

Tungaloy

Member IMC Group

Tungaloy Report No. 421-US

MILLLINE Shoulder milling cutter

TUNG-TRI

NEW

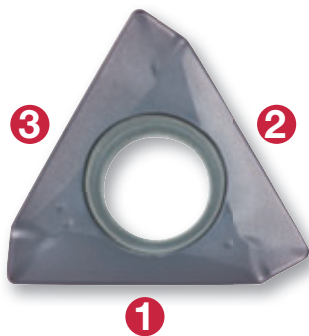
**Economical shoulder milling cutter
with anti-chatter design!**



Innovative shoulder milling series with 3 cornered insert with economical advantages and wide application range

Improved economics and cutting performance

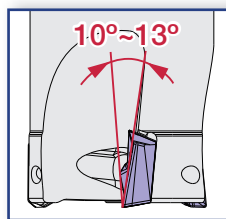
- Economical 3 cornered insert
- Large rake angle on cutting edges drastically reduces cutting force
- Excellent chip formation



Positive inclination of wiper edge moves swarf away from cutting zone improving surface finish



Optimized flank face design prevents chattering

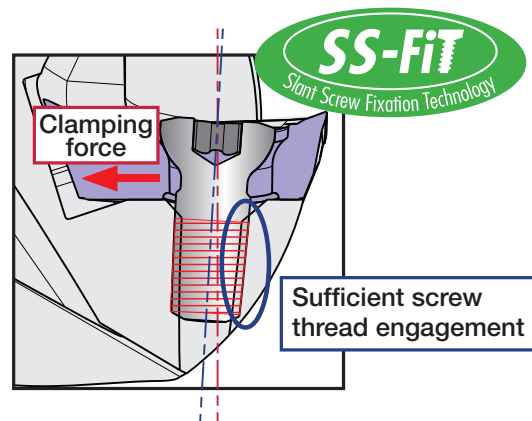


Large rake angle

Helical cutting edge provides low cutting forces at all depths of cut

High reliability

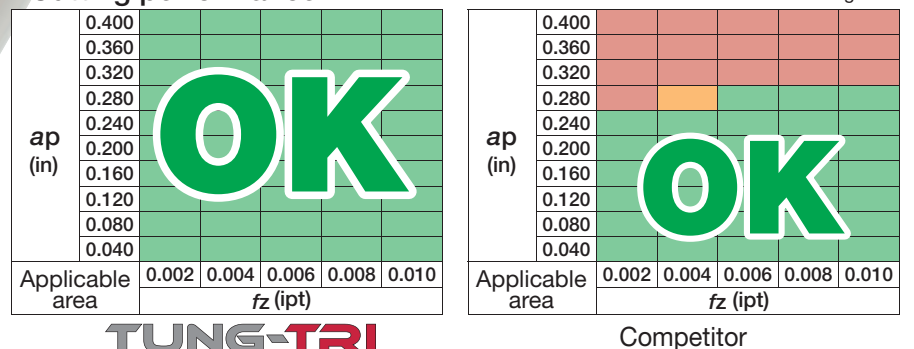
- Large size clamping screw with SS-FiT technology offers high clamping rigidity



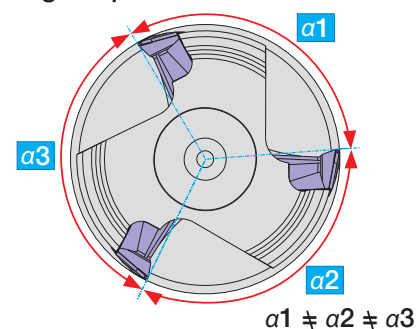
Applicable for a wide range of cutting conditions

- Optimized flank face design prevents chattering
- Irregular pitch positioning breaks the harmonics avoiding vibration during machining

Cutting performance



Irregular pitch

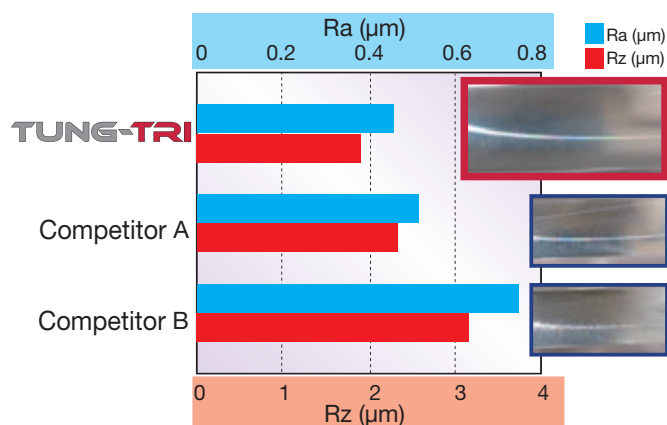


Cutter : EPA10R125U0125W03N ($\phi D_c = 1.25"$, $z = 3$)
 Insert : TOMT100404PDER-MJ
 Grade : AH3135
 Work material : 1055 (200 HB)
 Cutting speed : $V_c = 500$ sfm
 Width of cut : $a_e = 1.250"$
 Machine : Vertical M/C, CAT50

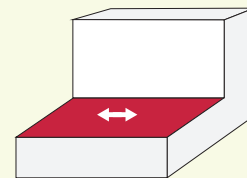
Excellent surface finish and high wall accuracy

- Cutting edge geometry for low cutting force and positive larger wiper edge provides outstanding surface finish

Bottom surface finish

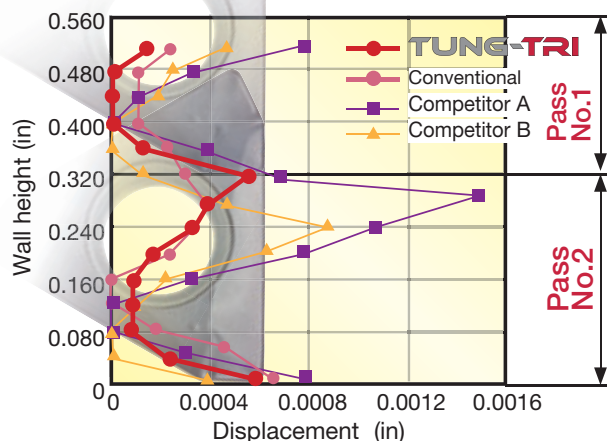


Cutter : EPA10R125U0125W03N ($\phi D_c = 1.25"$, $z = 3$)
 Insert : TOMT100404PDER-MJ
 Grade : AH3135
 Work material : 1055 (200HB)
 Cutting speed : $V_c = 500$ sfm
 Feed per tooth : $f_z = 0.004$ ipt
 Depth of cut : $a_p = 0.200"$
 Width of cut : $a_e = 0.830"$
 Machine : Vertical M/C, CAT50

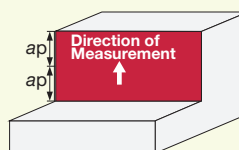


- Optimized cutting edge and helical angle lead to high wall accuracy surface

Accuracy



Cutter : EPA10R125U0125W03N ($\phi D_c = 1.25"$, $z = 3$)
 Insert : TOMT100404PDER-MJ
 Grade : AH3135
 Work material : 1055 (200HB)
 Cutting speed : $V_c = 500$ sfm
 Feed per tooth : $f_z = 0.004$ ipt
 Depth of cut : $a_p = 0.315"$ x 2 pass
 Width of cut : $a_e = 0.200"$
 Machine : Vertical M/C, CAT50



New coated grade offers longer tool life

New

AH3135

P

Steel

M

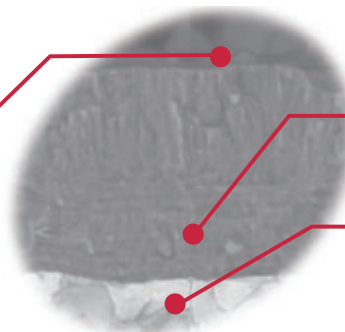
Stainless

Special Surface Technology

PREMIUMTEC

TUNGALOY

Smooth insert surface prevents chip adhesion!



Multi-layered coating with higher chipping resistance

Exclusive carbide substrate with incredible toughness

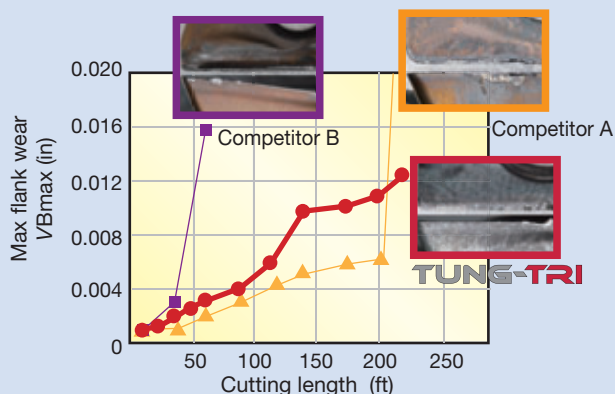
Brand-new grade for steel and stainless steel machining

● Dramatically improved chipping and fracture resistance

- Multi-layered coating prevents crack expansion which causes chipping and fracture
- Cobalt enriched carbide substrate improves impact resistance and toughness

● Longer tool life due to high wear resistance

■ Tool life



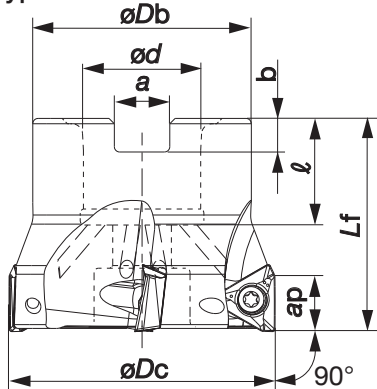
Cutter : EPA10R125U0125W03N
($\phi D_c = 1.25"$, $z = 3$)
Insert : TOMT100404PDER-MJ
Grade : AH3135
Work material : 1055 (200HB)
Cutting speed : $V_c = 500$ sfm
Feed per tooth : $f_z = 0.006$ ipt
Depth of cut : $a_p = 0.240"$
Width of cut : $a_e = 0.413"$
Coolant : Dry
Machine : Vertical M/C, HSK63

● Specification of AH3135

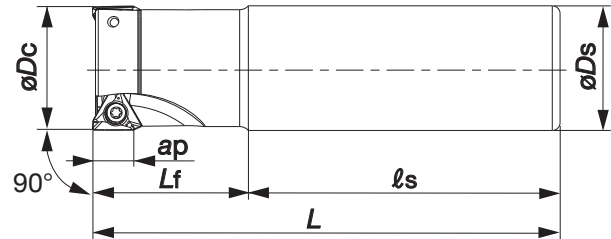
Application	Grade	Substrate			Coating layer		Features
	Application code	Specific gravity	Hardness (HRA)	T.R.S. (GPa)	Main Composition	Thickness (μm)	
	AH3135	14.0	89.5	2.8	(Ti, Al)N Multi-layer	4	Brand-new grade for steel and stainless steel machining Dramatically improved chipping and fracture resistance
	P30 - P40						
	AH120	14.5	90.8	2.8	(Ti, Al)N	3	General grade Well balanced general purpose grade with both wear resistance and impact resistance
	K15 - K30						

Cutter

Bore type



Shank type



Parts

Descriptions		Parts Cat. No.	
Applicable cutter		T/EPA10	T/EPA15
Clamping screw		SR14-562/S	TS45120I
Wrench	Torx bit	BLDT10/S7	BT20S
	Grip	SW6-SD	H-TBS

Max. depth of cut :
T/EPA10: Max. $ap = 0.394"$
T/EPA15: Max. $ap = 0.590"$

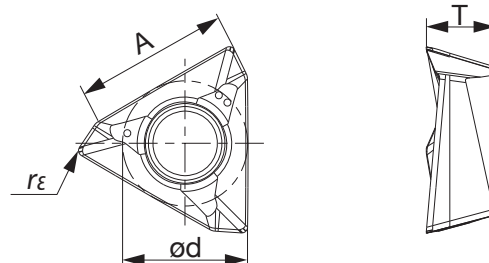
Bore type

Cat. No.	Stock	No. of Inserts	Dimensions (in)							Air hole	Center bolt	Applicable Insert
			ϕDc	ϕDb	ϕd	ℓ	L_f	b	a			
TPA10R200U0075A04	●	4	2.000	1.693	0.750	0.750	1.575	0.197	0.315	with	-	TOMT10040* PDER-MJ
TPA10R250U0075A06	●	6	2.500	1.693	0.750	0.750	1.575	0.197	0.315		-	
TPA15R200U0075A04	●	4	2.000	1.625	0.750	0.750	1.570	0.197	0.315	with	TCS9.525-35-I	TOMT15060* PDER-MJ
TPA15R250U0075A05	●	5	2.500	2.125	0.750	0.750	1.570	0.197	0.315		-	
TPA15R300U0100A06	●	6	3.000	2.250	1.000	1.024	1.750	0.236	0.374		-	
TPA15R400U0150A07N	●	7	4.000	3.000	1.500	1.181	2.000	0.394	0.626	without	-	

Shank type

Cat. No.	Stock	No. of Inserts	Dimensions (in)					Air hole	Applicable Insert
			ϕDc	ϕDs	ℓ_s	L_f	L		
EPA10R100U0100W02N	●	2	1.000	1.000	2.362	1.378	3.740	without	TOMT10040* PDER-MJ
EPA10R125U0125W03N	●	3	1.250	1.250	2.362	1.378	3.740		
EPA10R150U0125W04N	●	4	1.500	1.250	3.157	1.969	5.126		
EPA15R150U0125W03N	●	3	1.500	1.250	2.250	2.250	4.500	without	TOMT15060* PDER-MJ
EPA15R200U0125W04N	●	4	2.000	1.250	2.250	2.250	4.500		

Inserts



Cat. No.	Accuracy	Honing	Grades		Dimensions (in)				Cutter
			AH3135	AH120	A	ϕd	T	r_ϵ	
TOMT100404PDER-MJ	M	with	●	●	0.413	0.339	0.185	0.016	TPA10R... EPA10R...
TOMT100408PDER-MJ			●	●				0.031	
TOMT150604PDER-MJ	M	with	●	●	0.618	0.500	0.236	0.016	TPA15R... EPA15R...
TOMT150608PDER-MJ			●	●				0.031	

● : Offered items

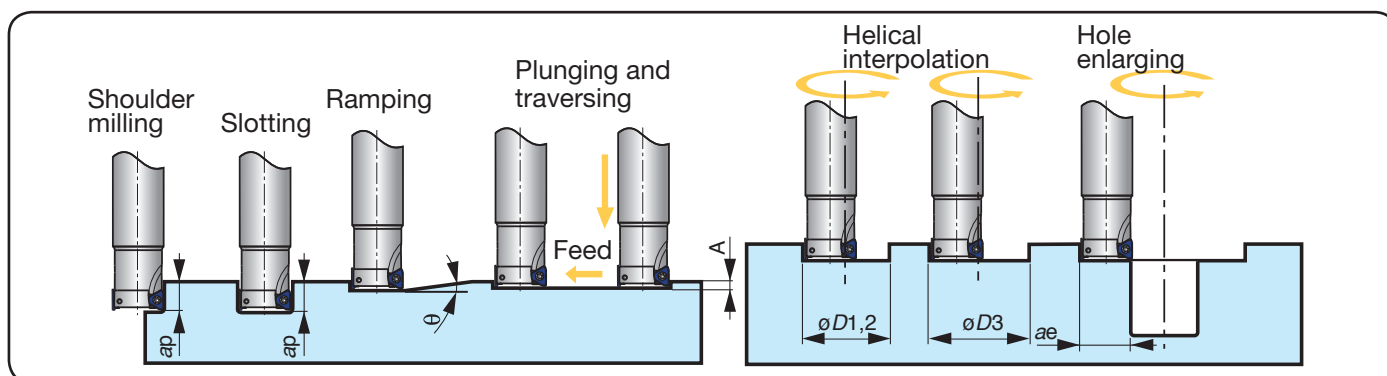
Standard cutting conditions

Workpiece materials	Hardness (HB)	Grades	Cutting speed: Vc (sfm)		Feed per tooth: fz (ipt)	
			T/EPA10	T/EPA15	T/EPA10	T/EPA15
Low carbon steels 1015 etc.	- 200	AH3135	330 - 820	330 - 820	0.003 - 0.008	0.003 - 0.01
High carbon steels 1045 etc.	200 - 300		330 - 660	330 - 750	0.003 - 0.006	0.003 - 0.008
Alloyed steels 4140 etc.						
Tool steels H13 etc.	150 - 300		330 - 500	330 - 600		
Stainless steels 304 etc.	-	AH3135	260 - 660	330 - 660	0.003 - 0.006	0.003 - 0.008
Grey cast irons No.250B etc.	150 - 250	AH120	330 - 820	330 - 820	0.005 - 0.01	0.003 - 0.01
Ductile cast irons 65-45-12 etc.			260 - 660	260 - 660		
Titanium alloy Ti-6Al-4V etc.	-	AH120	60 - 200	60 - 200	0.003 - 0.006	0.003 - 0.007
Heat-resistance alloy Inconel 718 etc.			60 - 130	60 - 130	0.003 - 0.005	0.003 - 0.006

- To remove excessive chip accumulation use an air blast.
- When cutting an interrupted surface or a casted skin, the feed per tooth (fz) should be reduced to the lower recommended value shown in the above table.

- Cutting conditions are limited by 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.

Machining applications

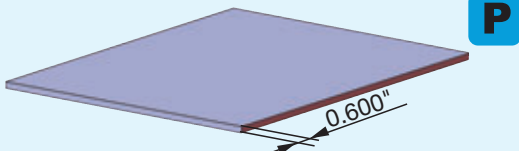
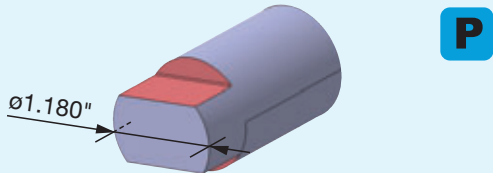
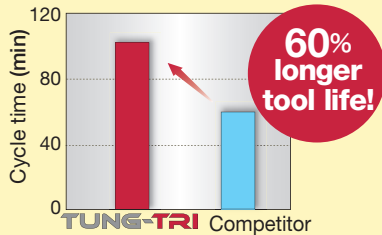


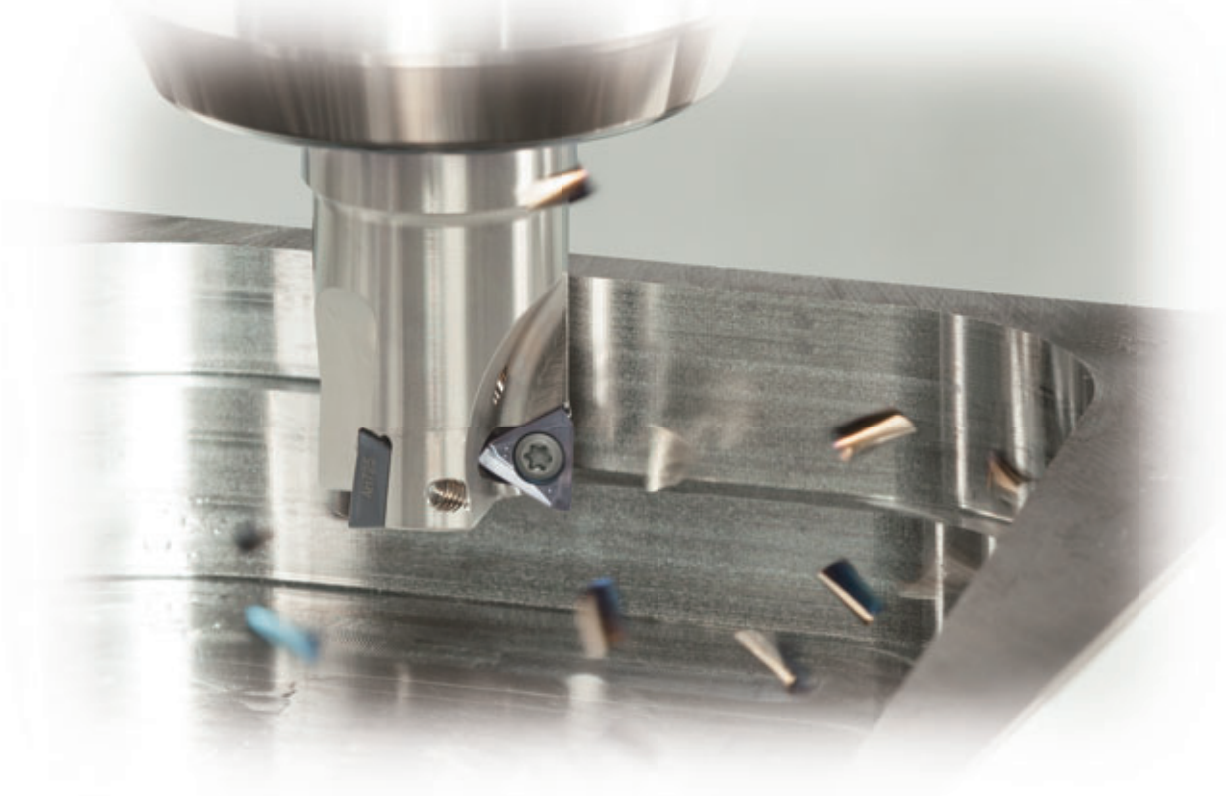
Cat. No.	Tool- ϕ ϕ_{Dc} (in)	Max. depth of cut a_p (in)	Max. ramping angle θ	Max. plunging A (in)	Min. machining ϕ_{D1} (in)	Max. machining ϕ_{D2} (in)	*Max. machining ϕ_{D3} (in)	Max. cutting width in enlarging a_e (in)
EPA10R100U...	1.000	0.394	2°	0.024	1.689	1.984	1.882	0.980
EPA10R125U...	1.250	0.394	2°	0.024	2.189	2.484	2.382	1.230
EPA10R150U...	1.500	0.394	1.4°	0.024	2.689	2.984	2.882	1.480
TPA10R200U...	2.000	0.394	0.8°	0.024	3.689	3.984	3.882	1.980
TPA10R250U...	2.500	0.394	0.7°	0.024	4.689	4.984	4.882	2.480
EPA15R150U...	1.500	0.590	2.3°	0.031	2.547	2.969	2.823	1.461
E/TPA15R200U...	2.000	0.590	1.7°	0.031	3.547	3.969	3.823	1.961
TPA15R2500U...	2.500	0.590	1.4°	0.031	4.547	4.969	4.823	2.461
TPA15R3000U...	3.000	0.590	1°	0.031	5.547	5.969	5.823	2.961
TPA15R4000U...	4.000	0.590	0.8°	0.031	7.547	7.969	7.823	3.961

*Flat bottom hole

6 Notes: Corner r_ϵ for dimensions of ϕ_{D1} , ϕ_{D2} , and ϕ_{D3} : $r_\epsilon = 0.016"$ for T/EPA10 and $r_\epsilon = 0.030"$ for T/EPA15.

Practical examples

Workpiece type		Base	Machine parts									
Cutter		EPA10R125U0125W03N (ø1.250", z = 3)	EPA10R125U0125W03N (ø1.250", z = 3)									
Insert		TOMT100404PDER-MJ	TOMT100404PDER-MJ									
Grade		AH3135	AH3135									
Workpiece material		1050	1045									
												
Cutting conditions	Cutting speed: V_c (sfm)	430	500									
	Feed per tooth: f_z (ipt)	0.004	0.007									
	Feed speed: V_f (ipm)	15.4	33.0									
	Depth of cut: a_p (in)	0.060	0.040									
	Width of cut: a_e (in)	1.00	0.200									
	Method of machining	Shoulder milling	Shoulder milling									
	Coolant	External air	External air									
	Machine	Vertical M/C	Turn-Mill center									
Results		 TUNG-TRI provided 60% longer tool life than competitor's cutter due to the superior wear resistance of grade AH3135.	<table><tr><th>Conditions</th><th>Burr</th><th>Wall surface finish</th></tr><tr><td>TUNG-TRI</td><td>Small</td><td>Better</td></tr><tr><td>Competitor</td><td>Big</td><td>Worse</td></tr></table> Due to the low cutting force, Tung-Tri formed a smaller burr than competitor's. The wall surface finish of Tung-Tri is also better than competitor's.	Conditions	Burr	Wall surface finish	TUNG-TRI	Small	Better	Competitor	Big	Worse
		Conditions	Burr	Wall surface finish								
TUNG-TRI	Small	Better										
Competitor	Big	Worse										





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