

MillLine

TUNG^{ORCE}**FREC**

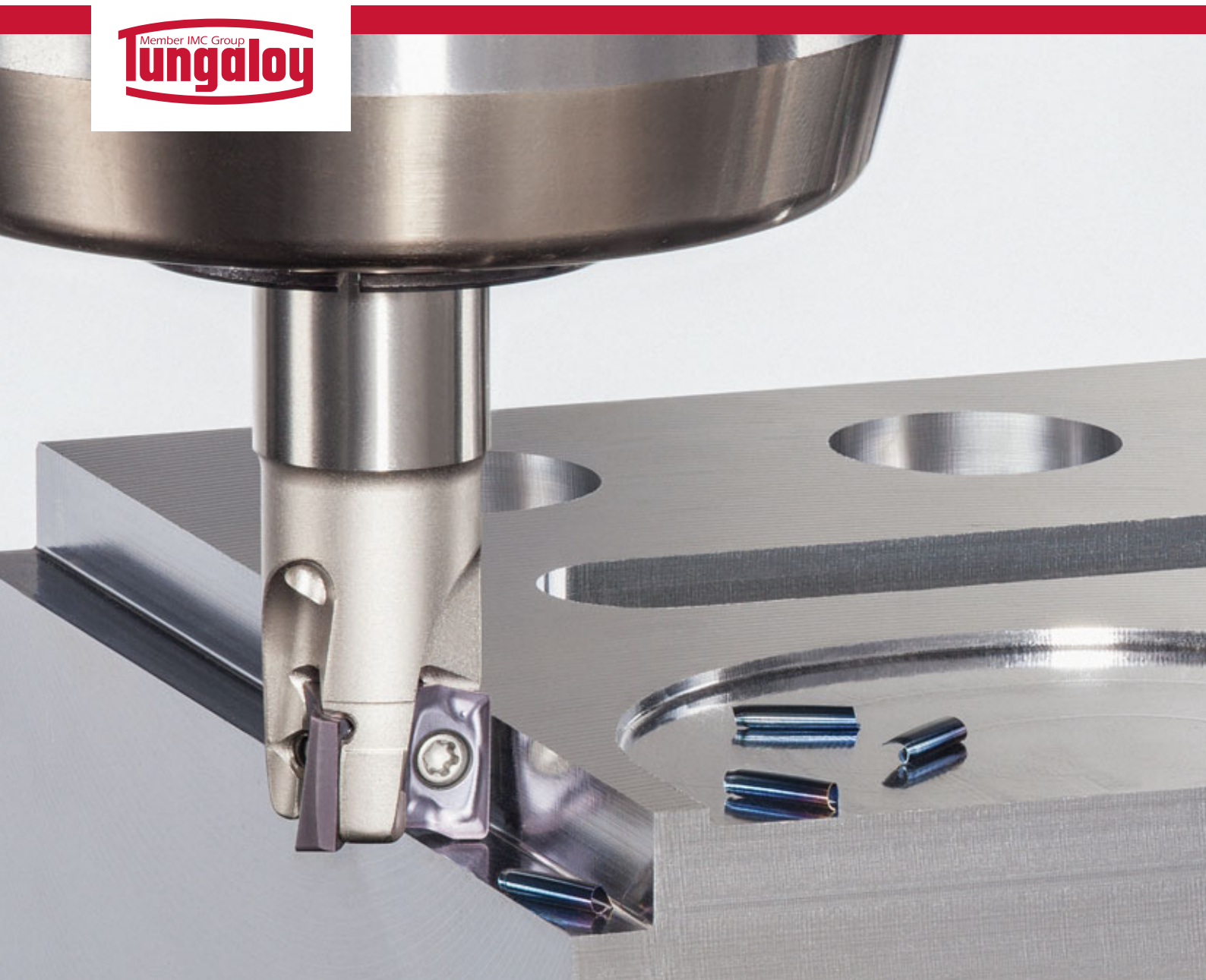
www.tungaloy.com

Tungaloy Report No. 506-G

SM[★]**TOOLS**[®]

Small diameter shoulder milling cutter with
enhanced lineup for various applications

Member IMC Group
Tungaloy



INDUSTRY 4.0
FEED the SPEED!



ACCELERATED MACHINING



MillLine

TUNG^{ORCE}**FREC**
TUNGALOY

TUNG^{ORCE}**MILL**
ACCELERATED MACHINING



TungForce-Rec, a **new miniature shoulder milling series**, features a unique clamping system offering **exceptional stability** in machining small pockets and slots.

www.tungaloy.com

Square shoulder milling endmills with small diameter **with exceptional stability and productivity**

Exceptional reliability and stability

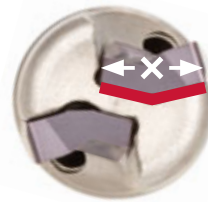
Chatter-free milling

- Unique insert and seat interface allows for a robust body structure and secure insert performance.



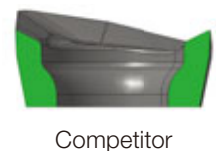
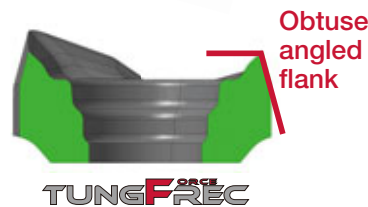
Secure insert clamping

- **V** shaped design keeps the inserts securely in place when fixed to the body. This prevents unwanted insert movements during machining, eliminating premature insert failures, while improving machining accuracy.



High fracture resistance

- Obtuse-angled flank face of the insert strengthens cutting edge and avoids chipping.
- Thicker insert design increases the insert robustness and allows larger screws to be used for added fixture security.



Strong and easy-to-handle insert screws

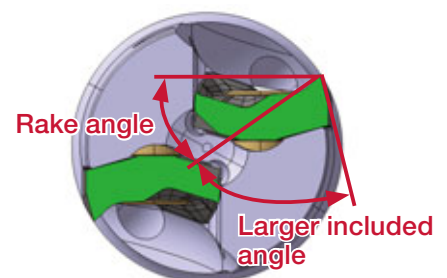
- M2 screws reduce screw neck shears under high cutting forces. Large-sized screws enhances insert fixturing and facilitates handlings.



High precision shoulder milling - with less tooling cost than solid tools

High accuracy on wall and bottom surfaces

- Secure and rigid insert fixturing enhances the indexing accuracy.
- Sharp cutting edge with large rake angle ensures smooth cutting.
- Ground to high precision, the insert provides highly accurate wall and surface finish.

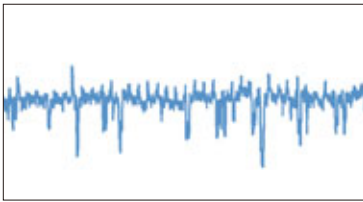


Insert with R0 corner radius

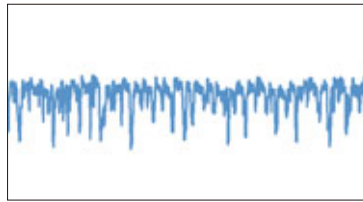
The MJ and AJ geometries are now available in corner radii of R0 for light and efficient cutting of near-zero radius corners.

Surface roughness comparison (in machining steel)

TUNGFREC
($\phi 10$ mm, z = 2, **Corner R0**)
Ra: 0.3 μm



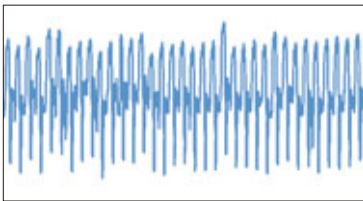
TUNGFREC
($\phi 10$ mm, z = 2, **Corner R0.4**)
Ra: 0.41 μm



P

Cutter : HPAV06M010S06R02
 Insert : AVGT060300PBER-MJ AH3135
 AVGT060304PBER-MJ AH3135
 Shank : VER16CL010S06-S
 Workpiece : S45C
 Cutting speed : $V_c = 60$ m/min
 Feed : $f = 0.1$ mm/rev
 Feed speed : $V_f = 191$ mm/min
 Depth of cut : $a_p = 1$ mm
 Width of cut : $a_e = 4$ mm
 Machining : Swiss type

Competitor's solid endmill
($\phi 10$ mm, z = 3, **Corner R0**)
Ra: 1.1 μm



R0 insert achieved better surface quality than that of solid endmill.

ER collet conversion adaptor

Wide application area by integration design of holder and collet

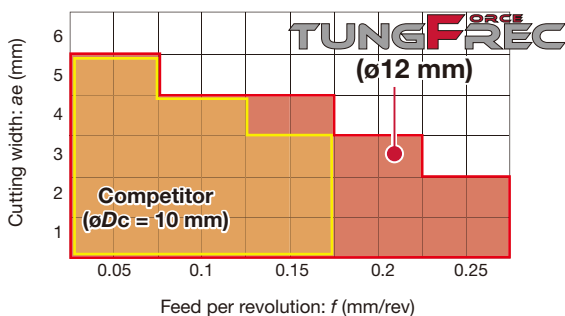
→ Larger tool diameter is available than conventional one! Robust connection make expanded application area and high rigidity!

High anti-chattering performance by optimized overhang

→ Overhang set to get highest rigidity without interference in machine easy to make interference such as automatic lathe!



Application area (Stainless steel, SUS304)



M Head : VEE120L09.0R00-03S08 AH725
 Shank : VER16CL006S05-S
 Cutting speed : $V_c = 40$ m/min
 Depth of cut : $a_p = 3$ mm
 Machine : Automatic lathe
 Coolant : Wet

TungMeister connection make larger diameter available, achieved wider application area than solid carbide end mill!

Inserts

2 types of insert geometries cover wide variety of material machining from steel, stainless, cast iron, aluminum to heat resistant superalloys.

MJ type

- Suitable for tough materials with appropriate cutting edge preparation allows well-balanced sharpness and toughness.
- 4 sizes of corner radii available, R = 0, 0.2, 0.4, & 0.8 mm
- 3 types of grades are available;

AH3135: Suitable for steel and stainless steel machining with high toughness

AH120: Ideal for machining of cast iron and heat resistant alloy

AH130: Optimized for titanium alloys and heat resistant alloy. First choice for wet machining



AVGT-MJ

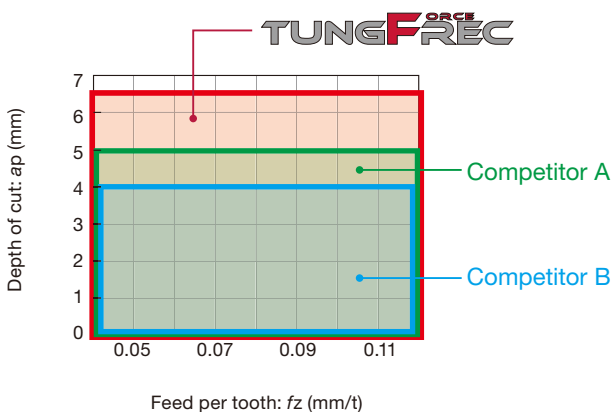
AJ type

- Ideal insert for aluminum or non-ferrous metals machining.
- Precise ground flank face and polished rake surface creates excellent sharpness on the cutting edge.
- 4 sizes of corner radii available, R = 0, 0.2, 0.4, & 0.8 mm.
- Uncoated carbide grade, KS05F with fine grain cemented carbide has high wear resistance for non-ferrous machining.



AVGT-AJ

APPLICATION RANGE

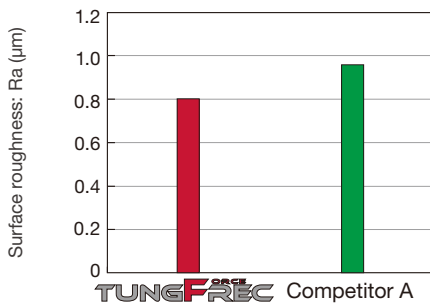


Cutter	: EPAV06M010C10.0R02 ($\phi D_c = 10$ mm)
Insert	: AVGT060302PBER-MJ AH3135
Workpiece material	: S55C / C55
Cutting speed	: $V_c = 270$ m/min
Machining	: Slotting
Cutting width	: $a_e = 10$ mm
Coolant	: Dry
Machine	: Vertical M/C, BT40 18.5kW

TungForce-Rec is applicable for a wider range of cutting condition than competitors'.

CUTTING PERFORMANCE

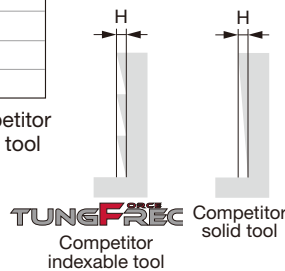
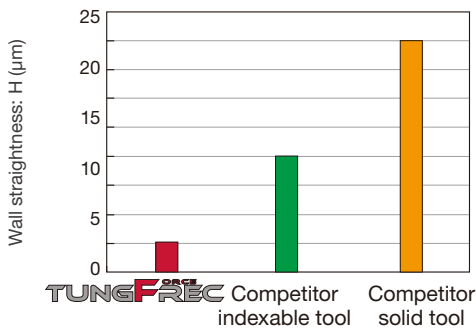
Surface finish: Carbon steel



Cutter : EPAV06M010C10.0R02
 (øDc = 10 mm, z = 2)
Insert : AVGT060302PBER-MJ AH3135
Workpiece material : S55C / C55 (180HB)
Cutting speed : Vc = 270 m/min
Feed per tooth : fz = 0.07 mm/t
Depth of cut : ap = 2.0 mm
Cutting width : ae = 7.0 mm
Coolant : Dry
Machine : Vertical M/C, BT40

TungForce-Rec provides good surface finish compared with the competitors.

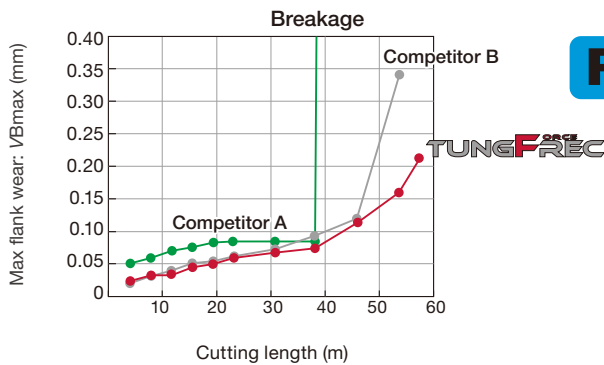
Wall straightness: Carbon steel



Cutter : EPAV06M012C12.0R03
 (øDc = 12 mm, z = 3)
Insert : AVGT060304PBER-MJ AH3135
Workpiece material : S50C / C50 (180HB)
Cutting speed : Vc = 330 m/min
 (Solid tool: Vc = 60 m/min)
Feed per tooth : fz = 0.1 mm/t
 (Solid tool: fz = 0.04 mm/t)
Depth of cut : ap = 4.0 mm x 3 pass
 (Solid tool: ap = 12 mm)
Cutting width : ae = 2.0 mm
Coolant : Dry
Machine : Vertical M/C, BT40

TungForce-Rec has achieved the best wall finish quality.

Tool life: Carbon steel

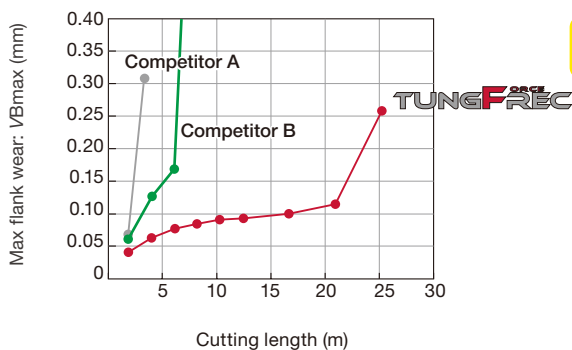


P

Cutter : EPAV06M010C10.0R02 ($\phi D_c = 10$ mm, $z = 2$)
 Insert : AVGT060302PBER-MJ AH3135
 Workpiece material : S55C / C55 (180HB)
 Cutting speed : $V_c = 270$ m/min
 Feed per tooth : $f_z = 0.07$ mm/t
 Depth of cut : $a_p = 3.0$ mm
 Cutting width : $a_e = 2.7$ mm
 Coolant : Dry
 Machine : Vertical M/C, BT40

A highly wear resistant, PremiumTec grade, AH3135 has significantly improved insert life over the competitor's grade.

Tool life: Stainless steel

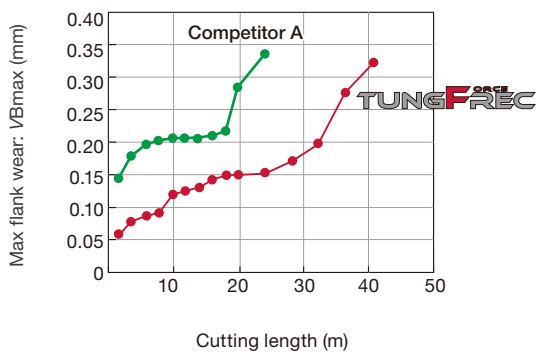


M

Cutter : EPAV06M010C10.0R02 ($\phi D_c = 10$ mm, $z = 2$)
 Insert : AVGT060302PBER-MJ AH3135
 Workpiece material : SUS304 / X5CrNi18-9
 Cutting speed : $V_c = 260$ m/min
 Feed per tooth : $f_z = 0.07$ mm/t
 Depth of cut : $a_p = 3.0$ mm
 Cutting width : $a_e = 2.9$ mm
 Coolant : Dry
 Machine : Vertical M/C, BT40

Light cutting action, reduced buildup-edge and thermal cracking, and improved insert life.

Tool life: Superalloys



S

Cutter : EPAV06M016C16.0R04 ($\phi D_c = 16$ mm, $z = 4$)
 Insert : AVGT060304PBER-MJ AH130
 Workpiece material : Ti6Al4V
 Cutting speed : $V_c = 80$ m/min
 Feed per tooth : $f_z = 0.08$ mm/t
 Depth of cut : $a_p = 5.0$ mm
 Cutting width : $a_e = 5.0$ mm
 Coolant : Emulsion
 Machine : Vertical M/C, BT40, 18.5 kW

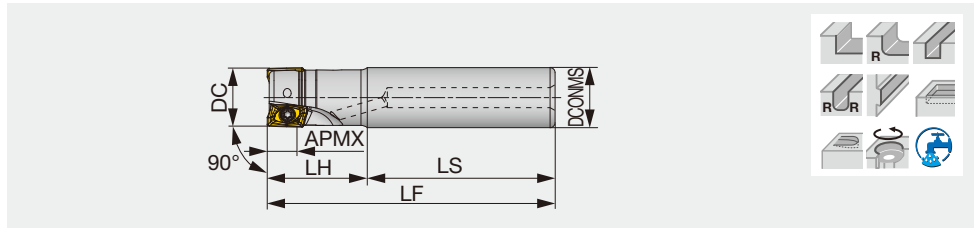
Highly wear resistant in a wet cutting, AH130 has dramatically improved the tool life.

Mini square shoulder milling cutter

CUTTER - SHANK TYPE

TungForce-Rec EPAV

GAMP = +6.0°~ +7.7°, GAMF = -37.1°~ -30°



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT (kg)	Insert
EPAV06M008C10.0R01	6	8	1	10	60	20	80	0.04	AVGT06...
EPAV06M010C10.0R02	6	10	2	10	60	20	80	0.04	AVGT06...
EPAV06M010C10.0R02L	6	10	2	10	65	35	100	0.06	AVGT06...
EPAV06M010C08.0R02L	6	10	2	8	80	20	100	0.04	AVGT06...
EPAV06M012C12.0R02	6	12	2	12	60	20	80	0.06	AVGT06...
EPAV06M012C12.0R03	6	12	3	12	60	20	80	0.06	AVGT06...
EPAV06M012C12.0R02L	6	12	2	12	85	35	120	0.09	AVGT06...
EPAV06M012C10.0R02L	6	12	2	10	100	20	120	0.07	AVGT06...
EPAV06M012C10.0R03	6	12	3	10	60	20	80	0.04	AVGT06...
EPAV06M014C12.0R03	6	14	3	12	60	20	80	0.07	AVGT06...
EPAV06M014C12.0R03L	6	14	3	12	120	20	140	0.11	AVGT06...
EPAV06M016C16.0R03	6	16	3	16	70	20	90	0.12	AVGT06...
EPAV06M016C16.0R04	6	16	4	16	70	20	90	0.12	AVGT06...
EPAV06M016C16.0R03L	6	16	3	16	105	35	140	0.20	AVGT06...
EPAV06M018C16.0R03	6	18	3	16	70	20	90	0.13	AVGT06...
EPAV06M018C16.0R04	6	18	4	16	70	20	90	0.13	AVGT06...
EPAV06M018C16.0R03L	6	18	3	16	160	20	180	0.26	AVGT06...
EPAV06M020C20.0R04	6	20	4	20	70	30	100	0.23	AVGT06...
EPAV06M020C20.0R05	6	20	5	20	70	30	100	0.21	AVGT06...
EPAV06M020C20.0R04L	6	20	4	20	165	35	200	0.45	AVGT06...
EPAV06M020C16.0R04	6	20	4	16	80	30	110	0.17	AVGT06...
EPAV06M025C25.0R05	6	25	5	25	80	35	115	0.4	AVGT06...
EPAV06M025C25.0R06	6	25	6	25	80	35	115	0.4	AVGT06...
EPAV06M025C25.0R04L	6	25	4	25	160	40	200	0.72	AVGT06...
EPAV06M025C20.0R06	6	25	6	20	80	35	115	0.27	AVGT06...
EPAV06M032C32.0R08	6	32	8	32	80	40	120	0.7	AVGT06...
EPAV06M032C32.0R06L	6	32	6	32	155	45	200	1.2	AVGT06...

SPARE PARTS

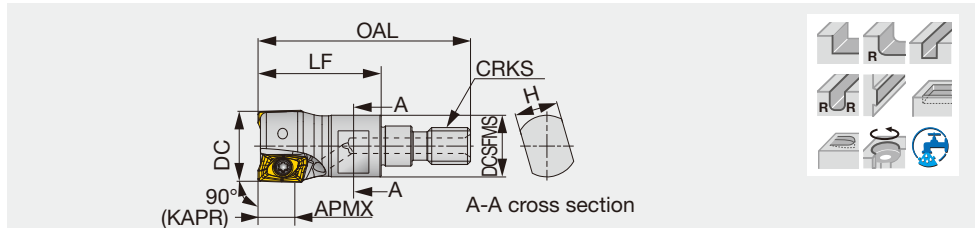
Designation	Clamping screw	Lubricant	Wrench
EPAV06M...	CSPB-2H	M-1000	IP-6DB

Mini square shoulder milling cutter

CUTTER - MODULAR TYPE - METRIC THREAD

TungForce-Rec HPAV-M

GAMP = +6.9°~ +7.6°, GAMF = -35.2°~ -32.4°



Designation	APMX	DC	CICT	OAL	LF	H	DCSFMS	CRKS	WT (kg)	Insert
HPAV06M010M06R02	6	10	2	34.5	20	7	9.5	M6	0.01	AVGT06...
HPAV06M012M06R02	6	12	2	34.5	20	7	10	M6	0.01	AVGT06...
HPAV06M012M06R03	6	12	3	34.5	20	7	10	M6	0.01	AVGT06...
HPAV06M016M08R03	6	16	3	42	25	10	13	M8	0.03	AVGT06...
HPAV06M016M08R04	6	16	4	42	25	10	13	M8	0.03	AVGT06...

For details of metric shank, please refer to TungFlex series in TR419 TungFlex

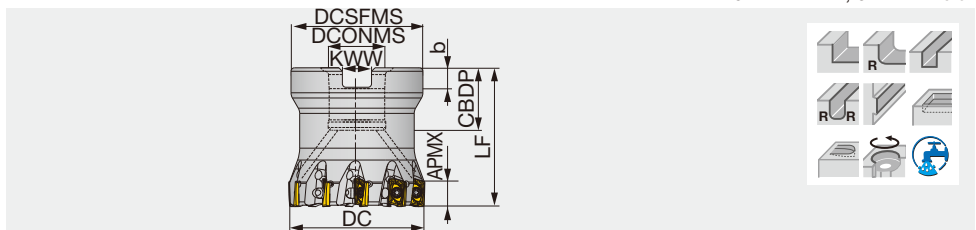
SPARE PARTS

Designation	Clamping screw	Lubricant	Wrench
HPAV06M...	CSPB-2H	M-1000	IP-6DB

CUTTER - BORE TYPE

TungForce-Rec TPAV

GAMP = +7.7°, GAMF = -29.8°



Designation	APMX	DC	CICT	DCSFMS	DCONMS	CBDP	LF	KWW	b	WT (kg)	Insert
TPAV06M040B16.0R10	6	40	10	38	16	18	40	8.4	5.6	0.24	AVGT06...

SPARE PARTS

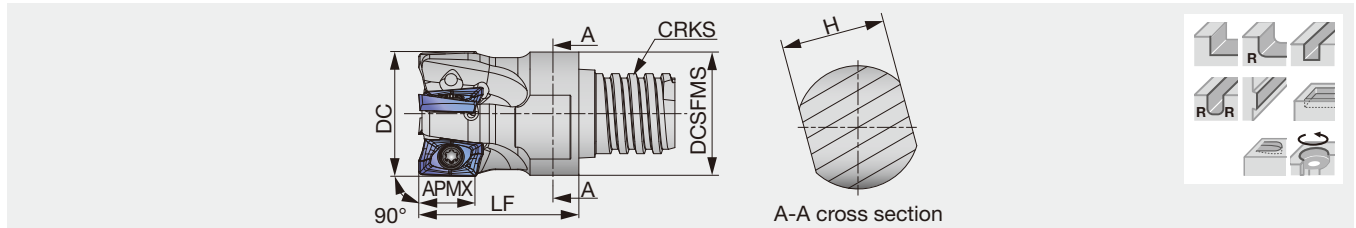
Designation	Clamping screw	Lubricant	Wrench	Center bolt
TPAV06M040B16.0R10	CSPB-2H	M-1000	IP-6DB	CM8X30H

Mini square shoulder milling cutter

CUTTER - MODULAR HEAD - TUNGMEISTER THREAD

TungForce-Rec HPAV06-S

GAMP = +6.9°~ +7.6°, GAMF = -35.2°~ -32.4°



	Designation	APMX	DC	CICT	LF	H	DCSFMS	CRKS	WT (kg)	Insert
New	HPAV06M010S05R02	6	10	2	10	8	8	S05	0.01	AVGT06...
	HPAV06M010S06R02	6	10	2	16	8	9.8	S06	0.01	AVGT06...
	HPAV06M012S08R02	6	12	2	18	10	11.7	S08	0.02	AVGT06...
	HPAV06M012S08R03	6	12	3	18	10	11.7	S08	0.02	AVGT06...
	HPAV06M016S10R03	6	16	3	20	13	15.4	S10	0.03	AVGT06...
	HPAV06M016S10R04	6	16	4	20	13	15.4	S10	0.03	AVGT06...

- For details of shanks, please refer to TR381 TungMeister

Shank types: VSSD, VTSD, VSC, VSTD

- For connections between metric shank and TungMeister thread, please use VAD-M type connector

Spanner for clamping	Cat. No.	Connection screw size
	KEYV-S05	S05
	KEYV-S06	S06
	KEYV-S08	S08
	KEYV-S10	S10

Optional- to be ordered separately.

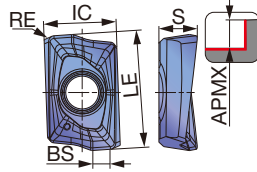
SPARE PARTS

Designation	Clamping screw	Lubricant	Wrench
HPAV06M...	CSPB-2H	M-1000	IP-6DB

INSERTS

AVGT-MJ

AVGT-AJ



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

★ : First choice
☆ : Second choice

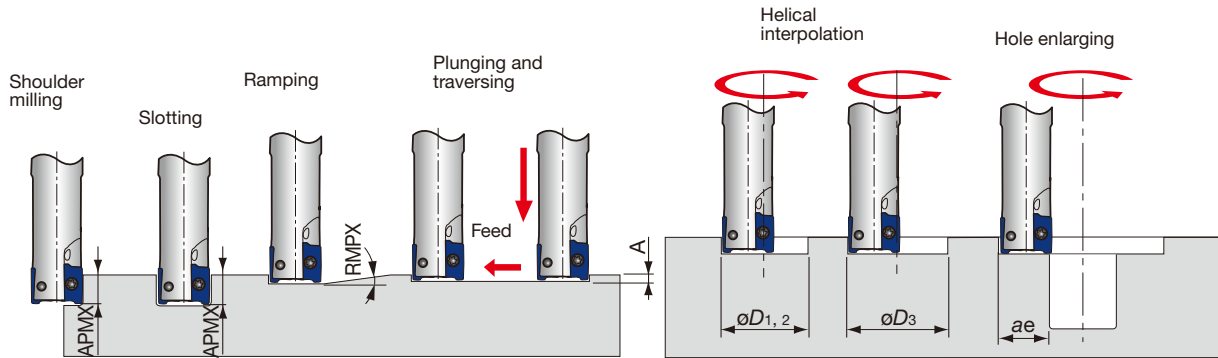
Designation	RE	APMX	Coated			Carbide				LE	IC	S	BS	
			AH120	AH130	AH3135	KS05F								
New AVGT060300PBER-MJ	0.0	6			●						8	5	2.7	1.6
AVGT060302PBER-MJ	0.2	6	●	●	●						8	5	2.7	1.5
AVGT060304PBER-MJ	0.4	6	●	●	●						8	5	2.7	1.3
AVGT060308PBER-MJ	0.8	6	●	●	●						8	5	2.6	0.9
New AVGT060300PBFR-AJ	0.0	6				●					8	5	2.7	1.6
AVGT060302PBFR-AJ	0.2	6				●					8	5	2.7	1.5
AVGT060304PBFR-AJ	0.4	6				●					8	5	2.7	1.3
AVGT060308PBFR-AJ	0.8	6				●					8	5	2.6	0.9

●: Line up

STANDARD CUTTING CONDITIONS

ISO	Workpiece materials	Hardness	Priority	Grades	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	
P	Low carbon steel (S15C / C15E4, SS400 / E275A, etc.)	- 200 HB	First choice	AH3135	230 - 430	0.07 - 0.12	
	Carbon steel and alloy steel (S55C / C55, SCM440 / 42CrMo4, etc.)	- 300 HB	First choice	AH3135	150 - 350	0.07 - 0.12	
	Prehardend steel (NAK80, PX5, etc.)	30 - 40 HRC	First choice	AH3135	100 - 230	0.07 - 0.12	
M	Stainless steel (SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3, etc.)	-	First choice	AH3135	150 - 220	0.06 - 0.1	
K	Grey cast iron (FC250 / 250, FC300 / 300, etc.)	150 - 250 HB	First choice	AH120	200 - 330	0.07 - 0.12	
	Ductile cast iron (FCD400, FCD600 / 600-3, etc.)	150 - 250 HB	First choice	AH120	150 - 240	0.07 - 0.12	
N	Aluminium alloys (Si < 13%)	-	First choice	KS05F	650 - 1000	0.07 - 0.12	
	Aluminium alloys (Si ≥ 13%)	-	First choice	KS05F	100 - 230	0.04 - 0.12	
S	Titanium alloys (Ti-6Al-4V, etc.)	-	First choice	AH130	40 - 90	0.04 - 0.1	
	Superalloys (Inconel718, etc.)	-	First choice	AH130	45 - 65	0.04 - 0.09	
H	Hardened steel	(SKD61 / X40CrMoV5-1, etc.)	40 - 50 HRC	First choice	AH120	45 - 70	0.04 - 0.08
		(SKD11 / X153CrMoV12, etc.)	50 - 60 HRC		AH120	40 - 65	0.04 - 0.06

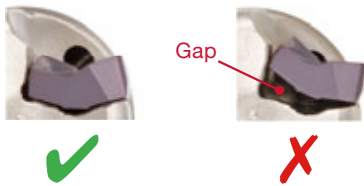
MACHINING APPLICATIONS



Designation	DC	Max. depth of cut		Max. ramping angle	Max. plunging	Min. machining		Max. machining		Max. cutting width in enlarging
		APMX	RMPX			ϕD_1	ϕD_2	ϕD_3^*	ae	
EPAV06_008...	8	6	-	-	-	-	-	-	-	-
EPAV/HPAV06_010...	10	6	3°	0.3	15	19	18	9.5		
EPAV/HPAV06_012...	12	6	3°	0.3	18	23	22	11.5		
EPAV/HPAV06_014...	14	6	2.3°	0.3	22	27	26	13.5		
EPAV/HPAV06_016...	16	6	2°	0.3	28	31	30	15.5		
EPAV/HPAV06_018...	18	6	1.6°	0.3	30	35	34	17.5		
EPAV/HPAV06_020...	20	6	1.4°	0.3	34	39	38	19.5		
EPAV/HPAV06_025...	25	6	1.1°	0.3	44	49	48	24.5		
EPAV/HPAV06_032...	32	6	0.8°	0.3	58	63	62	31.5		
TPAV06_040...	40	6	0.6°	0.3	74	79	78	39.5		

*Flat bottom hole

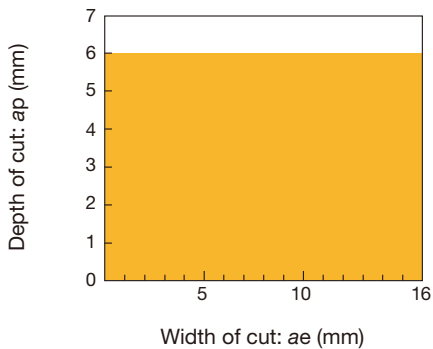
When clamping the insert, please confirm that there is no gap between the cutter body and the insert as shown in the picture.



Caution for using a large diameter cutter (over $\varnothing 18$ mm)

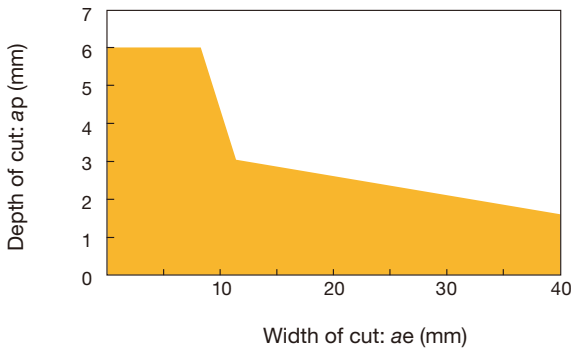
When using a cutter diameter over 18 mm, please note that the applicable range of cutting depth significantly drops as the cutting width applied increases, thus an additional finishing process may be required.

Cutting depth in relation to cutting width (for up to $\varnothing 16$ mm)




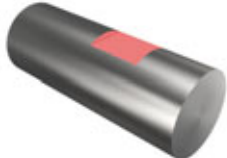
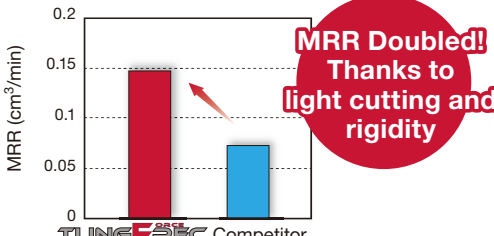
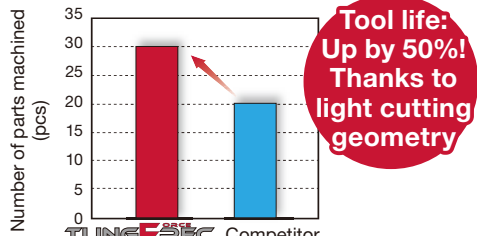
Cutter : EPAV06M016C16.0R04 ($\varnothing D_c = 16$ mm, $z = 4$)
 Insert : AVGT060304PBER-MJ AH3135
 Workpiece material : S55C / C55
 Cutting speed : $V_c = 250$ m/min
 Feed per tooth : $f_z = 0.07$ mm/t
 Machining : Slot milling
 Coolant : Dry
 Machine : Vertical M/C, BT40, 18.5 kW



Cutting depth in relation to cutting width (for $\varnothing 18$ mm and up)



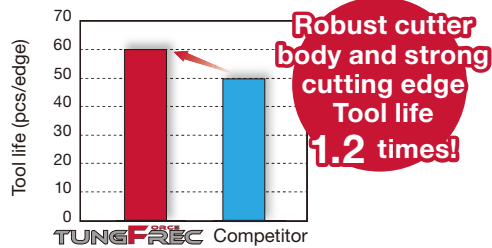
Cutter : EPAV06M032C32.0R08 ($\varnothing D_c = 32$ mm, $z = 8$)
 Insert : AVGT060304PBER-MJ AH3135
 Workpiece material : S55C / C55
 Cutting speed : $V_c = 250$ m/min
 Feed per tooth : $f_z = 0.07$ mm/t
 Coolant : Dry
 Machine : Vertical M/C, BT40, 18.5 kW

PRACTICAL EXAMPLES

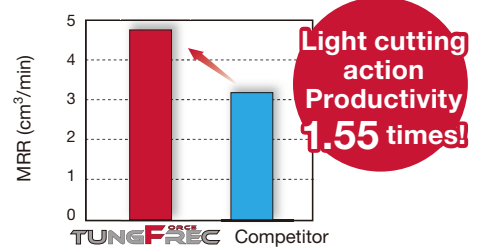
Workpiece type	Part	Screw	
Cutter	HPAV06M012S08R03 (ø12 mm, z = 3)	HPAV06M010S06R02 (ø10 mm, z=2)	
Insert	AVGT060300PBER-MJ	AVGT060300PBER-MJ	
Shank	VER16L006-S08-S	VER16L010-S06-S	
Grade	AH3135	AH3135	
	SUS304	SUS304	
Workpiece material	 New M	 New M	
Cutting conditions	Cutting speed: Vc (m/min)	90 (Competitor: Vc = 38)	56
	Feed per tooth: fz (mm/t)	0.025 (Competitor: fz = 0.0125)	0.014
	Feed speed: Vf (m/min)	120 (Competitor: Vf = 60)	50.4
	Depth of cut: ap (mm)	6	2 x 2 passes
	Width of cut: ae (mm)	0.2	10
	Machining	Shoulder milling	Grooving
	Coolant	Wet	Wet
Machine	Lathe (Swiss type)	Lathe (Swiss type)	
Results	 <p>MRR Doubled! Thanks to light cutting and rigidity</p> <p>The use of the collet shank allowed the use of a larger-sized tool, improving tool rigidity during machining. Free cutting geometry promoted efficient and chatter-free machining.</p>	 <p>Tool life: Up by 50%! Thanks to light cutting geometry</p> <p>Stable surface finish was achieved thanks to light cutting geometry and chatter-free machining. Tool life was also improved by 50% over the competitor's solid endmill.</p>	

Workpiece type	Guide shift	Spindle	
Cutter	EPAV06M010C10.0R02 (ø10 mm, z = 2)	EPAV06M012C12.0R03 (ø12 mm, z = 3)	
Insert	AVGT060304PBER-MJ	AVGT060304PBER-MJ	
Grade	AH3135	AH3135	
	S45C / C45 (25HRC)	Alloy steel (low carbon, 30HRC)	
Workpiece material	 P	 P	
Cutting conditions	Cutting speed: Vc (m/min)	151 (Competitor: Vc = 60)	143 (Competitor: Vc = 72)
	Feed per tooth: fz (mm/t)	0.05	0.04
	Feed speed: Vf (m/min)	481 (Competitor: Vf = 382)	601 (Competitor: Vf = 382)
	Depth of cut: ap (mm)	0.1	1
	Width of cut: ae (mm)	2.5	1.6
	Machining	Shoulder milling	Shoulder milling
	Coolant	Wet	Dry
Machine	Vertical M/C, BT40	Vertical M/C, BT30	

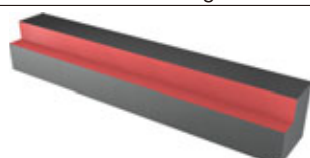

Results



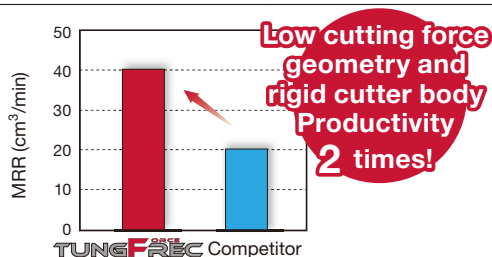
High MRR thanks to the rigid body design. Optimized geometry has allowed for high speed milling.



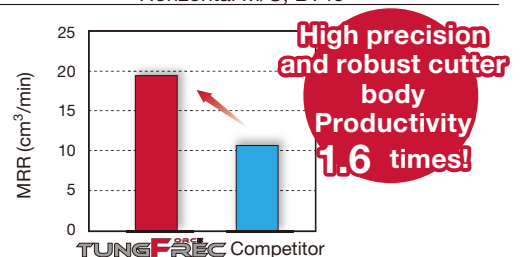
The sharp cutting edge geometry has enabled a smoother, vibration-free cutting at higher parameters even on a low power machine.

Workpiece type	Machine parts	Bracket	
Cutter	EPAV06M016C16.0R04 (ø16 mm, z = 4)	EPAV06M016C16.0R03L (ø16 mm, z = 3)	
Insert	AVGT060403PBER-AJ	AVGT060304PBER-MJ	
Grade	KS05F	AH120	
	A5025 / AlMg2.5	FC250 / 250 / GG25	
Workpiece material	 N	 K	
Cutting conditions	Cutting speed: Vc (m/min)	251	200 (Competitor: Vc = 145)
	Feed per tooth: fz (mm/t)	0.1	0.08 (Competitor: fz = 0.06)
	Feed speed: Vf (m/min)	1998 (Competitor: Vf = 999)	955 (Competitor: Vf = 554)
	Depth of cut: ap (mm)	2	5.0
	Width of cut: ae (mm)	10	4
	Machining	Shoulder milling	Shoulder milling
	Coolant	Wet	Dry
Machine	Vertical M/C, BT40	Horizontal M/C, BT40	



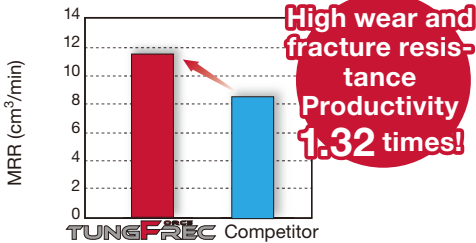
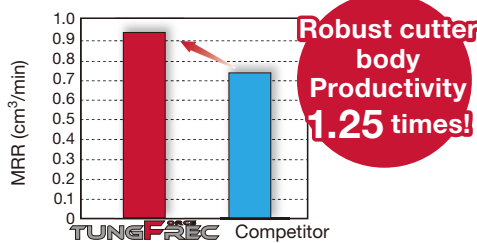


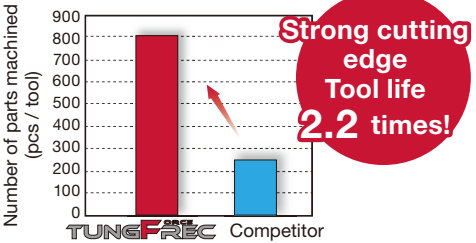
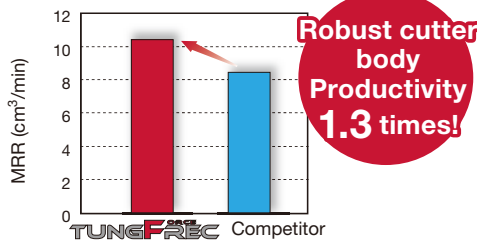
Results



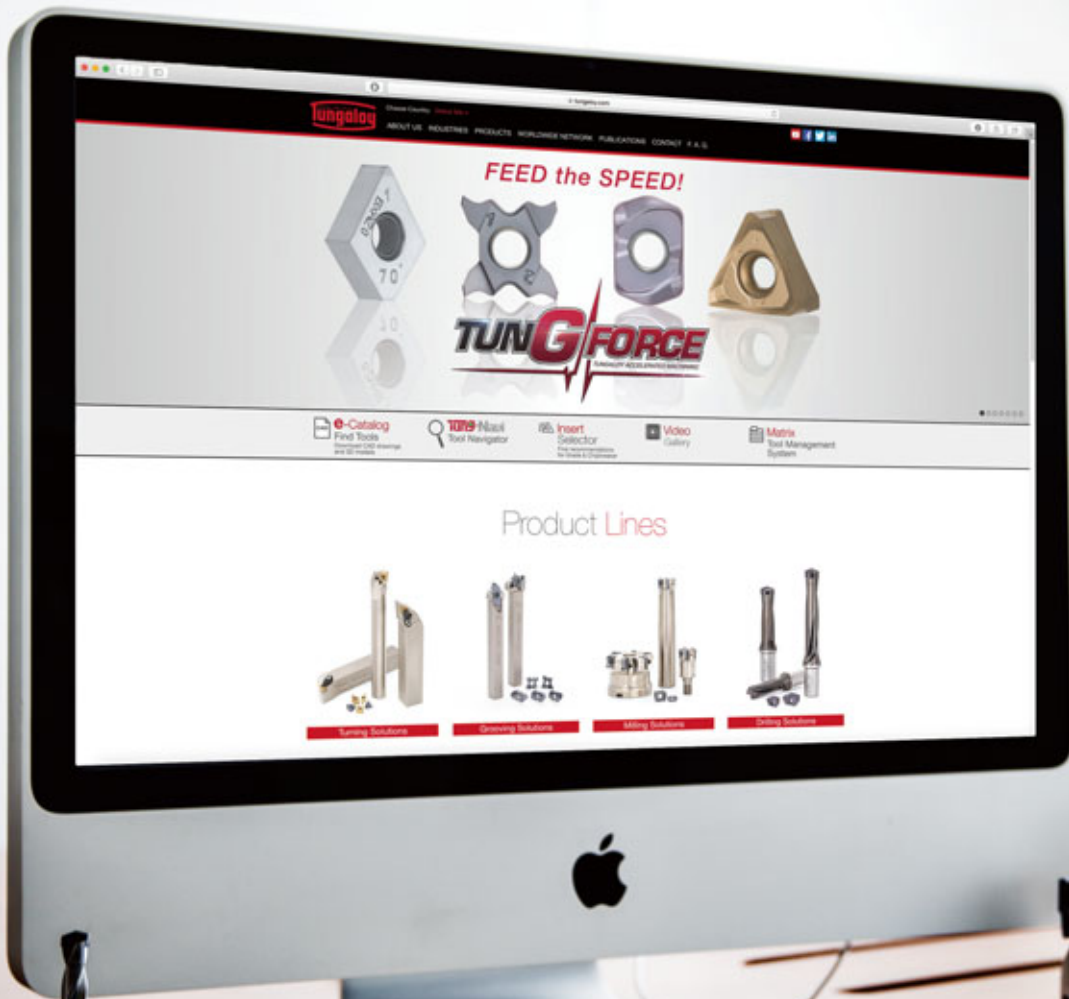
Thanks to light cutting action and body rigidity, stable, chatter-free milling was possible with a high MRR.



The tool rigidity and accuracy has improved the MRR and surface quality. The result: the roughing and finishing processes are now integrated into a single operation.

Workpiece type		Blocks	Machine parts
Cutter		EPAV06M016C16.0R04 (ø16 mm, z = 4)	EPAV06M010C10.0R02 (ø10 mm, z = 2)
Insert		AVGT060308PBER-M	AVGT060302PBER-MJ
Grade		AH130 Ti6Al4V	AH3135 SUS304 / X5CrNi18-9
Workpiece material		 S	 M
Cutting conditions	Cutting speed: Vc (m/min)	50 (Competitor: Vc = 40)	94 (Competitor: Vc = 50)
	Feed per tooth: fz (mm/t)	0.12	0.05 (Competitor: fz = 0.03)
	Feed speed: Vf (m/min)	478	299 (Competitor: Vf = 239)
	Depth of cut: ap (mm)	1.5 (Competitor: ap = 0.5)	0.5
	Width of cut: ae (mm)	16	6.3
	Machining	Shoulder milling	Face milling
	Coolant	Internal	External
Machine		With angle head, BT50	Lathe (Swiss type)
Results		 <p>High wear and fracture resistance Productivity 1.32 times!</p> <p>High wear and fracture resistant, AH130 has enabled a high M.R.R. with stability, eliminating premature insert failures.</p>	 <p>Robust cutter body Productivity 1.25 times!</p> <p>Enhanced machining stability has improved the MRR at high cutting parameters.</p>
Workpiece type		Screw	Machine parts
Cutter		EPAV06M010C10.0R02 (ø10 mm, z = 2)	HPAV06M010M06R02 (ø10 mm, z = 2)
Insert		AVGT060302PBER-MJ	AVGT060304PBER
Grade		AH3135 S45C / C45	AH3135 Alloy steel (Nickel-Chromium-Molybdenum)
Workpiece material		 P	 S
Cutting conditions	Cutting speed: Vc (m/min)	101	140 (Competitor: Vc = 110)
	Feed per tooth: fz (mm/t)	0.06 (Competitor: fz = 0.04)	0.08 (Competitor: fz = 0.04)
	Feed speed: Vf (m/min)	386	713 (Competitor: Vf = 560)
	Depth of cut: ap (mm)	2	1.5
	Width of cut: ae (mm)	10	10
	Machining	Face milling	Grooving
	Coolant	External	External
Machine		Lathe (Swiss type)	Lathe
Results		 <p>Strong cutting edge Tool life 2.2 times!</p> <p>The robust edge geometry has improved the tool life stability, eliminating premature failures.</p>	 <p>Robust cutter body Productivity 1.3 times!</p> <p>The high tool rigidity has allowed for a stable, chatter-free machining at high cutting parameters.</p>

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