/8	1/4	3
40-005	1/4	5/8	1/4	2 3/4
40-007	1/4	3/4	1/4	2 3/4
40-009	1/4	3/4	1/2	3 1/4
40-011*	1/4	1	1/4	3
40-015	5/16	1	5/16	3
40-021	5/16	3/4	1/2	3 1/4
40-023	5/16	1	1/2	3 1/2
40-025	21/64	3/4	1/2	3 1/4
40-031	3/8	1	3/8	3
40-033	3/8	1	1/2	3 1/2
40-035	3/8	1 1/4	1/2	3 3/4
40-037	1/2	1 1/4	1/2	3 1/4

HELIX ANGLE \approx 19° - 32° Shear

These tools are designed and toleranced for air routers with guide bushings.

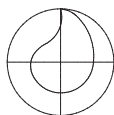


1 Flute - High Speed Steel Downcut Spiral

40-000

Designed for through cut routing operations where speed is the primary concern and fixturing is such that both chips and material are better off forced down.

Usage Sheet aluminum



Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL
40-004	3/16	5/8	1/4	2 7/8
40-008	1/4	3/4	1/4	2 3/4
40-010	1/4	3/4	1/2	3 1/4
40-012	1/4	1	1/4	3
40-022	5/16	3/4	1/2	3 1/4
40-024	5/16	1	1/2	3 1/2
40-034	3/8	1	1/2	3 1/2
40-040	1/2	1 1/2	1/2	3 1/2

HELIX ANGLE \approx 19° - 32° Shear

These tools are designed and toleranced for air routers with guide bushings.

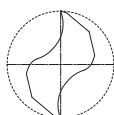


2 Flute - High Speed Steel Downcut

49-000

These double flute downcuts with a drill type point were developed initially as "Aircraft Throwaway" tools. They have many uses in trimming and routing primarily with hand held routers.

Usage Aluminum



Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL
49-005	1/4	9/16	1/4	2 1/2
49-001	1/4	9/16	1/4	2 3/4
49-007	1/4	9/16	1/4	3 1/4
49-003	3/8	3/4	3/8	2 1/2

THESE TOOLS ARE DESIGNED AND TOLERANCED FOR AIR ROUTERS WITH GUIDE BUSHINGS, + .000 - .006

HELIX ANGLE \approx 24°



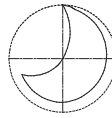
62-600



1 Flute - Solid Carbide Downcut Spiral O Flute

High speed cutters for machining aluminum sheet material. These tools are optimized for use on high-speed CNC mills, high speed machining centers and CNC routers.

Usage Aluminum sheet or extrusions



Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL
62-602	1/16	1/4	1/8	1 1/2
62-604	1/8	1/4	1/8	1 1/2
62-606	1/8	1/4	1/4	2
62-610	1/8	1/2	1/4	2
62-612	3/16	3/8	3/16	1 1/2
62-614	3/16	3/8	1/4	2
62-618	3/16	5/8	1/4	2
62-620	1/4	3/8	1/4	2
62-622	1/4	3/4	1/4	2 1/2
62-624	1/4	1 1/4	1/4	3
62-630	5/16	3/4	1/2	3
62-625	3/8	3/4	3/8	3
62-626	3/8	1 1/8	3/8	3
62-631	1/2	1 1/8	1/2	3 1/2

HELIX ANGLE = 22°

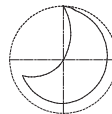
62-900



1 Flute - Solid Carbide Downcut Spiral O Flute

High speed cutters for machining aluminum sheet material. These tools are optimized for use on high-speed CNC mills, high speed machining centers and CNC routers.

Usage Aluminum sheet or extrusions



Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL
62-912	3mm	8mm	6mm	64mm
62-938	6mm	20mm	6mm	64mm
62-944	8mm	25mm	8mm	64mm

HELIX ANGLE = 22°

63-400

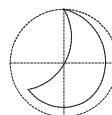


NEW

Single Flute - Solid Carbide Upcut for Soft Aluminum

These tools are specially designed to cut soft grades of aluminum and create a good edge finish. The improved cutting geometry properly forms and evacuates the chips preventing chip rewelding.

Usage Aluminum sheet

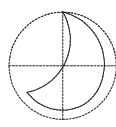


Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL
63-405	1/16	1/4	1/8	1-1/2
63-410	1/8	1/4	1/8	1-1/2
63-415	1/8	1/2	1/4	1-1/2
63-420	3/16	3/8	1/4	2
63-425	3/16	5/8	1/4	2
63-430	1/4	3/8	1/4	2
63-435	1/4	5/8	1/4	2-1/2

1 Flute - Solid Carbide Upcut Spiral O Flute

High speed cutters for machining aluminum sheet and block material. These tools are optimized for use on high-speed CNC mills, high speed machining centers and CNC routers.

Usage Aluminum plate, single/multi sheet aluminum and extrusions



Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL
63-602	1/16	1/4	1/8	1 1/2
63-603	3/32	1/4	1/8	2
63-604	1/8	1/4	1/8	1 1/2
63-606	1/8	1/4	1/4	2
63-610	1/8	1/2	1/4	2
63-611	5/32	5/16	3/16	2
63-612	3/16	3/8	3/16	1 1/2
63-614	3/16	3/8	1/4	2
63-618	3/16	5/8	1/4	2
63-619	7/32	7/16	1/4	2 1/2
63-620	1/4	3/8	1/4	2
63-622	1/4	3/4	1/4	2 1/2
63-624	1/4	1 1/4	1/4	3
63-628	9/32	7/16	5/16	2 1/2
63-629	5/16	9/16	5/16	2 1/2
63-630	5/16	3/4	1/2	3
63-634	21/64	3/4	1/2	3
63-637	11/32	9/16	3/8	2 1/2
63-625	3/8	3/4	3/8	3
63-626	3/8	1 1/8	3/8	3
63-627	3/8	1 3/8	3/8	3 1/2
63-631	1/2	1 1/8	1/2	3 1/2
63-632	1/2	1 3/8	1/2	3 1/2

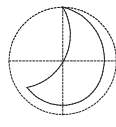
HELIX ANGLE ≈ 22°



1 Flute - Solid Carbide Upcut Spiral O Flute

High speed cutters for machining aluminum sheet and block material. These tools are optimized for use on high-speed CNC mills, high speed machining centers and CNC routers.

Usage Aluminum plate, single/multi sheet aluminum and extrusions



Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL
63-902	2mm	6mm	2mm	50mm
63-904	2mm	6mm	6mm	64mm
63-908	2.5mm	6mm	6mm	64mm
63-912	3mm	8mm	6mm	64mm
63-916	3mm	12mm	6mm	64mm
63-918	4mm	8mm	4mm	64mm
63-924	4mm	20mm	6mm	64mm
63-928	5mm	16mm	5mm	64mm
63-930	5mm	16mm	6mm	64mm
63-934	6mm	8mm	6mm	64mm
63-938	6mm	20mm	6mm	64mm
63-944	8mm	25mm	8mm	64mm
63-946	8mm	38mm	8mm	76mm
63-948	10mm	30mm	10mm	76mm
63-950	12mm	38mm	12mm	76mm

HELIX ANGLE ≈ 22°



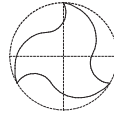
80-000



3 Flute - High Speed Steel Taper Pin Router

These three flute upcuts with a tapered flute are used for profiling and trimming primarily in aircraft assembly operations.

Usage Aluminum



Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL
80-001	.081	3/4	.098	2
80-002	.110	7/8	.128	2 1/4
80-003	.165	1 1/16	.1875	2 1/2

HELIX ANGLE = 24°

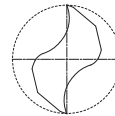
81-000



2 Flute - High Speed Steel Lo Helix

These lo helix upcut spirals were developed for CNC routers used primarily in the aircraft industry. They are designed with maximum strength of configuration to cut T, O or combined stacks of aluminum-using coolant.

Usage Aluminum



Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL	Helix	ALUM Condition
81-001	1/4	3/4	1/2	3 1/16	5°	T
81-003	5/16	3/4	1/2	3 1/16	10°	C
81-004S	5/16	3/4	1/2	3 1/16	10°	O
81-007	21/64	3/4	1/2	3 1/16	10°	C

S = Single Edge

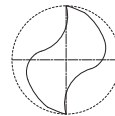
81-100



2 Flute - Solid Carbide Spiral Extrusion Cutters

Designed for reduced vibration producing smoother finish cuts. Extended reach during side thinning and gage reduction. Longer tool life to reduce tool changes.

Usage Extrusion and sheet aluminum. Optimized for use on multi-head extrusion mills CNC mills and routers



UPCUT

Part Number	Cutting DIA	Flute LGTH	SHK DIA	OAL	Helix & DIR	Flutes	CNR RAD Chamfer	Aluminum Condition	MACH ENV
Tolerance	+.002	±.03	+.0000 -.0005	±.03					
81-103	5/16	13/16	1/2	3	10° RH	2	.02 x 45°	C	Wet
81-111	21/64	3/4	1/2	3	10° RH	2	.02 x 45°	C	Wet
81-104	3/8	13/16	1/2	3	10° RH	2	.02 x 45°	O	Wet

ONSRUD CUTTER LP CUSTOM END MILL REQUEST FORM

800 Liberty Drive • Libertyville, Illinois 60048 • Phone (847) 362-1560 • Fax (847) 362-5028 • www.onsrud.com

ITEMS IN BOLD REQUIRED

Distributor Reference Number _____

Distributor Name _____

Distributor Address _____

Contact _____

Telephone _____ **Fax** _____

End User Name _____

Customer Quote Number _____

End User Address _____

Contact _____

Telephone _____ **Fax** _____

Material Being Machined _____

Hardness _____

Machine Type Vertical Horizontal Multi Spindle Geared Head Belt Drive Other

Machine Make And Model _____

H.P. _____ Rigidity Of Set-Up _____

Max. Spindle Speed _____ Spindle Taper _____

Coolant Type _____ Though The Spindle Coolant Yes No

Style Of Milling Slotting Profiling Pocketing Multi-Axis

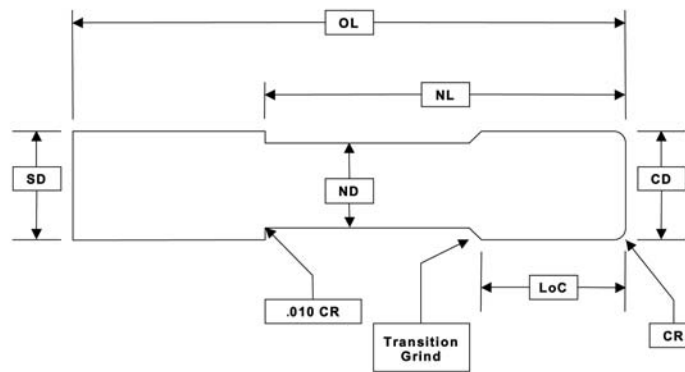
Approval Drawings Not Necessary Required

Tool Material (Specify If Other Than Carbide) _____

Tool Modification (Tool To Be Modified) _____

Corner Radius Chamfer Weldon Flat Whistle Notch

Quote Quantities _____ Yearly Quantities _____



Cutting Diameter (CD) _____

Number Of Flutes _____

Shank Diameter (SD) _____

Corner Radius (CR) _____

Length Of Cut (LoC) _____

Coating _____

Neck Diameter (ND) _____

Coolant Through _____

Neck length (NL) _____

Cylindrical Margin _____

Overall Length (OL) _____

Notes _____

Onsrud Cutter, LP Terms & Conditions

Terms - Net 30

Shipping - F.O.B. Libertyville, IL. All shipments ground unless otherwise specified. For standard catalog product orders must be in by 3:00 p.m. Central Time Zone for same day shipment. This time is extended to 4:00 p.m. Central Time Zone for orders place through Onsrud's B2B e-commerce site.

Claims – Any claims for shortage, damage or loss must be made within 30 days of invoice date. United Parcel Service is a preferred method of shipment because of reliability and ease of tracing problem shipments.

Guarantee - Our products are guaranteed against defects in material and quality of manufacture when used in the proper manner. If tools are returned and found to be defective, we will repair or replace the tools. Continued tool breakage caused by improper tool usage without the knowledge of Onsrud Cutter's technical staff is not a condition for return and replacement of such tools.

Errors - Onsrud Cutter, LP cannot be held responsible for incorrect parts made with our products due to mislabeling or defect.

Return Goods Policy – No merchandise can be returned without prior authorization. Credit will not be issued for merchandise returned without a return authorization number. Product must be a current revision catalog item in new and saleable condition. All returns subject to a 15% restocking fee or offsetting order of equal value.

Specials - Onsrud Cutter, LP has the right to over or under ship by 10% all specials. Special orders less than 10 pieces are subject to +/- 1 piece. Specials and modified tools are not returnable for credit. Specials cancelled will be assessed an in-process charge based on the status of the order and expenses incurred at the time of cancellation. If a special tool has been completed, the tool will be shipped and the price quoted will be billed.

Safety Precautions – Cutting tools should only be used to perform operations that are compatible with the original tool design. Safety glasses and other appropriate safety equipment should be worn by all people in the vicinity of tool use.

Prices & Terms - All prices and terms are subject to change without notice. All orders are subject to acceptance at Onsrud Cutter.



ONSRUD

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Libertyville, IL 60048 USA
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