

MillLine



TUNG-TRI

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Tungaloy Report No. 421S1-US

New high precision shoulder milling inserts

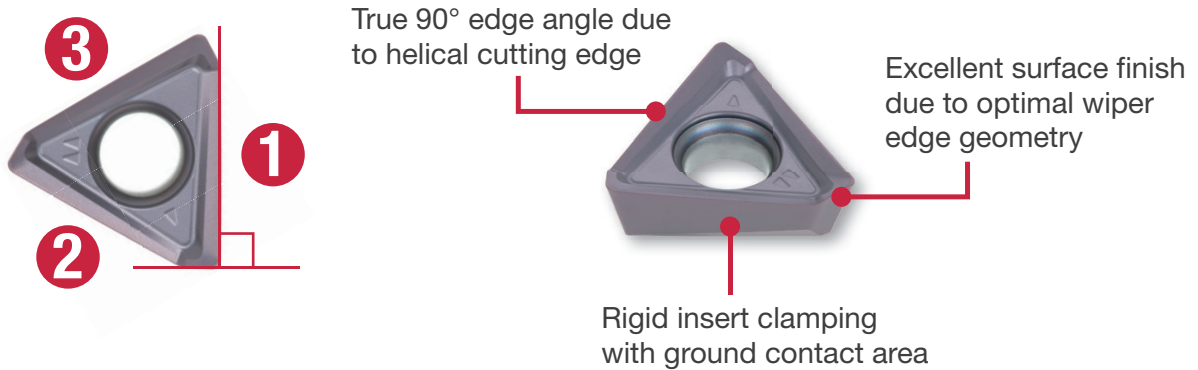


INDUSTRY 4.0
FEED the SPEED!



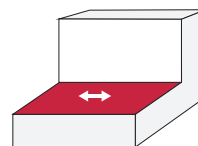
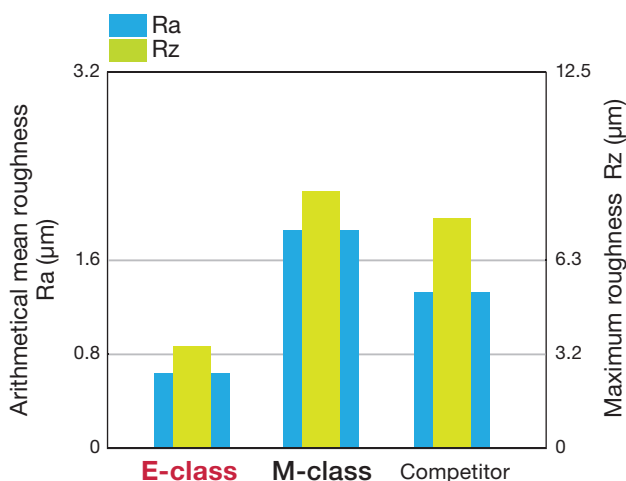
New ground E-class MJ insert offers precise square shoulder milling and excellent surface finish!

3 cutting edges perfectly perpendicular to the workpiece material



Excellent surface finish

Surface roughness

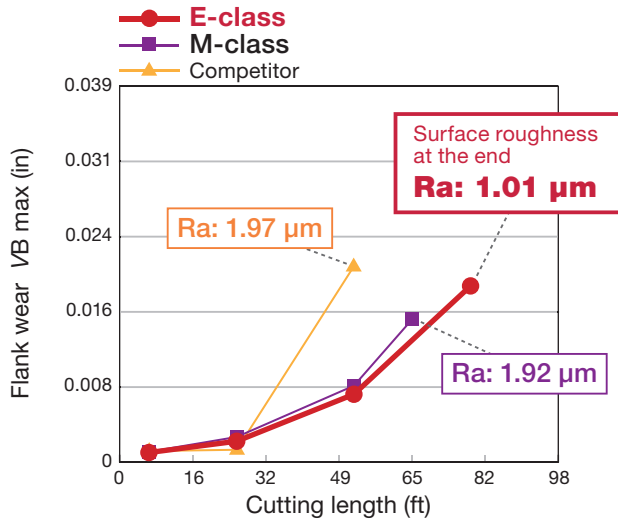


Cutter : TPA15R400U0150A07N (ø4.000", z = 7)
 Insert : TOET150608PDER-MJ
 Grade : AH3135
 Workpiece material : 1055
 Cutting speed : Vc = 820 sfm
 Feed per tooth : fz = 0.004 ipt
 Depth of cut : ap = 0.118"
 Width of cut : ae = 2.756"
 Coolant : Air
 Machine : Vertical M/C, BT50

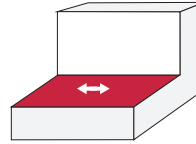
Only the E-class inserts offered Ra < 0.8 µm and Rz < 6.3 µm surface roughness due to optimal wiper edge.

Stable surface finish quality

■ Tool life and surface roughness at the end of the machining process



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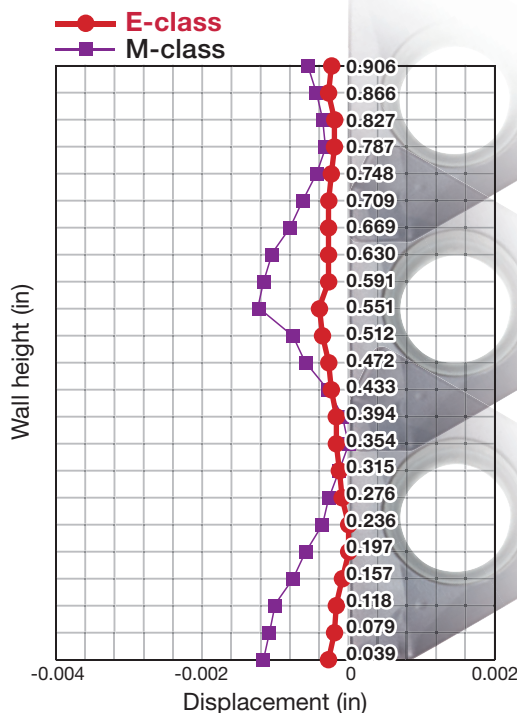
Cutter : TPA10R300U0100A07 ($\phi 3.000''$, $z = 7$)
 Insert : TOET100404PDER-MJ
 Grade : AH3135
 Workpiece material: 1055
 Cutting speed : $V_c = 820$ sfm
 Feed per tooth : $f_z = 0.004$ ipt
 Depth of cut : $a_p = 0.079''$
 Width of cut : $a_e = 0.787''$
 Coolant : Air
 Machine : Vertical M/C, BT50

AH3135 - PVD grade for high fracture resistance
 - Most suitable for steel and stainless steel in general cutting parameters

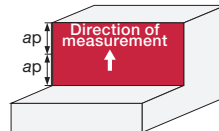
Close runout accuracy improved tool life and provided stable surface finish quality.

High wall accuracy

■ Wall accuracy in high speed machining



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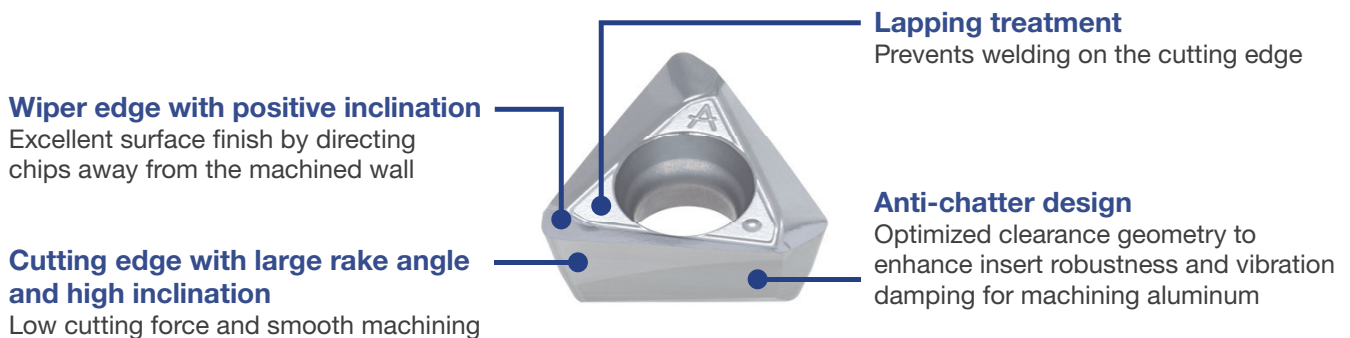


Cutter : EPA15R150U0125W03N ($\phi 1.500''$, $z = 3$)
 Insert : TOET150608PDER-MJ
 Grade : AH3135
 Workpiece material: 1055
 Cutting speed : $V_c = 820$ sfm
 Feed per tooth : $f_z = 0.004$ ipt
 Depth of cut : $a_p = 0.315''$
 Width of cut : $a_e = 0.197''$
 Coolant : Air
 Machine : Vertical M/C, BT50

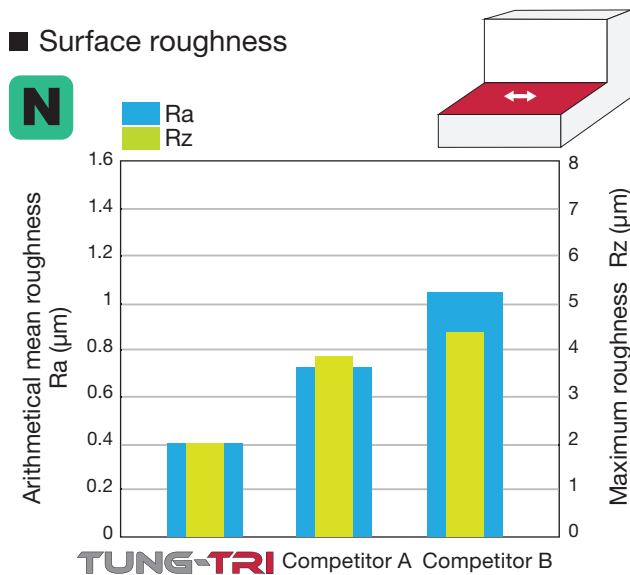
Helical cutting edge and secure insert clamping with the ground surface provide excellent wall accuracy even during demanding machining conditions.

Extra sharp, tough and precise cutting edge accelerates machining operations of non-ferrous materials!

AJ specialized chipbreaker in machining aluminum

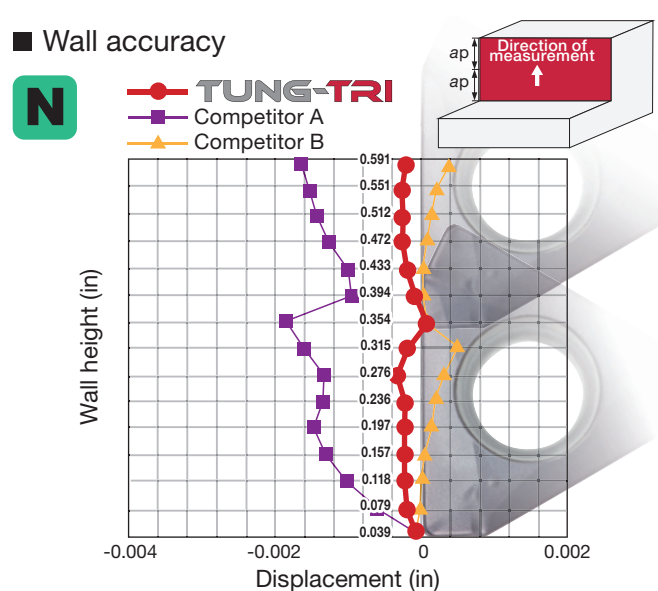


Excellent surface finish and wall accuracy



Cutter : EPA10R125U0125W03N
 Insert : TOGT100408PDFR-AJ
 Grade : KS05F
 Workpiece material : A7075 (Alumigo Hard)
 Cutting speed : $V_c = 2953$ sfm
 Feed per tooth : $f_z = 0.004$ ipt
 Depth of cut : $a_p = 0.079$ "
 Width of cut : $a_e = 0.827$ "
 Coolant : External air
 Machine : Vertical M/C, HSK63A

Special wiper edge geometry protects the machined workpiece material from chip re-cutting and offers excellent surface finish.

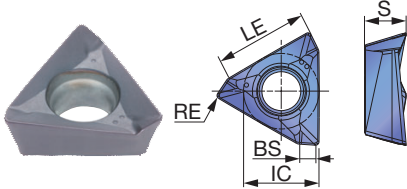


Cutter : EPA10R125U0125W03N
 Insert : TOGT100408PDFR-AJ
 Grade : KS05F
 Workpiece material : A7075 (Alumigo Hard)
 Cutting speed : $V_c = 2953$ sfm
 Feed per tooth : $f_z = 0.004$ ipt
 Depth of cut : $a_p = 0.315$ " x 2 pass
 Width of cut : $a_e = 0.197$ "
 Coolant : External air
 Machine : Vertical M/C, HSK63A

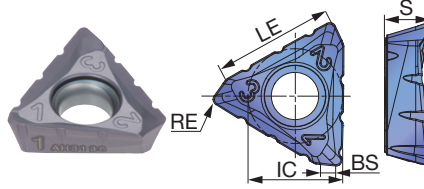
Ideal helical cutting edge design offers smooth engagement in the cut and reduces steps between the passes.

INSERTS

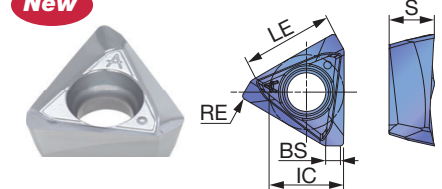
TOMT-MJ



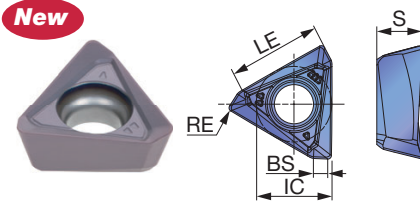
TOMT-NMJ



TOGT-AJ



TOET-MJ



P	Steel	☆	★	☆					
M	Stainless		★	☆					
K	Cast iron	★		★					
N	Non-ferrous					★			
S	Superalloys	★	☆						
H	Hard materials								

★ : First choice
☆ : Second choice

Designation	RE	APMX	Coated					Un-coated	LE	IC	S	BS
			AH120	AH3135	T1215	T3225	KS05F					
TOMT060302PDER-MJ	0.008	0.236	●	●				0.244	0.220	0.126	0.055	
TOMT060304PDER-MJ	0.016	0.236	●	●	●			0.244	0.220	0.126	0.047	
TOMT060308PDER-MJ	0.031	0.236	●	●	●	●		0.244	0.220	0.126	0.031	
New TOGT060304PDFR-AJ	0.016	0.236					●	0.244	0.220	0.130	0.047	
New TOGT060308PDFR-AJ	0.031	0.236					●	0.244	0.220	0.130	0.031	
New TOET060302PDER-MJ	0.008	0.236		●				0.244	0.220	0.130	0.051	
New TOET060304PDER-MJ	0.016	0.236		●				0.244	0.220	0.130	0.043	
TOMT100404PDER-MJ	0.016	0.394	●	●		●		0.413	0.339	0.185	0.059	
TOMT100408PDER-MJ	0.031	0.394	●	●	●	●		0.413	0.339	0.185	0.043	
TOMT100416PDER-MJ	0.063	0.394	●	●				0.413	0.339	0.185	0.008	
TOGT100404PDFR-AJ	0.016	0.394					●	0.413	0.339	0.205	0.059	
TOGT100408PDFR-AJ	0.031	0.394					●	0.413	0.339	0.201	0.043	
New TOET100404PDER-MJ	0.016	0.394		●				0.413	0.339	0.201	0.059	
New TOET100408PDER-MJ	0.031	0.394		●				0.413	0.339	0.201	0.043	
TOMT150604PDER-MJ	0.016	0.591	●	●		●		0.618	0.500	0.236	0.087	
TOMT150608PDER-MJ	0.031	0.591	●	●	●	●		0.618	0.500	0.236	0.075	
TOMT150616PDER-MJ	0.063	0.591	●	●				0.618	0.500	0.236	0.043	
TOMT150620PDER-MJ	0.079	0.591	●	●				0.618	0.500	0.236	0.028	
TOMT150608PDER-NMJ	0.031	0.591	●	●		●		0.618	0.500	0.236	0.075	
New TOGT150604PDFR-AJ	0.016	0.591					●	0.618	0.492	0.220	0.083	
New TOGT150608PDFR-AJ	0.031	0.591					●	0.618	0.492	0.217	0.071	
New TOET150604PDER-MJ	0.016	0.591		●				0.618	0.492	0.220	0.087	
New TOET150608PDER-MJ	0.031	0.591		●				0.618	0.492	0.220	0.075	

● : Line up
● : New product

STANDARD CUTTING CONDITIONS

TPA/EPA/HPA

ISO	Workpiece materials	Hardness HB	Grades	Cutting speed Vc (sfm)			Feed per tooth: fz (ipt)				
							MJ		NMJ		AJ
				T/E/HPA06	T/E/HPA10	T/EPA15	T/E/HPA06	T/E/HPA10	T/EPA15	T/EPA15	T/E/HPA06, T/E/HPA10, T/EPA15
P	Low carbon steel 1015, etc.	- 200	AH3135	330 - 720	330 - 820	330 - 820	0.002 - 0.006	0.003 - 0.008	0.003 - 0.010	0.003 - 0.006	-
	High carbon steel 1045, etc.	200 - 300	AH3135	330 - 560	330 - 660	330 - 660	0.002 - 0.005	0.003 - 0.006	0.003 - 0.008	0.003 - 0.006	-
	Alloy steel 4140, etc.	150 - 300	AH3135	330 - 560	330 - 660	330 - 660	0.002 - 0.005	0.003 - 0.006	0.003 - 0.008	0.003 - 0.006	-
	Tool steel H13, etc.	30 - 40 HRC	AH3135	330 - 390	330 - 490	330 - 490	0.002 - 0.005	0.003 - 0.006	0.003 - 0.008	0.003 - 0.006	-
M	Stainless steel 304, etc.	-	AH3135	260 - 490	260 - 660	260 - 660	0.002 - 0.006	0.003 - 0.008	0.003 - 0.008	0.003 - 0.006	-
K	Gray cast iron No.250B, etc.	150 - 250	AH120 T1215	330 - 660 490 - 820	330 - 820 490 - 980	330 - 820 490 - 980	0.002 - 0.006 0.002 - 0.005	0.003 - 0.008 0.003 - 0.006	0.003 - 0.010 0.003 - 0.007	0.003 - 0.006 -	- -
	Ductile cast iron 65-45-12, etc.	150 - 250	AH120 T1215	260 - 490 330 - 660	260 - 660 430 - 820	260 - 660 430 - 820	0.002 - 0.006 0.002 - 0.005	0.003 - 0.008 0.003 - 0.006	0.003 - 0.010 0.003 - 0.007	0.003 - 0.006 -	- -
N	Aluminum Si < 13%	-	KS05F	980 - 2950	980 - 3280	980 - 3280	-	-	-	-	0.003 - 0.009
	Aluminum Si ≥ 13%	-	KS05F	330 - 660	330 - 660	330 - 660	-	-	-	-	0.003 - 0.009
S	Titanium alloys (Ti-6Al-4V, etc.)	-	AH120	66 - 164	66 - 197	66 - 197	0.002 - 0.004	0.003 - 0.006	0.003 - 0.007	0.003 - 0.006	-
	Heat-resistant alloys (Inconel 718, etc.)	-	AH120	66 - 115	66 - 131	66 - 131	0.001 - 0.003	0.002 - 0.005	0.003 - 0.006	0.003 - 0.006	-

- When you use the NMJ chipbreaker, please set up the feed less than 0.006 ipt.
- Remove excessive chip accumulation with an air blast.
- For the operation with depth of cut which varies (ex.casting skin) and machining of workpiece materials with interrupted surface, the feed per tooth (fz) should be set to the lower recommended value shown in the above table.

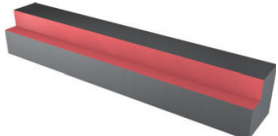
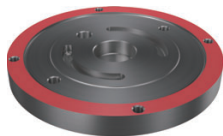
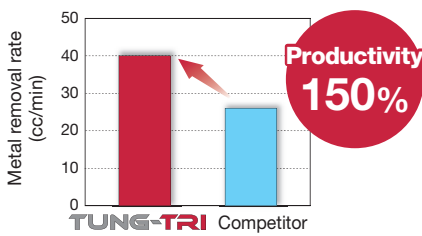
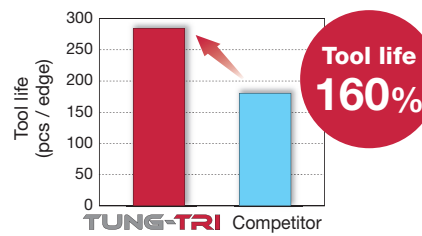
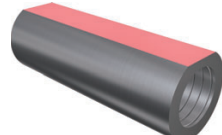
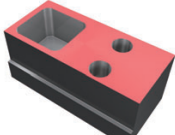
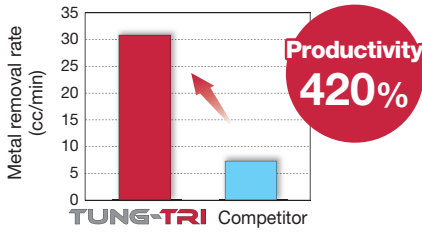
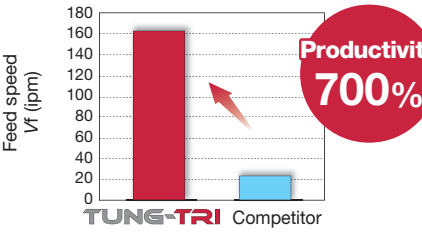
- Cutting conditions may be limited depending on machine power, workpiece rigidity and spindle output. When the cutting width, depth or overhang length is large, set Vc and fz to the lower recommended values and check the machine power and vibration.

TLA (Roughing type)

ISO	Workpiece materials	Hardness HB	Grades	Cutting speed Vc (sfm)		Feed per tooth: fz (ipt)					
						MJ		NMJ		AJ	
				TLA10	TLA15	TLA10	TLA15	TLA15	TLA10	TLA15	
P	Low carbon steel 1015, etc.	- 200	AH3135	330 - 820	330 - 820	0.003 - 0.007	0.003 - 0.009	0.003 - 0.006	-	-	
	High carbon steel 1045, etc.	200 - 300	AH3135	330 - 660	330 - 890	0.003 - 0.006	0.003 - 0.007	0.003 - 0.006	-	-	
	Alloy steel 4140, etc.	30 - 40 HRC	AH3135	330 - 490	330 - 590	0.003 - 0.006	0.003 - 0.007	0.003 - 0.006	-	-	
M	Stainless steel 304, etc.	-	AH3135	260 - 660	260 - 660	0.003 - 0.006	0.003 - 0.007	0.003 - 0.006	-	-	
K	Gray cast iron No.250B, etc.	150 - 250	AH120 T1215	330 - 820 490 - 820	460 - 820 490 - 820	0.003 - 0.007 0.003 - 0.006	0.003 - 0.010 0.003 - 0.007	0.003 - 0.006 -	- -	- -	
	Ductile cast iron 65-45-12, etc.	150 - 250	AH120 T1215	260 - 660 490 - 820	360 - 660 490 - 820	0.003 - 0.007 0.003 - 0.006	0.003 - 0.010 0.003 - 0.007	0.003 - 0.006 -	- -	- -	
	Aluminum Si < 13%	-	KS05F	980 - 3280	990 - 3280	-	-	-	0.003 - 0.009	0.003 - 0.009	
N	Aluminum Si ≥ 13%	-	KS05F	330 - 660	330 - 660	-	-	-	0.003 - 0.009	0.003 - 0.009	
	Titanium alloys (Ti-6Al-4V, etc.)	-	AH120	66 - 197	66 - 197	0.003 - 0.006	0.003 - 0.007	0.003 - 0.006	-	-	
S	Heat-resistant alloys (Inconel 718, etc.)	-	AH120	66 - 131	66 - 131	0.002 - 0.005	0.003 - 0.006	0.003 - 0.006	-	-	

- When using NMJ chipbreaker, please set up the feed not to exceed 0.006 ipt.

PRACTICAL EXAMPLES

Workpiece type		Machine part	Housing for brake	
Cutter		TLA15R400L326U0150A05M ($\phi 4.000"$, $z = 5$)	EPA10R125U0125W03N ($\phi 1.260"$, $z = 3$)	
Insert		TOET100408PDER-MJ	TOET100408PDER-MJ	
Grade		AH3135	AH3135	
Workpiece material		1045	Class25	
		 M	 K	
Cutting conditions	Cutting speed: V_c (sfm)	660	720	
	Feed per tooth: f_z (ipt)	0.006	0.003	
	Feed speed: V_f (ipm)	30.079	19.685	
	Depth of cut : a_p (in)	0.059	0.020	
	Width of cut : a_e (in)	1.378	1.181	
	Machining	Shoulder milling	Shoulder milling	
	Coolant	Wet	Wet	
Machine	Vertical M/C, BT50	Vertical M/C, HSK A100		
Results	 <p>Optimal wiper edge design offered excellent surface finish even in high speed machining.</p>		 <p>Special wiper edge design provided long and stable tool life.</p>	
Workpiece type		Housing	Machine part	
Cutter		Special tool ($\phi 1.260"$, $z = 3$)	EPA10R100U0100W02N ($\phi 1.000"$, $z = 2$)	
Insert		TOET100408PDER-MJ	TOGT100408PDR-AJ	
Grade		AH3135	KS05F	
Workpiece material		SACM645 / 41CrAlMo74	AC4B	
		 P	 N	
Cutting conditions	Cutting speed: V_c (sfm)	490	1499	
	Feed per tooth: f_z (ipt)	0.008	0.012	
	Feed speed: V_f (ipm)	35.244	160.315	
	Depth of cut : a_p (in)	0.059	0.050	
	Width of cut : a_e (in)	0.906	-	
	Machining	Shoulder milling	Face milling	
	Coolant	Wet	Wet (External coolant)	
Machine	Multi tasking lathe	Vertical M/C, BT40		
Results	 <p>Ideal wiper edge design allowed increase in feed per tooth and cutting speed, leading to surface finish of $R_a < 3.2 \mu m$.</p>		 <p>AJ chipbreaker exhibited high fracture resistance even in a demanding cutting condition.</p>	

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