

ONSRUD

ONSRUD CUTTER LP

Tooling for
Exotic Metals



Leitz Metalworking Technology Group

the **ONSRUD** *advantage*

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.



the
ONSRUD
a d v a n t a g e
more than just cutting tools

ONSRUD CUTTER LP

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the ONSRUD advantage

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.



HIGH TEMPERATURE ALLOYS - TITANIUM

MATERIAL	GRADE	SFPM	3/8	1/2	5/8	3/4	1
Titanium Alloy	5AL-2.5Sn-Eli, 8Al-1 Mo-1V	90-120	0.0011	0.0014	0.0015	0.002	0.004
Titanium Alloy	Commercially, Pure, 6AL-4V, Astm 1/2/3, 6AL-25N-4Zr-2Mo-Si	100-250					
Titanium Alloy	5553	60-100					
Cobalt Base	Air-Resist 13/213/215, Haynes 21/36, NASA CO-W-RE	40-80	0.0011	0.0017	0.0019	0.0024	0.0029
Cobalt Base	Stellite, HS-21, HAYNES25/188, X-40, L-605	60-100					
Iron Base	A-286, Haynes 556, Discoly, V57	50-80	0.0015	0.002	0.0025	0.003	0.004
Iron Base	%Incoly 600-802, Multimet N-155, Timkin 16-25-6	80-100					
Nickel Base	Hastalloy-C/B.X, INCONEL 718/X/W, Waspalloy	40-60	0.0015	0.002	0.0025	0.003	0.004
	Rene 41-95						
Nickel Base	INCONEL 600/625, Nickel 200-270, Monel 400-405	45-100	0.001	0.002	0.0025	0.003	0.004

STAINLESS STEEL

MATERIAL	GRADE	SFPM	3/8	1/2	5/8	3/4	1
Austenitic	304, 310, 314, 316, 321, 330, 347, 348, 21-6-9	100-250	0.001	0.002	0.0025	0.0035	0.004
Austenitic	200 series, 302, 303, 304L, 316	100-350					
Precipitation	17/4, 17/7, AF-71, Custom 450/635, 15/7 Mo, 21-6-9	90-250	0.001	0.002	0.003	0.004	0.005
Precipitation	13/8, 15/5, AM-350/355	100-250					
Martensitic	420, 430F, 440, 446	90-250	0.001	0.0015	0.002	0.003	0.004
Martensitic	403, 410, 416	100-250					

RPM = SFM x 3.82 ÷ Diameter
IPM = RPM x # of Teeth x Chip Load

Titanium Variable Index

Standard Length

DESCRIPTION	CUTTING DIA	SHK DIA	FLUTE LGTH	OAL	NO OF FLUTES	CORNER RADIUS	UNCOATED EDP #	ATTN 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
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
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
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
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
						Square	EMC601703	EMC601702
						0.190	EMC601707	EMC601706
						0.250	EMC601709	EMC601708
						Ball	EMC601727	EMC601726
						Ball	EMC601729	EMC601728

Titanium Variable Index

Medium Length

DESCRIPTION	CUTTING DIA	SHK DIA	FLUTE LGTH	OAL	NO OF FLUTES	CORNER RADIUS	UNCOATED EDP #	ATTN 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 #	ATTN 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
Ball	EMC602323	EMC602322						
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
Ball	EMC602325	EMC602324						
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
Ball	EMC602327	EMC602326						
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						

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 #	ATTN 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

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 #	ATTN 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 #	ATTN 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								

the ONSRUD advantage

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.



HIGH TEMPERATURE ALLOYS - TITANIUM

MATERIAL	GRADE	SFPM	3/8	1/2	5/8	3/4	1
Titanium Alloy	5AL-2.5Sn-Eli, 8Al-1 Mo-1V	90-120	0.0011	0.0014	0.0015	0.002	0.004
Titanium Alloy	Commercially, Pure, 6AL-4V, Astm 1/2/3, 6AL-25N-4Zr-2Mo-Si	400					
Titanium Alloy	5553	200					
Cobalt Base	Air-Resist 13/213/215, Haynes 21/36, NASA CO-W-RE	40-80	0.0011	0.0017	0.0019	0.0024	0.0029
Cobalt Base	Stellite, HS-21, HAYNES25/188, X-40, L-605	60-100					
Iron Base	A-286, Haynes 556, Discoly, V57	50-80	0.0015	0.002	0.0025	0.003	0.004
Iron Base	¾ Incoly 600-802, Multimet N-155, Timkin 16-25-6	80-100					
Nickel Base	Hastalloy-C/B.X, INCONEL 718/X/W, Waspalloy	40-60	0.0015	0.002	0.0025	0.003	0.004
	Rene 41-95						
Nickel Base	INCONEL 600/625, Nickel 200-270, Monel 400-405	45-100	0.001	0.002	0.0025	0.003	0.004

STAINLESS STEEL

MATERIAL	GRADE	SFPM	3/8	1/2	5/8	3/4	1
Austenitic	304, 310, 314, 316, 321, 330, 347, 348, 21-6-9	100-250	0.001	0.002	0.0025	0.0035	0.004
Austenitic	200 series, 302, 303, 304L, 316	100-350					
Precipitation	17/4, 17/7, AF-71, Custom 450/635, 15/7 Mo, 21-6-9	90-250	0.001	0.002	0.003	0.004	0.005
Precipitation	13/8, 15/5, AM-350/355	100-250					
Martensitic	420, 430F, 440, 446	90-250	0.001	0.0015	0.002	0.003	0.004
Martensitic	403, 410, 416	100-250					

$RPM = SFM \times 3.82 \div Diameter$
 $IPM = RPM \times \# \text{ of Teeth} \times \text{Chip Load}$

Titanium Finishers

Standard Length

DESCRIPTION	CUTTING DIA	SHK DIA	FLUTE LGTH	OAL	NO OF FLUTES	CORNER RADIUS	UNCOATED EDP #	ATTN 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 #	ATTN 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

Titanium Finishers

Long Length

DESCRIPTION	CUTTING DIA	SHK DIA	FLUTE LGTH	OAL	NO OF FLUTES	CORNER RADIUS	UNCOATED EDP #	ATTN 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
						0.250	EMC601397	EMC601396
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						

Titanium Finishers **NECKED**

Medium Length

DESCRIPTION	CUTTING DIA	SHK DIA	FLUTE LGTH	OAL	NO OF FLUTES	NECK LGTHS	NECK DIA	CORNER RADIUS	UNCOATED EDP #	ATTN EDP #
TFNM-60250	1/4	1/4	3/8	4	6	2 1/2	.236	Square	EMC600303	EMC600302
								0.015	EMC600403	EMC600402
								0.030	EMC600319	EMC600318
								0.060	EMC600335	EMC600334
								0.090	EMC600351	EMC600350
TFNM-60375	3/8	3/8	1/2	4	6	2 5/8	.355	Square	EMC600307	EMC600306
								0.015	EMC600407	EMC600406
								0.030	EMC600323	EMC600322
								0.060	EMC600339	EMC600338
								0.090	EMC600355	EMC600354
								0.120	EMC600367	EMC600366
TFNM-60500	1/2	1/2	5/8	6	6	3 1/8	.470	Square	EMC600311	EMC600310
								0.015	EMC600411	EMC600410
								0.030	EMC600327	EMC600326
								0.060	EMC600343	EMC600342
								0.090	EMC600359	EMC600358
								0.120	EMC600371	EMC600370
								0.156	EMC600383	EMC600382
TFNM-60625	5/8	5/8	3/4	6	6	3 1/8	0.593	Square	EMC600313	EMC600312
								0.030	EMC600329	EMC600328
								0.060	EMC600345	EMC600344
								0.090	EMC600361	EMC600360
								0.120	EMC600373	EMC600372
								0.156	EMC600385	EMC600384
								0.190	EMC600393	EMC600392
TFNM-80750	3/4	3/4	1 1/8	6	8	3 1/8	.715	Square	EMC600315	EMC600314
								0.030	EMC600331	EMC600330
								0.060	EMC600347	EMC600346
								0.090	EMC600363	EMC600362
								0.120	EMC600375	EMC600374
								0.156	EMC600387	EMC600386
								0.190	EMC600395	EMC600394
TFNM-101000	1	1	1 1/4	6	10	3 1/8	.955	Square	EMC600317	EMC600316
								0.030	EMC600333	EMC600332
								0.060	EMC600349	EMC600348
								0.090	EMC600365	EMC600364
								0.120	EMC600377	EMC600376
								0.156	EMC600389	EMC600388
								0.190	EMC600397	EMC600396
								0.250	EMC600401	EMC600400

Titanium Finishers **NECKED**

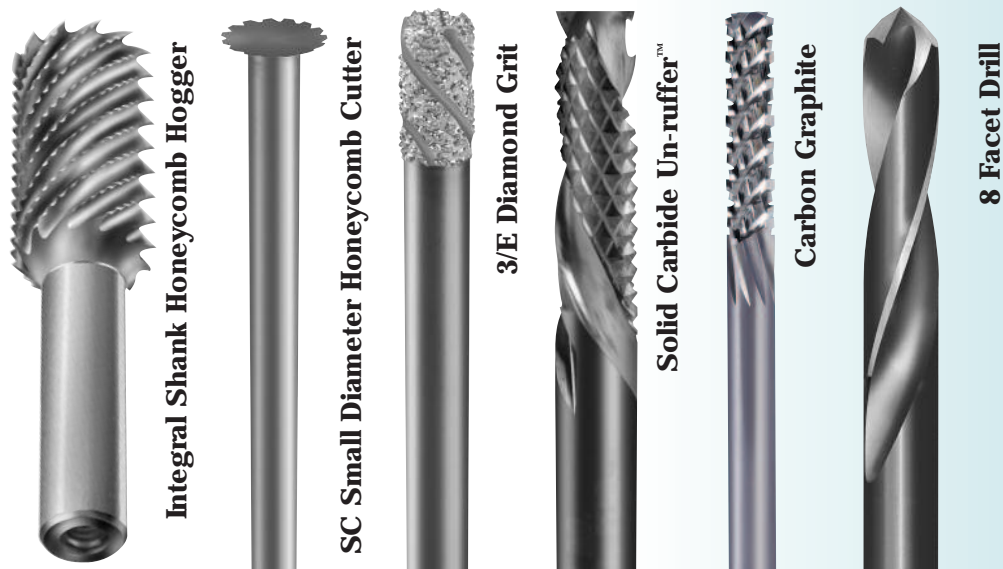
Long Length

DESCRIPTION	CUTTING DIA	SHK DIA	FLUTE LGTH	OAL	NO OF FLUTES	NECK LGTHS	NECK DIA	CORNER RADIUS	UNCOATED EDP #	ATHN 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

the **ONSRUD** *advantage*

Onsrud Cutter has provided tooling to the aerospace industry 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 Onsrud Cutter, the aerospace cutting tool specialist.



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ENDMILL QUOTE REQUEST

ITEMS IN BOLD REQUIRED

Distributor's Quote # _____
Distributor Name _____ Distributor's # _____

Distributor Address _____

Contact _____ Email _____

Telephone _____ **Fax** _____

End User Name _____ Customer Quote # _____

End User Address _____

Contact _____

Telephone _____ Fax _____

Material Being Machined _____

Hardness _____

Machine Type (Check all that apply) Vertical Multi Spindle Belt Drive
 Horizontal Geared Head Other

Machine, Make & Model _____

Rigidity Of Set-Up _____ H.P. _____

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

If Other, Describe _____

Quote Quantities _____ **Yearly Quantities** _____

Part Number Required For Quote Yes No

Notes _____

For Onsrud Use Only - RQF # _____ GUARANTEED TOOL Yes No



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