

suttontools
world class cutting tools

**SUPER ALLOY
MACHINING**



HARMONY



Energy

Oil & Gas

Automotive

Aviation

Medical

Machining Super Alloys

Cutting tools in industries such as aerospace, medical, oil and gas, are being used on materials such as titaniums, nickel alloys and stainless steels. These are known as difficult-to-machine materials. The properties that make these materials so sought after, is the high toughness, high strength to weight ratio and low thermal conductivity, which is exactly why they are difficult-to-machine and form into complex shapes.

These super alloys have very poor machinability (refer table), since most of the heat is absorbed by the cutting edge.

Hence, the importance of High Productivity Milling (HPM) and trochoidal milling strategies that transfers most of the heat to the chips produced. The best performing endmills for these milling strategies are variable helix geometries with optimised carbide grades as well as the ideal PVD (Physical Vapour Deposition) coating that really counteracts the challenging properties.

The Sutton Tools high performing endmills in this brochure have been carefully put together to cater for the above mentioned industries and milling applications.

ISO	Material group	Material Type	Machinability
P	Steels	Free Cutting	100%
		Low Carbon	70-80%
		Medium Carbon	55-65%
		High Carbon	50-60%
M	Stainless Steels	Austenitic	40-50%
		Duplex	40-55%
		Precipitation Hardening	50-65%
S	Titaniums & Super Alloys	Titanium Alloy	30%
		Fe Based	25%
		Nickel Based	10%
		Cobalt Based	5-10%

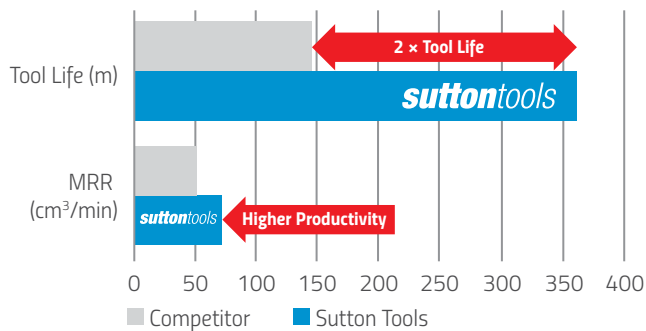
	Material Group	Page	Item Code	Tool	Diameter range	Type	Shank Type	No. of Flutes	Geometry	Tool Material	Coating	Standard
MILLING	Ti Alloys	5	E464		6mm – 20mm	Square End	DIN6535 HA	5	R40/42 Ti	VHM-Ultra	AlNova	DIN6527 L
			E465				DIN6535 HB					
			E466			Corner Radius	DIN6535 HA					
			E467				DIN6535 HB					
		9	E468		12mm – 20mm	Square End	DIN6535 HA	6	R40/42 Ti	VHM-Ultra	AlNova	DIN6527 L
			E469				DIN6535 HB					
			E470			Corner Radius	DIN6535 HA					
			E471				DIN6535 HB					
		7	E476		12mm – 20mm	3XL	DIN6535 HA	5	R40/42 Ti	VHM-Ultra	AlNova	Sutton Standard
			E477			4XL	DIN6535 HA					
	Ni Alloys	15	E472		6mm – 20mm	Square End	DIN6535 HA	5	R40/42 Ni	VHM-Ultra	X.Ceed	DIN6527 L
			E473				DIN6535 HB					
			E474			Corner Radius	DIN6535 HA					
			E475				DIN6535 HB					
	Stainless Steels	11	E459		3mm – 20mm	Square End	DIN6535 HA	4	R40/42 VA	VHM-Ultra	Helica	DIN6527 L
			E460				DIN6535 HB					
			E462		6mm – 20mm	Corner Radius	DIN6535 HA		R40/42 VA	VHM-Ultra	Helica	DIN6527 L
			E463				DIN6535 HB					
		13	E251		6mm - 32mm	Square End	DIN1835 B	4, 5, 6	R30 VA-R	SPM	AlCrN	DIN844K
			E252		6mm - 32mm							DIN844L
			E255		10mm - 32mm	Corner Radius						DIN844K

Performance Comparison - Ti

Case Study 1

Material	TiAl6V4
Tool	E466 1610
Tool Holder	Collet Chuck (Big Dashowa)
Size	Ø16 x 1 Corner Radius
Cutting Speed Vc (m/min)	50
RPM	994
Feed Rate (mm/min)	497
Feed f (mm/flute)	0.1
ae (mm)	5
ap (mm) depth	16

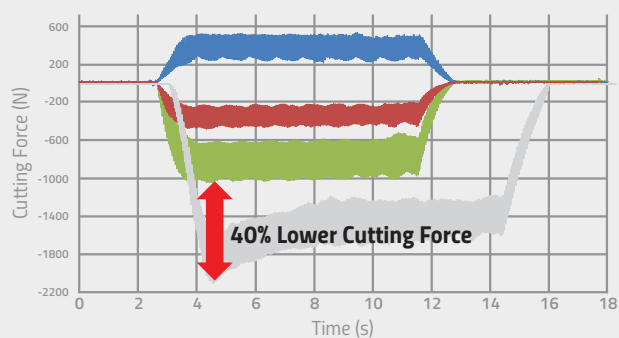
Results



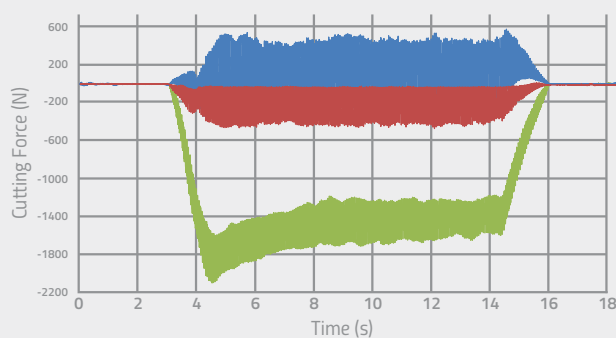
Comparison

Sutton Tools

Competitor



Key: YN XN ZN

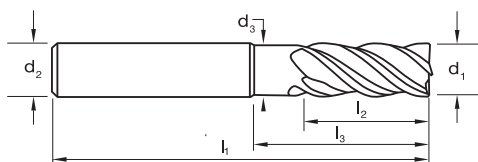


Endmills Carbide, 5 Flute, R40/42 Ti

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HARMONY

- Optimised design for trochoidal HSM milling strategies in titanium alloys
- Especially suited to large step-overs (ae), offering a high productivity solution
- Variable helix design to suppress vibration
- AlNova for outstanding oxidation resistance and hot hardness



Type
Product Group
Material
Surface Finish
Sutton Designation
Geometry
Shank Form (DIN 6535)
Shank Tolerance

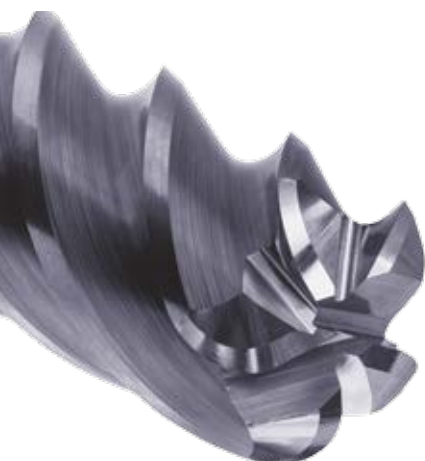
5 Flute	5 Flute
B0210	B0210
VHM-ULTRA	VHM-ULTRA
AlNova	AlNova
Ti	Ti
R40/42	R40/42
HA	HB
h6	h6

Size Ref.	d ₁ (e8)	l ₁	l ₂	l ₃	d ₂	d ₃	z	chf	rad	Item #	Item #
DIN6527L - Square End										E464	E465
0600	6.0	57	13	21	6	5.7	5			E464 0600	E465 0600
0800	8.0	63	19	27	8	7.6	5			E464 0800	E465 0800
1000	10.0	72	22	32	10	9.5	5			E464 1000	E465 1000
1200	12.0	83	26	38	12	11.5	5			E464 1200	E465 1200
1600	16.0	92	32	44	16	15.5	5			E464 1600	E465 1600
2000	20.0	104	38	54	20	19.5	5			E464 2000	E465 2000
DIN6527L - Corner Rad										E466	E467
0605	6.0	57	13	21	6	5.5	5	-	0.5	E466 0605	E467 0605
0610		57	13	21	6	5.5	5	-	1.0	E466 0610	E467 0610
0805	8.0	63	19	27	8	7.5	5	-	0.5	E466 0805	E467 0805
0810		63	19	27	8	7.5	5	-	1.0	E466 0810	E467 0810
1005	10.0	72	22	32	10	9.5	5	-	0.5	E466 1005	E467 1005
1010		72	22	32	10	9.5	5	-	1.0	E466 1010	E467 1010
1210	12.0	83	26	38	12	11.5	5	-	1.0	E466 1210	E467 1210
1225		83	26	38	12	11.5	5	-	2.5	E466 1225	E467 1225
1240		83	26	38	12	11.5	5	-	4.0	E466 1240	E467 1240
1610	16.0	92	32	44	16	15.5	5	-	1.0	E466 1610	E467 1610
1625		92	32	44	16	15.5	5	-	2.5	E466 1625	E467 1625
1630		92	32	44	16	15.5	5	-	3.0	E466 1630	E467 1630
1640		92	32	44	16	15.5	5	-	4.0	E466 1640	E467 1640
2010	20.0	104	38	54	20	19.5	5	-	1.0	E466 2010	E467 2010
2025		104	38	54	20	19.5	5	-	2.5	E466 2025	E467 2025
2030		104	38	54	20	19.5	5	-	3.0	E466 2030	E467 2030
2040		104	38	54	20	19.5	5	-	4.0	E466 2040	E467 2040
2050		104	38	54	20	19.5	5	-	5.0	E466 2050	E467 2050
2060		104	38	54	20	19.5	5	-	6.0	E466 2060	E467 2060

ISO	P													M			K					N										S										H							
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E464																																																	
E465																																																	
E466																																																	
E467																																																	

P Steel M Stainless Steel K Cast Iron N Non-Ferrous Metals S Titanium & Super Alloys H Hard Materials

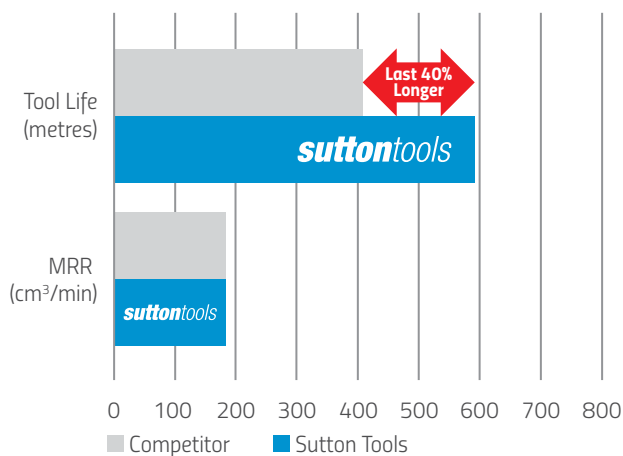
● Optimal ○ Effective



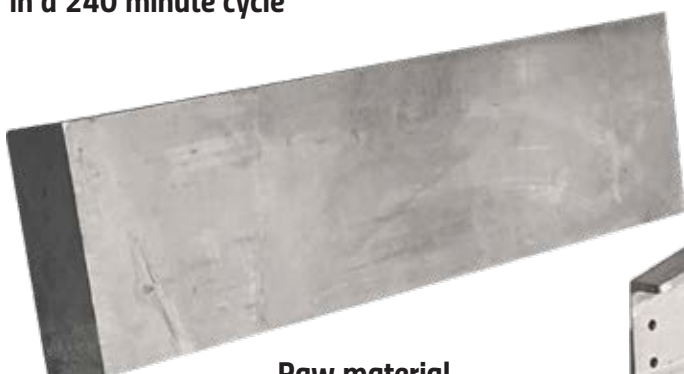
Case Study 1

Material	TiAl6V4
Tool	E476 1640
Size	ø16 x 4 Corner Radius 3XL
Cutting Speed Vc (m/min)	150
RPM	2981
Feed Rate (mm/min)	1640
Feed f (mm/flute)	0.11
ae (mm)	1.5
ap (mm) depth	57

Comparison



From raw material to finished component with just one Sutton Tools E476 1640 endmill in a 240 minute cycle



Raw material

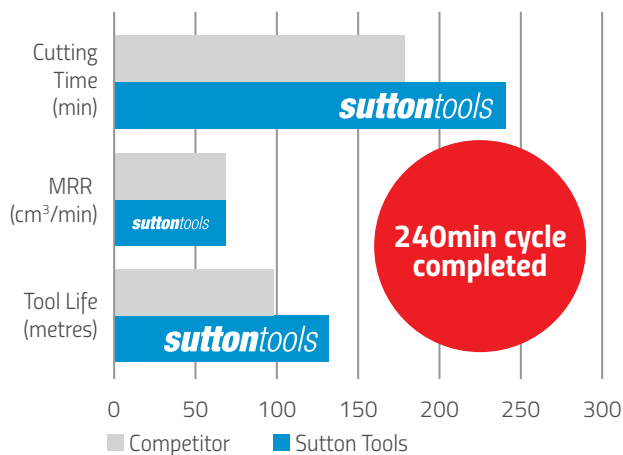


Finished component

Case Study 2

Material	TiAl6V4
Tool	E476 1640
Size	ø16 x 4 Corner Radius 3XL
Cutting Speed Vc (m/min)	55
RPM	1093
Feed Rate (mm/min)	547
Feed f (mm/flute)	0.1
ae (mm)	3
ap (mm) depth	43

Comparison

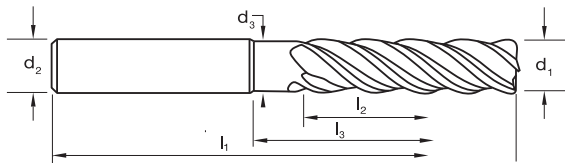


Endmills Carbide, 5 Flute, R40/42 Ti, Extra Long

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HARMONY

- Optimised design for trochoidal and HSM milling strategies in titanium alloys
- For extra deep pocket milling in typically thin wall components
- Variable helix design to suppress vibration
- AlNova for outstanding oxidation resistance and hot hardness



Type
Product Group
Material
Surface Finish
Sutton Designation
Geometry
Shank Form (DIN 6535)
Shank Tolerance

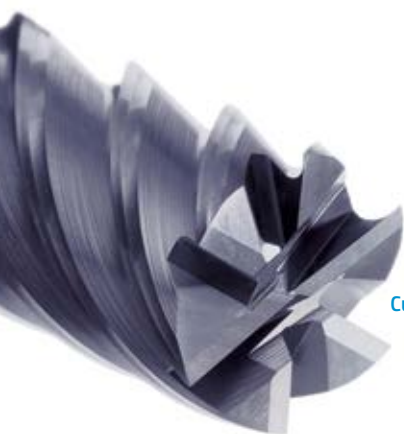
5 Flute	5 Flute
B0210	B0210
VHM-ULTRA	VHM-ULTRA
AlNova	AlNova
Ti-3XL	Ti-4XL
R40/42	R40/42
HA	HA
h6	h6

Size Ref.	d ₁ (e8)	l ₁	l ₂	l ₃	d ₂	d ₃	z	rad	Item #	Item #
1200	12	96	40	51	12	11.5	5	-	E4761200	
1210	12	96	40	51	12	11.5	5	1	E4761210	
1215	12	96	40	51	12	11.5	5	1.5	E4761215	
1220	12	96	40	51	12	11.5	5	2	E4761220	
1225	12	96	40	51	12	11.5	5	2.5	E4761225	
1230	12	96	40	51	12	11.5	5	3	E4761230	
1240	12	96	40	51	12	11.5	5	4	E4761240	
1600	16	105	52	57	16	15.5	5	-	E4761600	
1610	16	105	52	57	16	15.5	5	1	E4761610	
1615	16	105	52	57	16	15.5	5	1.5	E4761615	
1620	16	105	52	57	16	15.5	5	2	E4761620	
1625	16	105	52	57	16	15.5	5	2.5	E4761625	
1630	16	105	52	57	16	15.5	5	3	E4761630	
1640	16	105	52	57	16	15.5	5	4	E4761640	
2000	20	140	64	80	20	19.5	5	-	E4762000	
2010	20	140	64	80	20	19.5	5	1	E4762010	
2015	20	140	64	80	20	19.5	5	1.5	E4762015	
2020	20	140	64	80	20	19.5	5	2	E4762020	
2025	20	140	64	80	20	19.5	5	2.5	E4762025	
2030	20	140	64	80	20	19.5	5	3	E4762030	
2040	20	140	64	80	20	19.5	5	4	E4762040	
2050	20	140	64	80	20	19.5	5	5	E4762050	
										E477
1200	12	110	50	65	12	11.5	5	-	E4771200	
1210	12	110	50	65	12	11.5	5	1	E4771210	
1215	12	110	50	65	12	11.5	5	1.5	E4771215	
1220	12	110	50	65	12	11.5	5	2	E4771220	
1225	12	110	50	65	12	11.5	5	2.5	E4771225	
1230	12	110	50	65	12	11.5	5	3	E4771230	
1240	12	110	50	65	12	11.5	5	4	E4771240	
1600	16	130	66	82	16	15.5	5	-	E4771600	
1610	16	130	66	82	16	15.5	5	1	E4771610	
1615	16	130	66	82	16	15.5	5	1.5	E4771615	
1620	16	130	66	82	16	15.5	5	2	E4771620	
1625	16	130	66	82	16	15.5	5	2.5	E4771625	
1630	16	130	66	82	16	15.5	5	3	E4771630	
1640	16	130	66	82	16	15.5	5	4	E4771640	
2000	20	160	82	100	20	19.5	5	-	E4772000	
2010	20	160	82	100	20	19.5	5	1	E4772010	
2015	20	160	82	100	20	19.5	5	1.5	E4772015	
2020	20	160	82	100	20	19.5	5	2	E4772020	
2025	20	160	82	100	20	19.5	5	2.5	E4772025	
2030	20	160	82	100	20	19.5	5	3	E4772030	
2040	20	160	82	100	20	19.5	5	4	E4772040	
2050	20	160	82	100	20	19.5	5	5	E4772050	

ISO	P													M	K					N											S										H								
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E476																	○																																
E477																	○																																

P Steel M Stainless Steel K Cast Iron N Non-Ferrous Metals S Titanium & Super Alloys H Hard Materials

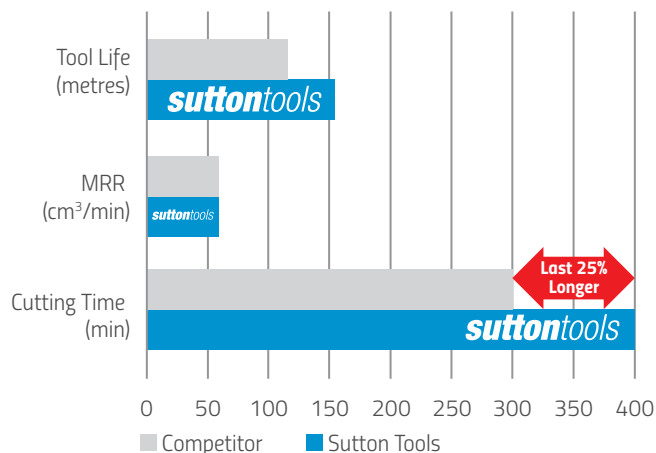
● Optimal ○ Effective



Case Study 1

Material	TiAl6V4
Tool Holder	HSK63 Shrink Fit
Size	ø20 x R1
ae (mm)	3
ap (mm)	26
Cutting Speed Vc (m/min)	80
RPM	1272
Feed Rate (mm/min)	382
Feed f (mm/flute)	0.06

Comparison



From the above case study, we demonstrated the tool life could complete the entire 400 minute cycle time with minimal wear. This results in significantly less machine downtime for tool changes which translates to lower tool cost. The edge condition after 400 minutes of milling is also suitable for regrinds, providing further cost savings.

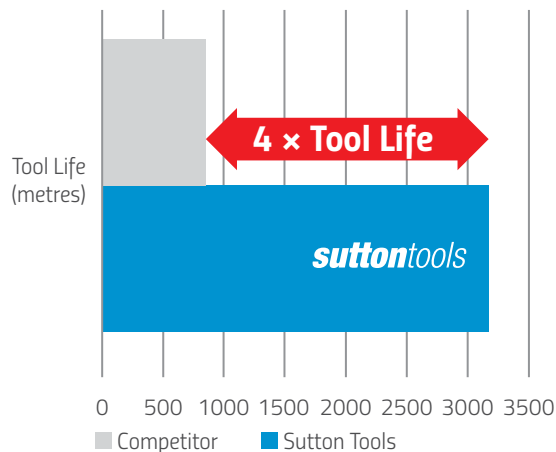
Edge condition after 400 minutes

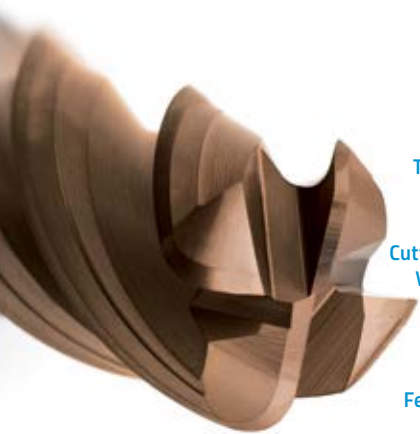


Case Study 2

Material	15-5Ph
Tool	E470 1610
Size	ø16 x 1 Corner radius
ae (mm)	1.2
ap (mm)	12
Cutting Speed Vc (m/min)	130
RPM	2584
Feed Rate (mm/min)	2225
Feed f (mm/flute)	0.144

Comparison

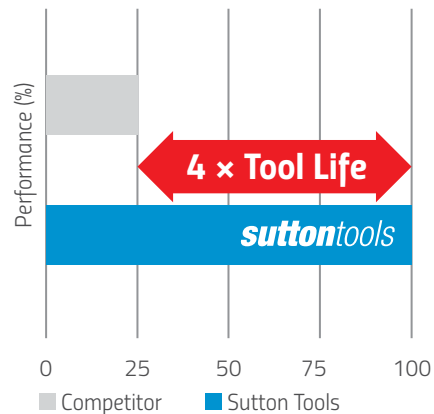




Case Study 1

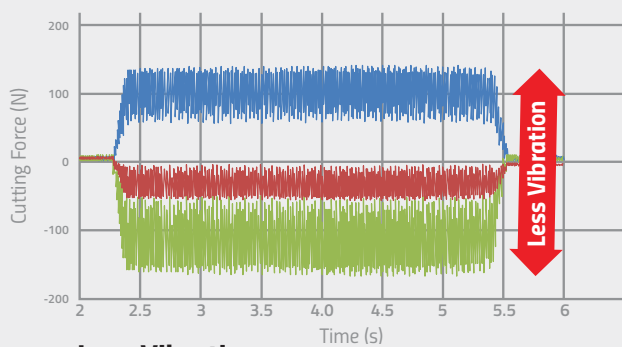
Material	15-5Ph
Tool	E462 1640
Tool Holder	Collet Chuck
Size	ø16 x 4 Corner Radius
Cutting Speed Vc (m/min)	120
RPM	2390
Feed Rate (mm/min)	1335
Feed f (mm/ flute)	0.14
ae (mm)	1.2
ap (mm) / depth	12

Comparison



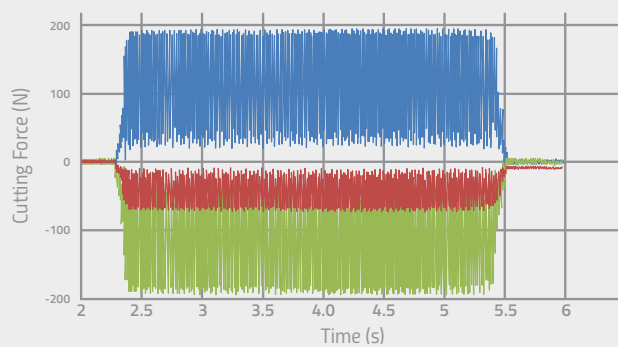
Comparison

Sutton Tools



Less Vibration

Competitor

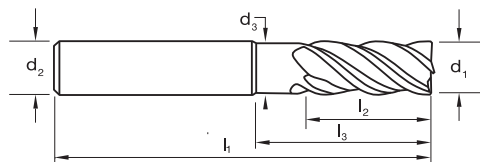


Endmills Carbide, 4 Flute, R40/42 VA

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HARMONY

- Excellent solution for stainless steels and super alloy type materials
- Optimised geometry with variable helix design ensures high productivity
- Suitable for slotting, side cutting and finishing applications with the one tool
- HELICA for outstanding oxidation resistance and hot hardness
- VHM-ULTRA grade of carbide for high performance



Type	4 Flute	4 Flute
Product Group	B0210	B0210
Material	VHM-ULTRA	VHM-ULTRA
Surface Finish	HELICA	HELICA
Sutton Designation	VA	VA
Geometry	R40/42	R40/42
Shank Form (DIN 6535)	HA	HB
Shank Tolerance	h6	h6

Size Ref.	d ₁ (e8)	l ₁	l ₂	l ₃	d ₂	d ₃	z	chf	rad	Item #	Item #
DIN6527L - Square End										E459	E460
0300	3.0	57	8	14	6	2.8	4	0.08	-	E459 0300	E460 0300
0400	4.0	57	11	16	6	3.8	4	0.08	-	E459 0400	E460 0400
0500	5.0	57	13	18	6	4.8	4	0.20	-	E459 0500	E460 0500
0600	6.0	57	13	21	6	5.7	4	0.20	-	E459 0600	E460 0600
0800	8.0	63	19	27	8	7.6	4	0.20	-	E459 0800	E460 0800
1000	10.0	72	22	32	10	9.5	4	0.25	-	E459 1000	E460 1000
1200	12.0	83	26	38	12	11.5	4	0.25	-	E459 1200	E460 1200
1400	14.0	83	26	38	14	13.5	4	0.35	-	E459 1400	E460 1400
1600	16.0	92	32	44	16	15.5	4	0.35	-	E459 1600	E460 1600
1800	18.0	92	32	44	18	17.5	4	0.35	-	E459 1800	E460 1800
2000	20.0	104	38	54	20	19.5	4	0.35	-	E459 2000	E460 2000

DIN6527L - Corner Rad										E462	E463
0603	6.0	57	13	21	6	5.7	4	-	0.3	E462 0603	E463 0603
0605		57	13	21	6	5.7	4	-	0.5	E462 0605	E463 0605
0610		57	13	21	6	5.7	4	-	1.0	E462 0610	E463 0610
0803	8.0	63	19	27	8	7.6	4	-	0.3	E462 0803	E463 0803
0805		63	19	27	8	7.6	4	-	0.5	E462 0805	E463 0805
0810		63	19	27	8	7.6	4	-	1.0	E462 0810	E463 0810
0815		63	19	27	8	7.6	4	-	1.5	E462 0815	E463 0815
0820		63	19	27	8	7.6	4	-	2.0	E462 0820	E463 0820
1003	10.0	72	22	32	10	9.5	4	-	0.3	E462 1003	E463 1003
1005		72	22	32	10	9.5	4	-	0.5	E462 1005	E463 1005
1010		72	22	32	10	9.5	4	-	1.0	E462 1010	E463 1010
1015		72	22	32	10	9.5	4	-	1.5	E462 1015	E463 1015
1020		72	22	32	10	9.5	4	-	2.0	E462 1020	E463 1020
1203	12.0	83	26	38	12	11.5	4	-	0.3	E462 1203	E463 1203
1205		83	26	38	12	11.5	4	-	0.5	E462 1205	E463 1205
1210		83	26	38	12	11.5	4	-	1.0	E462 1210	E463 1210
1215		83	26	38	12	11.5	4	-	1.5	E462 1215	E463 1215
1220		83	26	38	12	11.5	4	-	2.0	E462 1220	E463 1220
1230		83	26	38	12	11.5	4	-	3.0	E462 1230	E463 1230
1605	16.0	92	32	44	16	15.5	4	-	0.5	E462 1605	E463 1605
1610		92	32	44	16	15.5	4	-	1.0	E462 1610	E463 1610
1615		92	32	44	16	15.5	4	-	1.5	E462 1615	E463 1615
1620		92	32	44	16	15.5	4	-	2.0	E462 1620	E463 1620
1630		92	32	44	16	15.5	4	-	3.0	E462 1630	E463 1630
1640		92	32	44	16	15.5	4	-	4.0	E462 1640	E463 1640
2005	20.0	104	38	54	20	19.5	4	-	0.5	E462 2005	E463 2005
2010		104	38	54	20	19.5	4	-	1.0	E462 2010	E463 2010
2015		104	38	54	20	19.5	4	-	1.5	E462 2015	E463 2015
2020		104	38	54	20	19.5	4	-	2.0	E462 2020	E463 2020
2030		104	38	54	20	19.5	4	-	3.0	E462 2030	E463 2030
2040		104	38	54	20	19.5	4	-	4.0	E462 2040	E463 2040

ISO	P												M		K					N										S							H											
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	14.2	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E459													○	○	●	●																	○	○	○	○	○	○			○							
E460													○	○	●	●																	○	○	○	○	○	○			○							
E462													○	○	●	●																	○	○	○	○	○	○			○							
E463													○	○	●	●																	○	○	○	○	○	○			○							

P Steel M Stainless Steel K Cast Iron N Non-Ferrous Metals S Titanium & Super Alloys H Hard Materials

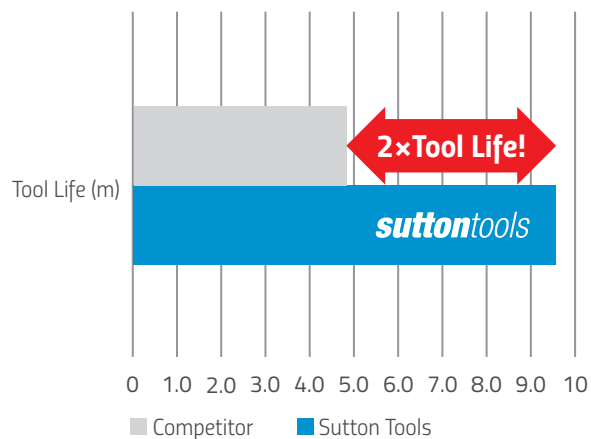
● Optimal ○ Effective



Case Study 1

Material	TiAl6V4
Tool	E255 1640
Tool Holder	Collet Chuck (BigDashowa)
Size	16mm
Cutting Speed Vc (m/min)	20
RPM	398
Feed Rate (mm/min)	119
Feed f (mm/flute)	0.06
ae (mm)	10
ap (mm) / depth	20

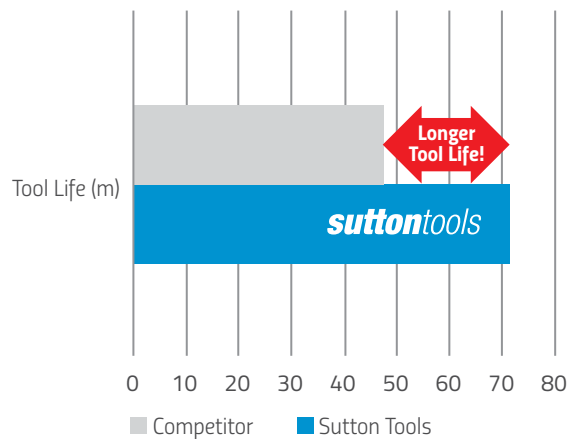
Results



Case Study 2

Material	TiAl6V4
Tool	Special Custom Make
Tool Holder	Collet Chuck
Size	31.75mm (1-1/4")
Cutting Speed Vc (m/min)	23
RPM	230
Feed Rate (mm/min)	79
Feed f (mm/flute)	0.057
ae (mm)	16
ap (mm) / depth	48

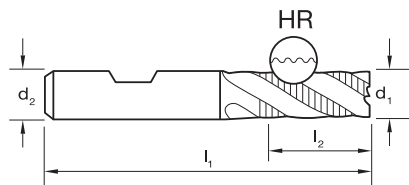
Results



Roughers SPM, R30 VA-R, Regular

suttontools

- HSS-SPM (Powder Metallurgy)
- Unique HR geometry offers stable performance in difficult to machine materials for roughing applications
- Ideal for large volume metal removal



Catalogue Code
Discount Group
Material
Surface Finish
Sutton Designation
Geometry
Shank Form (DIN 1835)
Shank Tolerance

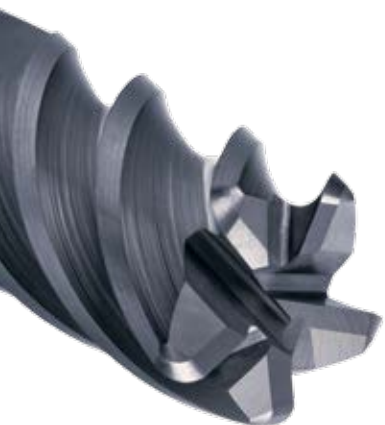
E251	E255	E252
B0408	B0408	B0408
SPM	SPM	SPM
AICrN	AICrN	AICrN
VA-R	VA-R	VA-R
R30 VA-R	R30 VA-R Corner Rad	R30 VA-R
B	B	B
h6	h6	h6

Size Ref.	d ₁ (js14)	l ₁	l ₂	d ₂	z	rad	Item #	Item #	Item #
0600	6.0	57	13	6	4	-	E251 0600		
0800	8.0	69	19	10	4	-	E251 0800		
1000	10.0	72	22	10	4	-	E251 1000		
1025	10.0	72	22	10	4	2.5		E255 1025	
1040	10.0	72	22	10	4	4		E255 1040	
1200	12.0	83	26	12	4	-	E251 1200		
1225		83	26	12	4	2.5		E255 1225	
1240		83	26	12	4	4		E255 1240	
1600	16.0	92	32	16	4	-	E251 1600		
1605		92	32	16	5	-	E251 1605		
1625		92	32	16	5	2.5		E255 1625	
1640		92	32	16	5	4		E255 1640	
2000	20.0	104	38	20	4	-	E251 2000		
2005		104	38	20	5	-	E251 2005		
2025		104	38	20	5	2.5		E255 2025	
2040		104	38	20	5	4		E255 2040	
2050		104	38	20	5	5		E255 2050	
2060		104	38	20	5	6		E255 2060	
2500	25.0	121	45	25	5	-	E251 2500		
2525		121	45	25	5	2.5		E255 2525	
2540		121	45	25	5	4		E255 2540	
2550		121	45	25	5	5		E255 2550	
2560		121	45	25	5	6		E255 2560	
3040	30.0	121	45	25	6	4		E255 3040	
3200	32.0	133	53	32	6	-	E251 3200		
3240	32.0	133	53	32	6	4		E255 3240	
0600	6.0	68	24	6	3	-			E252 0600
0800	8.0	88	38	10	3	-			E252 0800
1000	10.0	95	45	10	4	-			E252 1000
1200	12.0	110	53	12	4	-			E252 1200
1600	16.0	123	63	16	4	-			E252 1600
2000	20.0	141	75	20	4	-			E252 2000
2500	25.0	166	90	25	5	-			E252 2500

ISO	P												M		K					N										S										H											
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41		
E251	○	○	○	○	●	○	●	●		●		○	●	●	●	○																	○	○	○	○	○	○	●	●	●	●	○	○							
E255	○	○	○	○	○	○	○	●		○		○	○	●	●	○																	○	○	○	○	○	○	○	●	●	●	●	○	○						
E252	○	○	○	○	○	○	○	●		●		○	○	●	●	○																	○	○	○	○	○	○	○	●	●	●	●	○	○						

P Steel M Stainless Steel K Cast Iron N Non-Ferrous Metals S Titanium & Super Alloys H Hard Materials

● Optimal ○ Effective



R40/42 5-Flute Ni Carbide Endmill E474 Series

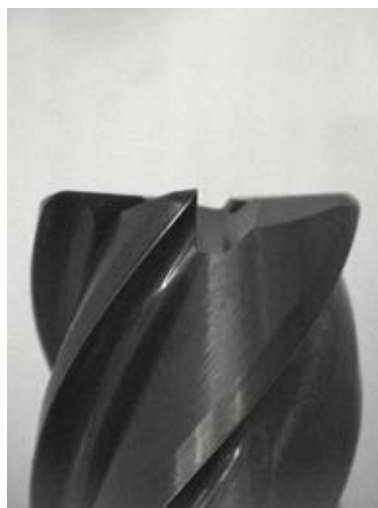
Excellent solution for shoulder and finish milling application, particularly for fine surface finish requirements, due to the multi-flute design the cutting forces and loads are distributed over more cutting edges than the conventional 4 flute endmills, resulting longer tool life.

Case Study 1 Test Data

Material	Inconel 718 (45 HRC)	
Tool Holder	ER Collet Chuck	
Size	ø16 x R1	
ae (mm)	3	
ap (mm)	28	
	Sutton Tools	Competitor
Tool	E474 1610	VA Tool 4 Flute
Cutting Speed Vc (m/min)	28	25
RPM	557	557
Feed Rate Vf (mm/min)	195	156
Feed fz (mm/tooth)	0.07	0.07

Wear Comparison

Sutton Tools 5 Flute Ni

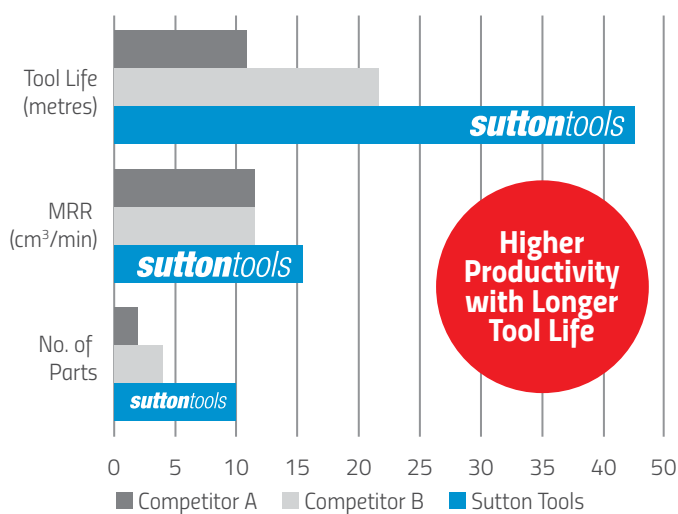


Competitor 4 Flute VA Tool



Case Study 2 Test Data

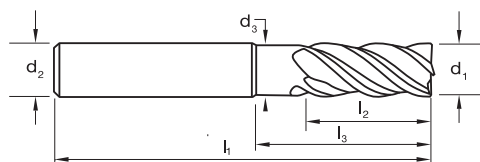
Material	Inconel 625		
Tool	E474 1010		
Tool Holder	BT40 Hydraulic Chuck		
Size	ø10 x 1 Corner Radius		
	Sutton Tools	Competitor A	Competitor B
z (teeth number)	5	4	4
ae (mm)	0.5	0.4	0.4
ap (mm)	22	22	22
Cutting Speed Vc (m/min)	45	45	45
RPM	1431	1431	1431
Feed Rate Vf (mm/min)	500	343	343
Feed fz (mm/tooth)	0.07	0.06	0.06



Endmills Carbide, 5 Flute, R40/42 Ni

suttontools

- Excellent solution for stainless steels and super alloy type materials
- Optimised geometry with variable helix design ensures high productivity
- Suitable for slotting, side cutting and finishing applications with the one tool
- Xceed for outstanding oxidation resistance and hot hardness
- VHM-ULTRA grade of carbide for high performance



Type
Product Group
Material
Surface Finish
Sutton Designation
Geometry
Shank Form (DIN 6535)
Shank Tolerance

5 Flute	5 Flute
B0210	B0210
VHM-ULTRA	VHM-ULTRA
Xceed	Xceed
Ni	Ni
R40/42 Ni	R40/42 Ni
HA	HB
h6	h6

Size Ref.	d ₁ (e8)	l ₁	l ₂	l ₃	d ₂	d ₃	z	chf	rad	Item #	Item #
DIN6527L - Square End										E472	E473
0600	6.0	57	13	21	6	5.7	5	0.20	-	E472 0600	E473 0600
0800	8.0	63	19	27	8	7.6	5	0.20	-	E472 0800	E473 0800
1000	10.0	72	22	32	10	9.5	5	0.25	-	E472 1000	E473 1000
1200	12.0	83	26	38	12	11.5	5	0.25	-	E472 1200	E473 1200
1600	16.0	92	32	44	16	15.5	5	0.35	-	E472 1600	E473 1600
2000	20.0	104	38	54	20	19.5	5	0.35	-	E472 2000	E473 2000
DIN6527L - Corner Rad										E474	E475
0605	6.0	57	13	21	6	5.7	5	-	0.5	E474 0605	E475 0605
0610		57	13	21	6	5.7	5	-	1.0	E474 0610	E475 0610
0805	8.0	63	19	27	8	7.6	5	-	0.5	E474 0805	E475 0805
0810		63	19	27	8	7.6	5	-	1.0	E474 0810	E475 0810
1005	10.0	72	22	32	10	9.5	5	-	0.5	E474 1005	E475 1005
1010		72	22	32	10	9.5	5	-	1.0	E474 1010	E475 1010
1210	12.0	83	26	38	12	11.5	5	-	1.0	E474 1210	E475 1210
1215		83	26	38	12	11.5	5	-	1.5	E474 1215	E475 1215
1225		83	26	38	12	11.5	5	-	2.5	E474 1225	E475 1225
1240		83	26	38	12	11.5	5	-	4.0	E474 1240	E475 1240
1610	16.0	92	32	44	16	15.5	5	-	1.0	E474 1610	E475 1610
1615		92	32	44	16	15.5	5	-	1.5	E474 1615	E475 1615
1625		92	32	44	16	15.5	5	-	2.5	E474 1625	E475 1625
1640		92	32	44	16	15.5	5	-	4.0	E474 1640	E475 1640
2010	20.0	104	38	54	20	19.5	5	-	1.0	E474 2010	E475 2010
2015		104	38	54	20	19.5	5	-	1.5	E474 2015	E475 2015
2025		104	38	54	20	19.5	5	-	2.5	E474 2025	E475 2025
2040		104	38	54	20	19.5	5	-	4.0	E474 2040	E475 2040

ISO	P												M			K					N										S										H								
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E472													○	○	●	●	●																	●	●	●	●	●	●										
E473													○	○	●	●	●																	●	●	●	●	●	●										
E474													○	○	●	●	●																	●	●	●	●	●	●										
E475													○	○	●	●	●																	●	●	●	●	●	●										

P Steel M Stainless Steel K Cast Iron N Non-Ferrous Metals S Titanium & Super Alloys H Hard Materials

● Optimal ○ Effective

ISO	VDI	Material Group	Sutton
P	A	Steel	N
M	R	Stainless Steel	VA
K	F	Cast Iron	GG
N	N	Non-Ferrous Metals, Aluminiums & Coppers	Al W
S	S	Titaniums & Super Alloys	Ti Ni
H	H	Hard Materials (≥ 45 HRC)	H

^ VDI 3323 material groups can also be determined by referring to the workpiece material cross reference listing. Refer to main index of this section.

For expert tooling recommendations, go to:
www.suttontools.com/expert-tool-selector

Special Notes

- These cutting conditions are a guide for HPM applications & will vary subject to the user own machine conditions and set-up variables.
- Careful consideration has been given to chip loads based on the step over (ae) size of cut to ensure chip thinning is eliminated, with deflection kept to a minimum.

Catalogue Code

Material

Surface Finish

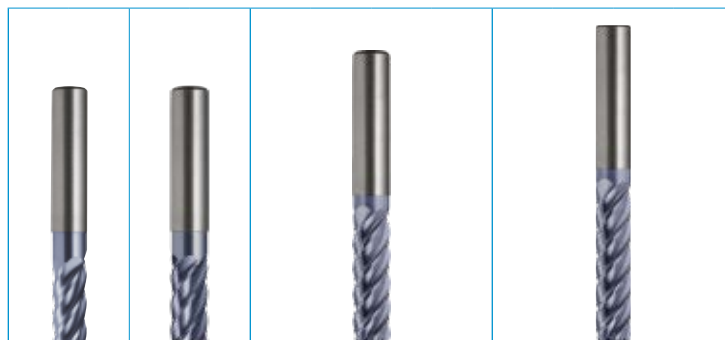
Sutton Designation

Type of Cut: Finishing

Roughing

$$\updownarrow ap \times \varnothing$$

$$\leftrightarrow ae \times \varnothing$$



E464/E465	E466/E467	E476	E477
VHM-ULTRA	VHM-ULTRA	VHM-ULTRA	VHM-ULTRA
AINova	AINova	AINova	AINova
Ti	Ti-3XL	Ti-4XL	Ti-4XL
•	•	•	•
1.5	1.5	3	3
0.05	0.3	0.05	0.25
0.05	0.3	0.05	0.25

ISO	VDI [^] 3323	Material	Condition	HB	N/mm ²	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #
M	14.1	Stainless Steel	Austenitic	AH	180	610	-	-	-	-	-	-	-	-	-	-	-
	14.2		Duplex		250	840	-	-	-	-	-	-	-	-	-	-	-
	14.3		Precipitation Hardening		250	840	120	11	100	13	80	11	60	13	60	10	50
S	31	High temp. alloys	Fe based	A	200	680	-	-	-	-	-	-	-	-	-	-	-
	32			AH	280	950	-	-	-	-	-	-	-	-	-	-	-
	33		Ni / Co based	A	250	840	-	-	-	-	-	-	-	-	-	-	-
	34			AH	350	1180	-	-	-	-	-	-	-	-	-	-	-
	35			C	320	1080	-	-	-	-	-	-	-	-	-	-	-
	36	Titanium & Ti alloys	CP Titanium		400 MPa		100	8	100	11	70	7	70	10	65	7	65
	37.1		Alpha alloys		860 MPa		90	8	80	11	65	7	55	10	60	7	50
	37.2		Alpha / Beta alloys	A	960 MPa		90	8	70	11	65	7	50	10	60	7	45
	37.3			AH	1170 MPa		70	8	60	11	50	7	40	10	45	7	35
	37.4		Beta alloys	A	830 MPa		90	8	80	11	65	7	55	10	60	7	50
	37.5			AH	1400 MPa		70	8	60	11	50	7	40	10	45	7	35

Condition: A (Annealed), AH (Age Hardened),
 C (Cast), HT (Hardened & Tempered),
 QT (Quenched & Tempered)

Bold = Optimal | Regular = Effective

Feed Table (fz) (mm/tooth)																				
Ø	Feed #																			
2	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.013	0.014	0.016	0.018	0.020	0.022	0.024	0.026	0.030
3	0.002	0.003	0.004	0.005	0.006	0.008	0.009	0.010	0.012	0.014	0.016	0.018	0.020	0.023	0.025	0.028	0.032	0.034	0.038	0.042
4	0.004	0.005	0.006	0.007	0.009	0.010	0.012	0.014	0.016	0.018	0.021	0.023	0.026	0.030	0.032	0.036	0.040	0.044	0.045	0.050
5	0.005	0.006	0.008	0.009	0.011	0.013	0.015	0.017	0.020	0.023	0.025	0.030	0.032	0.036	0.040	0.044	0.050	0.055	0.060	0.065
6	0.006	0.008	0.009	0.011	0.013	0.016	0.018	0.021	0.024	0.028	0.030	0.034	0.038	0.042	0.045	0.050	0.055	0.060	0.070	0.075
8	0.010	0.012	0.014	0.017	0.019	0.022	0.025	0.028	0.032	0.036	0.040	0.045	0.050	0.055	0.060	0.065	0.075	0.080	0.085	0.095
10	0.013	0.015	0.018	0.021	0.024	0.028	0.032	0.036	0.040	0.045	0.050	0.055	0.060	0.070	0.075	0.085	0.090	0.100	0.11	0.12
12	0.016	0.019	0.022	0.026	0.030	0.034	0.038	0.044	0.050	0.055	0.060	0.065	0.075	0.080	0.090	0.100	0.11	0.12	0.13	0.14
16	0.020	0.024	0.028	0.034	0.038	0.044	0.050	0.055	0.060	0.070	0.080	0.085	0.095	0.11	0.12	0.13	0.14	0.16	0.17	0.18
20	0.022	0.028	0.032	0.038	0.044	0.050	0.060	0.065	0.075	0.085	0.095	0.11	0.12	0.13	0.15	0.16	0.18	0.19	0.21	0.23
25	0.025	0.032	0.038	0.045	0.055	0.060	0.070	0.080	0.090	0.10	0.12	0.13	0.15	0.16	0.18	0.20	0.22	0.24	0.26	0.29

															
E468/E469	E470/E471	E459/E460	E461/E462	E251	E255	E252	E472/E473/E474/E475								
VHM-ULTRA		VHM-ULTRA		SPM	SPM		VHM-ULTRA								
AINova		HELICA		TICN	AlCrN		XCeed								
Ti 6 Flute		VA		VA	VA		Ni								
•		•					•								
		•		•	•	•									
1.5		1.5		1.5	1.0	1.0	1.5								
0.05		0.25		0.05	0.3	0.5	0.05								
Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #
-	-	-	-	120	8	100	9	40	10	40	10	40	10	120	14
-	-	-	-	100	8	90	9	40	10	40	10	40	10	120	14
120	11	100	13	100	8	90	9	25	6	25	6	25	6	100	14
-	-	-	-	-	-	-	-	25	4	25	4	25	4	60	14
-	-	-	-	-	-	-	-	15	4	15	4	15	4	50	14
-	-	-	-	-	-	-	-	25	4	25	4	25	4	50	14
-	-	-	-	-	-	-	-	10	4	10	4	10	4	40	13
-	-	-	-	-	-	-	-	15	4	15	4	15	4	30	11
100	8	100	11	110	7	70	8	30	5	30	5	30	5	-	-
90	8	80	11	100	7	60	8	15	4	15	4	15	4	-	-
90	8	70	11	90	7	50	8	15	4	15	4	15	4	-	-
70	8	60	11	80	7	50	8	12	4	12	4	12	4	-	-
90	8	80	11	100	7	60	8	15	4	15	4	15	4	-	-
70	8	60	11	80	7	50	8	12	4	12	4	12	4	-	-

METRIC ENDMILLS (mm size)

Ø	= nominal tool diameter (mm)	$n = \frac{v_c \times 1000}{\phi \times \pi} \approx \frac{v_c}{\phi} \times 318$
n	= Spindel speed (RPM)	
v _c	= Cutting speed (m/min)	$v_c = \frac{n \times \phi \times \pi}{1000} \approx \frac{n \times \phi}{318}$
f _z	= Feed rate per tooth (mm/tooth)	$f_z = \frac{V_f}{z \times n} \quad V_f = f_z \times z \times n$
v _f	= Feed rate (mm/min)	
z	= No. cutting edges	
Q	= Metal removal rate (cm³/min)	$Q = \frac{a_p \times a_e \times V_f}{1000}$
a _p	= Cutting depth (mm)	
a _e	= Cutting width (mm)	

Regrinding

The relationship with you does not end after the delivery of our products. Sutton Tools supports you by reducing your production costs through our regrinding service of carbide tools available at our state-of-the-art facility.

Using our regrinding service means:

- ✓ Reground with original geometry
- ✓ Quality assured
- ✓ Handled by highly experienced personnel
- ✓ Lower tooling cost

Recoating

As a total solution provider, Sutton Tools uses world leading heat treatment PVD coating (Physical Vapour Deposition) based on Oerlikon Balzers technology on their latest INNOVA coating machine to add life to our products.

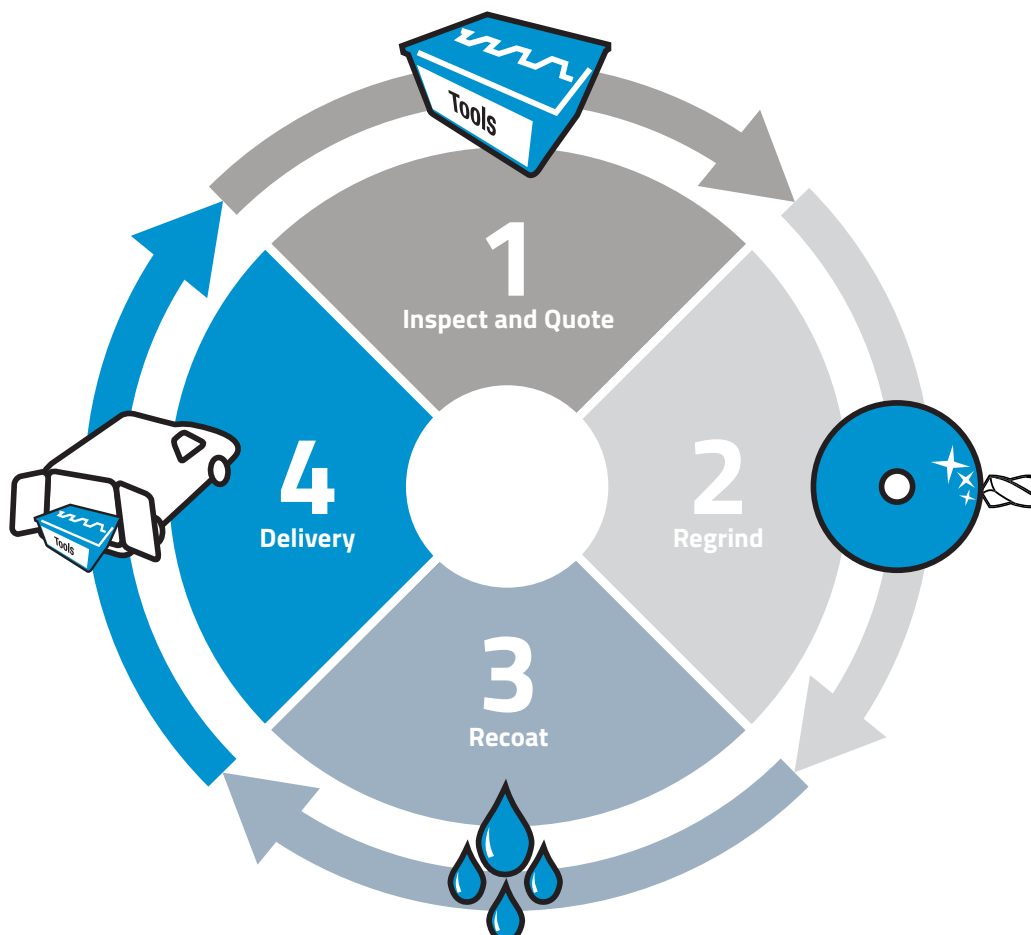
The benefits of PVD coatings include:

- ✓ 300%–1000% increase in tool life
- ✓ Increased productivity
- ✓ Uniform thickness
- ✓ Corrosion resistant
- ✓ Less tool changes due to less wear
- ✓ Better wear condition for regrinds

Custom Tools and Modifications

With these synergy of facility and services, Sutton Tools are able to manufacture custom tools to your exact requirements. Simply provide your details via our enquiry form and our team of engineers will be able to design a custom solution for your tooling needs in no time.

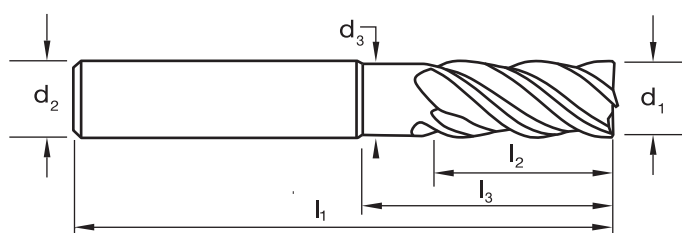
Tool Regrinding and Recoating Process



Customer No.:	New Customer ☐	Order No.
Company:		Contact:
Address:		Phone:
State / Province:		Fax:
Country:		Email:

Quantity:

Internal Cooling ☐ Yes ☐ No



Norm-Ø	d_1
Shank-Ø to DIN 6535	d_2
Shank length to DIN 6535	d_3
Total length	l_1
Cutting length	l_2
Reach length	l_3

Straight Shank (DIN 6535)

Finishing endmills
($\varnothing$ 3 – 20mm)

☐ N ☐ with Chip Breaker

Roughing endmills
($\varnothing$ 6 – 20mm)

☐ Fine ☐ Coarse

Cutting to Centre ☐ Yes ☐ No

Sharp edge		☐ Yes ☐ No
Corner protection		☐ Yes ☐ No mm x 45° (Ø 0.03 – 1.5mm)
Corner radius		☐ Yes ☐ No mm x d ₁ (Ø 0.3 – 2/3mm)
Ballnose		☐ Yes ☐ No

Coating ☐ Yes ☐ No

☐ AlNova ☐ Xceed ☐ TiAlN ☐ AlCrN

☐ Carbide _____

☐ HSS (SPM) _____

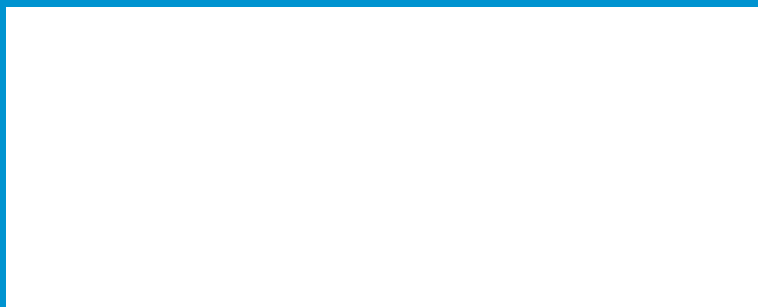
ae (mm)	
ap (mm)	
Material description	
Material hardness	(N/mm ² or HRC)

Application types

- ☐ Slotting
- ☐ Roughing
- ☐ Finishing
- ☐ HSM/Pocketing/
Trochoidal

Drawing / Notes

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