

MillLine



TUNG-TRI

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Tungaloy Report No. 421S1-G

New high precision shoulder milling inserts

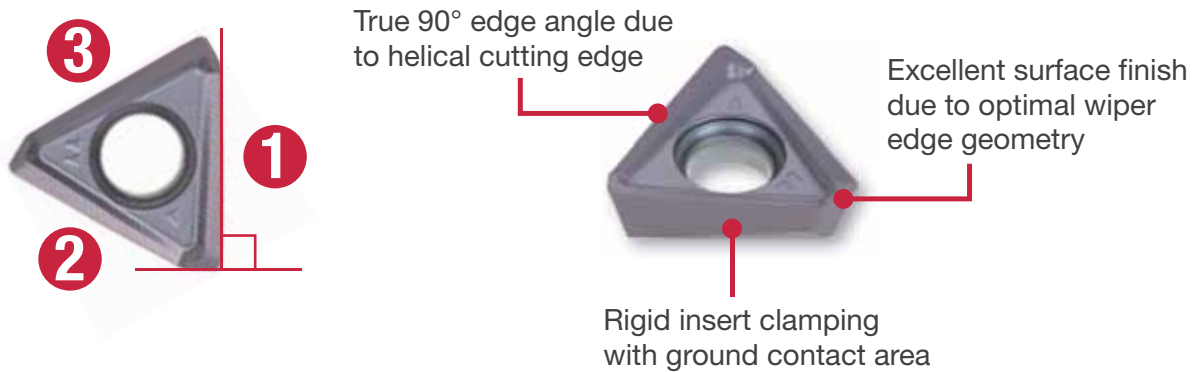


INDUSTRY 4.0
FEED the SPEED!



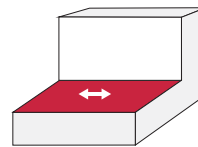
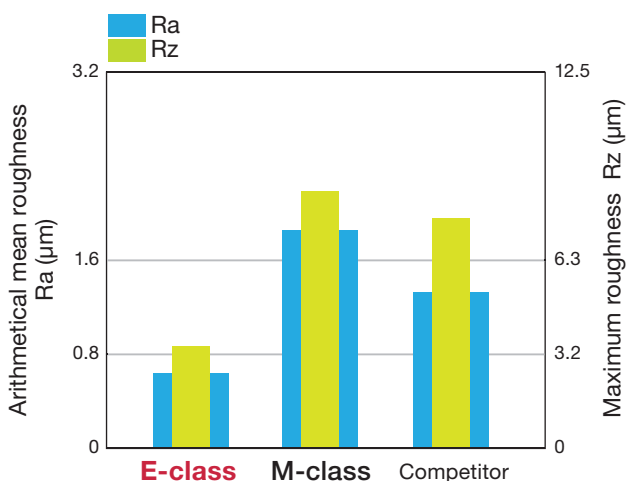
New ground E-class MJ insert offers precise square shoulder milling and excellent surface finish!

3 cutting edges perfectly perpendicular to the workpiece material



Excellent surface finish

Surface roughness

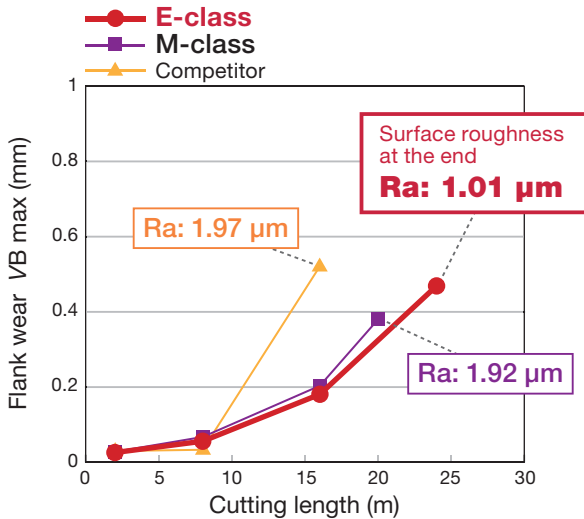


Cutter : TPA15R100M31.7-07 (ø100 mm, z = 7)
 Insert : TOET150608PDER-MJ
 Grade : AH3135
 Workpiece material: S55C / C55
 Cutting speed : Vc = 250 m/min
 Feed per tooth : fz = 0.1 mm/t
 Depth of cut : ap = 3 mm
 Width of cut : ae = 70 mm
 Coolant : Air
 Machine : Vertical M/C, BT50

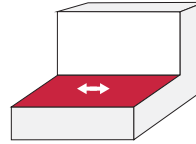
Only the E-class inserts offered Ra < 0.8 µm and Rz < 6.3 µm surface roughness due to optimal wiper edge.

Stable surface finish quality

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



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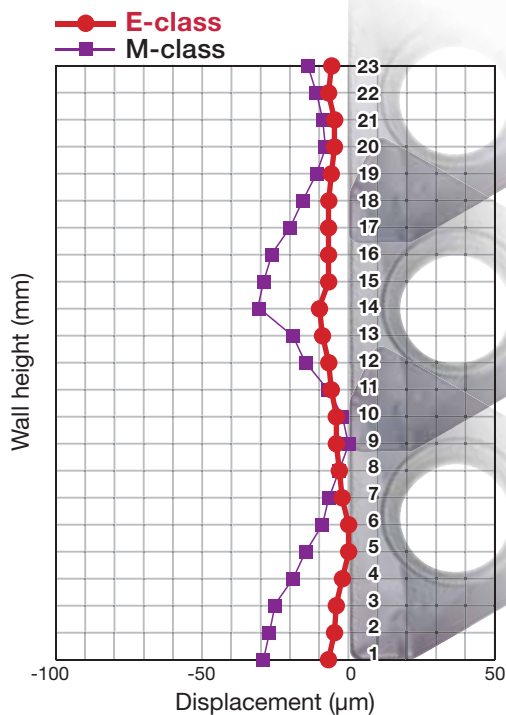
Cutter : TPA10R080M25.4-07 ($\phi 80$ mm, $z = 7$)
 Insert : TOET100404PDER-MJ
 Grade : AH3135
 Workpiece material : S55C / C55
 Cutting speed : $V_c = 250$ m/min
 Feed per tooth : $f_z = 0.1$ mm/t
 Depth of cut : $a_p = 2$ mm
 Width of cut : $a_e = 20$ mm
 Coolant : Air
 Machine : Vertical M/C, BT50

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

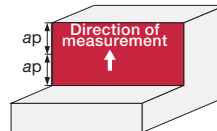
Close runout accuracy improved tool life and provided stable surface finish quality.

High wall accuracy

- Wall accuracy in high speed machining



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Cutter : EPA15R040M32.0-03 ($\phi 40$ mm, $z = 3$)
 Insert : TOET150608PDER-MJ
 Grade : AH3135
 Workpiece material : S55C / C55
 Cutting speed : $V_c = 250$ m/min
 Feed per tooth : $f_z = 0.1$ mm/t
 Depth of cut : $a_p = 8$ mm
 Width of cut : $a_e = 5$ mm
 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 aluminium

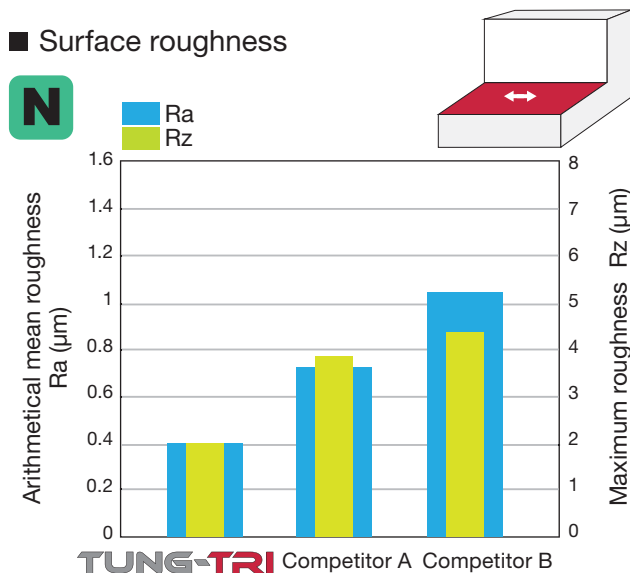
Wiper edge with positive inclination
Excellent surface finish by directing chips away from the machined wall

Cutting edge with large rake angle and high inclination
Low cutting force and smooth machining

Lapping treatment
Prevents welding on the cutting edge

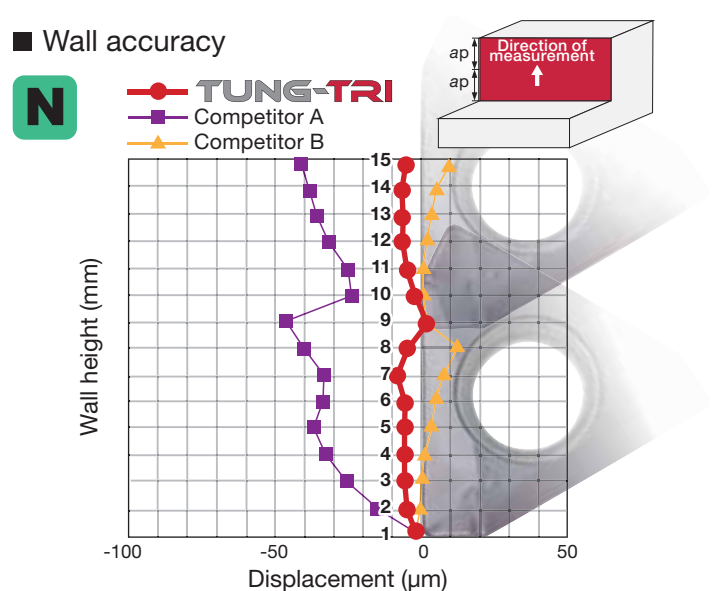
Anti-chatter design
Optimized clearance geometry to enhance insert robustness and vibration damping for machining aluminium

Excellent surface finish and wall accuracy



Cutter : EPA10R032M32.0-03N
 Insert : TOGT100408PDFR-AJ
 Grade : KS05F
 Workpiece material : A7075 (Alumigo Hard)
 Cutting speed : $V_c = 900$ m/min
 Feed per tooth : $f_z = 0.1$ mm/t
 Depth of cut : $a_p = 2$ mm
 Width of cut : $a_e = 21$ mm
 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.

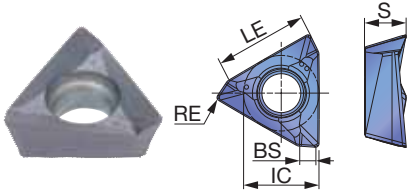


Cutter : EPA10R032M32.0-03N
 Insert : TOGT100408PDFR-AJ
 Grade : KS05F
 Workpiece material : A7075 (Alumigo Hard)
 Cutting speed : $V_c = 900$ m/min
 Feed per tooth : $f_z = 0.1$ mm/t
 Depth of cut : $a_p = 8$ mm x 2 pass
 Width of cut : $a_e = 5$ mm
 Coolant : External air
 Machine : Vertical M/C, HSK63A

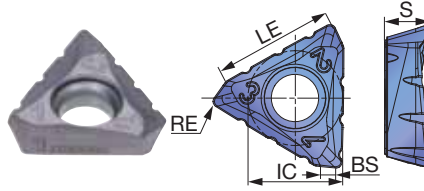
Ideal helical cutting edge design offers smooth engagement in the cut and reduces steps between the passes.

INSERTS

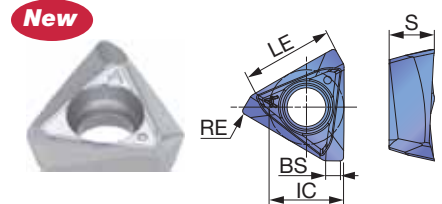
TOMT-MJ



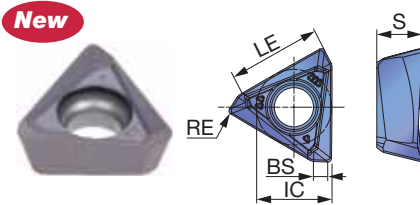
TOMT-NMJ



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	0.2	6	●	●					6.2	5.6	3.2	1.4
TOMT060304PDER-MJ	0.4	6	●	●		●			6.2	5.6	3.2	1.2
TOMT060308PDER-MJ	0.8	6	●	●	●	●			6.2	5.6	3.2	0.8
New TOGT060304PDFR-AJ	0.4	6					●		6.2	5.6	3.3	1.2
New TOGT060308PDFR-AJ	0.8	6					●		6.2	5.6	3.3	0.8
New TOET060302PDER-MJ	0.2	6		●					6.2	5.6	3.3	1.3
New TOET060304PDER-MJ	0.4	6		●					6.2	5.6	3.3	1.1
TOMT100404PDER-MJ	0.4	10	●	●		●			10.5	8.6	4.7	1.5
TOMT100408PDER-MJ	0.8	10	●	●	●	●			10.5	8.6	4.7	1.1
TOMT100416PDER-MJ	1.6	10	●	●					10.5	8.6	4.7	0.2
TOGT100404PDFR-AJ	0.4	10					●		10.5	8.6	5.2	1.5
TOGT100408PDFR-AJ	0.8	10					●		10.5	8.6	5.1	1.1
New TOET100404PDER-MJ	0.4	10		●					10.5	8.6	5.1	1.5
New TOET100408PDER-MJ	0.8	10		●					10.5	8.6	5.1	1.1
TOMT150604PDER-MJ	0.4	15	●	●		●			15.7	12.7	6	2.2
TOMT150608PDER-MJ	0.8	15	●	●	●	●			15.7	12.7	6	1.9
TOMT150616PDER-MJ	1.6	15	●	●					15.7	12.7	6	1.1
TOMT150620PDER-MJ	2	15	●	●					15.7	12.7	6	0.7
TOMT150608PDER-NMJ	0.8	15	●	●		●			15.7	12.7	6	1.9
New TOGT150604PDFR-AJ	0.4	15					●		15.7	12.5	5.6	2.1
New TOGT150608PDFR-AJ	0.8	15					●		15.7	12.5	5.5	1.8
New TOET150604PDER-MJ	0.4	15		●					15.7	12.5	5.6	2.2
New TOET150608PDER-MJ	0.8	15		●					15.7	12.5	5.6	1.9

● : Line up
● : New product

STANDARD CUTTING CONDITIONS

TPA/EPA/HPA

ISO	Workpiece materials	Hardness HB	Grades	Cutting speed Vc (m/min)			Feed per tooth: fz (mm/t)				
							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 (SS400 / E275A, S15C / C15E4, etc.)	- 200	AH3135	100 - 220	100 - 250	100 - 250	0.05 - 0.15	0.08 - 0.2	0.08 - 0.25	0.08 - 0.15	-
	High carbon steel (S45C / C45, etc.)	200 - 300	AH3135	100 - 170	100 - 200	100 - 230	0.05 - 0.12	0.08 - 0.15	0.08 - 0.2	0.08 - 0.15	-
	Alloy steel (SCM440, etc. / 42CrMo4, etc.)	150 - 300	AH3135	100 - 170	100 - 200	100 - 230	0.05 - 0.12	0.08 - 0.15	0.08 - 0.2	0.08 - 0.15	-
	Tool steel (SKD61 / X40CrMoV5-1, etc.)	30 - 40 HRC	AH3135	100 - 120	100 - 150	100 - 180	0.05 - 0.12	0.08 - 0.15	0.08 - 0.2	0.08 - 0.15	-
M	Stainless steel (SUS304 / X5CrNi18-9, etc.)	-	AH3135	80 - 150	80 - 200	90 - 200	0.05 - 0.15	0.08 - 0.2	0.08 - 0.2	0.08 - 0.15	-
K	Grey cast iron (FC250 / GG25 / 250, etc.)	150 - 250	AH120 T1215	100 - 200 150 - 250	100 - 250 150 - 300	140 - 250 200 - 300	0.05 - 0.15 0.05 - 0.12	0.08 - 0.2 0.08 - 0.15	0.08 - 0.25 0.08 - 0.18	0.08 - 0.15 -	- -
	Ductile cast iron (FCD450 / GGG45 / 450-10S, etc.)	150 - 250	AH120 T1215	80 - 150 100 - 200	80 - 200 130 - 250	110 - 200 150 - 250	0.05 - 0.15 0.05 - 0.12	0.08 - 0.2 0.08 - 0.15	0.08 - 0.25 0.08 - 0.18	0.08 - 0.15 -	- -
N	Aluminium (Si < 13%)	-	KS05F	300 - 900	300 - 1000	300 - 1000	-	-	-	-	0.08 - 0.22
	Aluminium (Si ≥ 13%)	-	KS05F	100 - 200	100 - 200	100 - 200	-	-	-	-	0.08 - 0.22
S	Titanium alloys (Ti-6Al-4V, etc.)	-	AH120	20 - 50	20 - 60	20 - 60	0.05 - 0.1	0.08 - 0.15	0.08 - 0.18	0.08 - 0.15	-
	Heat-resistant alloys (Inconel 718, etc.)	-	AH120	20 - 35	20 - 40	20 - 40	0.03 - 0.08	0.05 - 0.13	0.07 - 0.15	0.07 - 0.15	-

- When you use the NMJ chipbreaker, please set up the feed less than 0.15 mm/t.
- 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.



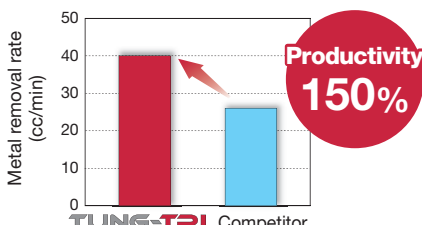
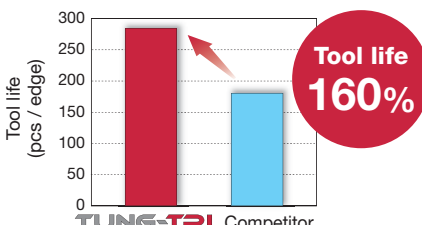


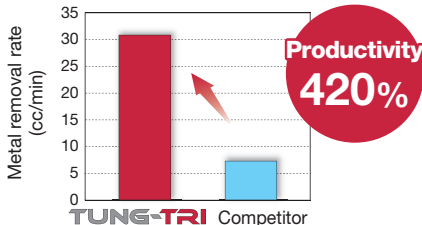
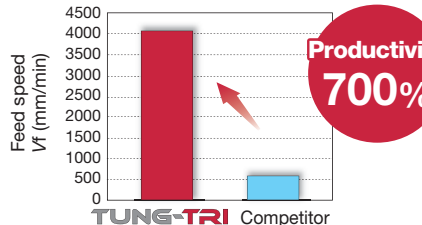
- Cutting conditions may be limited depending on machine power, workpiece rigidity, and spindle output. When the cutting width, depth, or overhang length is large, set Vc and fz to the lower recommended values and check the machine power and vibration.

TLA (Roughing type)

ISO	Workpiece materials	Hardness HB	Grades	Cutting speed Vc (m/min)		Feed per tooth: fz (mm/t)					
						MJ		NMJ		AJ	
				TLA10	TLA15	TLA10	TLA15	TLA15	TLA10	TLA15	
P	Low carbon steel (SS400 / E275A, S15C / C15E4, etc.)	- 200	AH3135	100 - 250	100 - 250	0.08 - 0.18	0.08 - 0.22	0.08 - 0.15	-	-	
	High carbon steel (S45C / C45, etc.)	200 - 300	AH3135	100 - 200	100 - 270	0.08 - 0.14	0.08 - 0.18	0.08 - 0.15	-	-	
	Alloy steel (SCM440, etc. / 42CrMo4, etc.)	30 - 40 HRC	AH3135	100 - 150	100 - 180	0.08 - 0.14	0.08 - 0.18	0.08 - 0.15	-	-	
M	Stainless steel (SUS304 / X5CrNi18-9, etc.)	-	AH3135	80 - 200	90 - 200	0.08 - 0.15	0.08 - 0.18	0.08 - 0.15	-	-	
K	Grey cast iron (FC250 / GG25 / 250, etc.)	150 - 250	AH120 T1215	100 - 250 150 - 250	140 - 250 150 - 250	0.08 - 0.18 0.08 - 0.15	0.08 - 0.25 0.08 - 0.18	0.08 - 0.15 -	- -	- -	
	Ductile cast iron (FCD450 / GGG45 / 450-10S, etc.)	150 - 250	AH120 T1215	80 - 200 150 - 250	110 - 200 150 - 250	0.08 - 0.18 0.08 - 0.15	0.08 - 0.25 0.08 - 0.18	0.08 - 0.15 -	- -	- -	
N	Aluminium (Si < 13%)	-	KS05F	300 - 1000	300 - 1000	-	-	-	0.08 - 0.22	0.08 - 0.22	
	Aluminium (Si ≥ 13%)	-	KS05F	100 - 200	100 - 200	-	-	-	0.08 - 0.22	0.08 - 0.22	
S	Titanium alloys (Ti-6Al-4V, etc.)	-	AH120	20 - 60	20 - 60	0.08 - 0.15	0.08 - 0.18	0.08 - 0.15	-	-	
	Heat-resistant alloys (Inconel 718, etc.)	-	AH120	20 - 40	20 - 40	0.05 - 0.13	0.07 - 0.15	0.07 - 0.15	-	-	

- When using NMJ chipbreaker, please set up the feed not to exceed 0.15 mm/t.

PRACTICAL EXAMPLES

Workpiece type		Machine part	Housing for brake	
Cutter		TPA10R050M22.0E04 (ø50 mm, z = 4)	EPA10R032M32.0-03N (ø32 mm, z = 3)	
Insert		TOET100408PDER-MJ	TOET100408PDER-MJ	
Grade		AH3135	AH3135	
Workpiece material		SUS316Ti / X6CrNiMoTi17-12-2	FC250 / 250 / GG25	
		 M	 K	
Cutting conditions	Cutting speed: Vc (m/min)	200	220	
	Feed per tooth: fz (mm/t)	0.15	0.08	
	Feed speed: Vf (mm/min)	764	500	
	Depth of cut : ap (mm)	1.5	0.5	
	Width of cut : ae (mm)	35	30	
	Machining	Shoulder milling	Shoulder milling	
	Coolant	Wet	Wet	
Machine	Vertical M/C, BT50	Vertical M/C, HSK A100		
Results	 <p>Productivity 150%</p> <p>Optimal wiper edge design offered excellent surface finish even in high speed machining.</p>		 <p>Tool life 160%</p> <p>Special wiper edge design provided long and stable tool life.</p>	
Workpiece type		Housing	Machine part	
Cutter		Special tool (ø32 mm, z = 3)	EPA10R025M25.0-02N (ø25 mm, z = 2)	
Insert		TOET100408PDER-MJ	TOGT100408PDRF-AJ	
Grade		AH3135	KS05F	
Workpiece material		SACM645 / 41CrAlMo74	AC4B	
		 P	 N	
Cutting conditions	Cutting speed: Vc (m/min)	150	457	
	Feed per tooth: fz (mm/t)	0.2	0.3	
	Feed speed: Vf (mm/min)	895.2	4072	
	Depth of cut : ap (mm)	1.5	1.27	
	Width of cut : ae (mm)	23	-	
	Machining	Shoulder milling	Face milling	
	Coolant	Wet	Wet (External coolant)	
Machine	Multi tasking lathe	Vertical M/C, BT40		
Results	 <p>Productivity 420%</p> <p>Ideal wiper edge design allowed increase in feed per tooth and cutting speed, leading to surface finish of Ra < 3.2 µm.</p>		 <p>Productivity 700%</p> <p>AJ chipbreaker exhibited high fracture resistance even in a demanding cutting condition.</p>	

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