MillLine

TECMILL

Member IMC Group Tungaloy

www.tungaloy.com/us

Tungaloy Report No. 374-US

Groundbreaking stability in roughing / finishing

due to highly reliable tangential insert

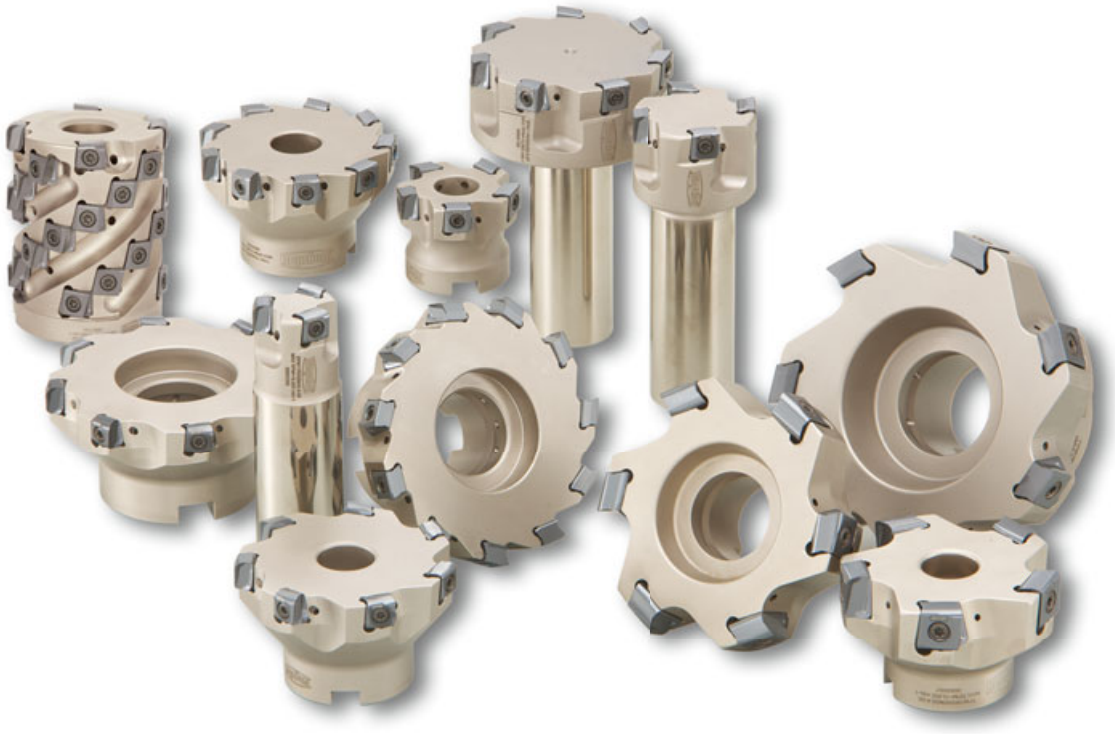
INDUSTRY 4.0

FEED the SPEED!

ACCELERATED MACHINING

MillLine

TECMILL
TUNGALOY



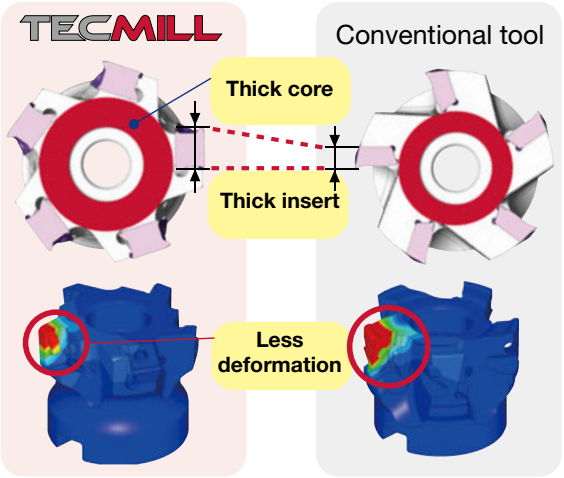
High productivity and stable cutting with large depth of cut in shouldering and finishing

Tangential insert with high stability guarantees exceptional reliability in rough shouldering and finishing

Reliable operation

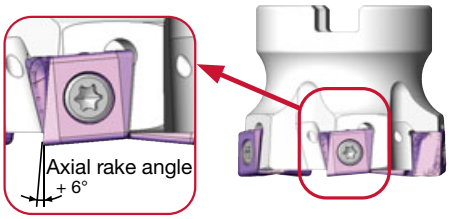
Delivers high productivity with large depth of cut

- Highly rigid cutter with thicker core
- Tangentially mounted insert with thicker cross section and tough cutting edges



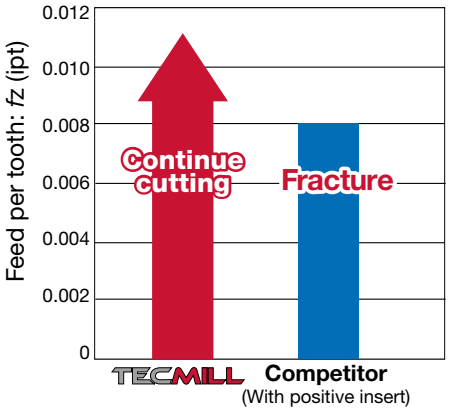
4-cornered insert

- Economical double sided insert
- Large rake and inclination angles reduce cutting forces and provide stable, smooth cutting



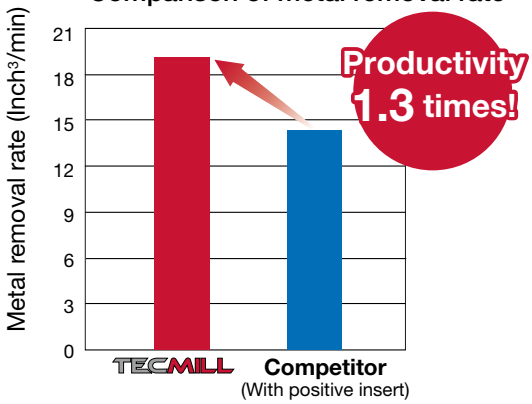
CUTTING PERFORMANCE

■ Comparison of cutting edge toughness



Work material	: 1055 (200HB)
Tool ø	: ø2.000"
Cutting speed	: *Vc* = 820 sfm
Depth of cut	: *ap* = 0.118"
Width of cut	: *ae* = 0.500"

■ Comparison of metal removal rate



Workpiece	: 1055 (200HB)
Tool ø	: ø2.500"
Cutting speed	: *Vc* = 500 sfm
Feed per tooth	
TECMILL	: *fz* = .008 ipt (z = 6)
Competitor	: *fz* = .006 ipt (z = 6)
Depth of cut	: *ap* = 0.400"
Width of cut	: *ae* = 1.400"
Cutting fluids	: Dry

Rich grade lineup for every type of material

A total of four grades, including two new CVD grades

New

AH3135
P Steel M Stainless

- PVD grade with high chipping resistance
- Suitable for machining steel and stainless steel in general cutting conditions

New

T1215
K Cast iron

- CVD grade with outstanding wear and chipping resistance
- Best for cast iron at high-speed machining

New

T3225
P Steel M Stainless

- CVD grade with outstanding wear and chipping resistance
- Most suited for steel and stainless steel at high-speed machining

AH725
P Steel S Superalloys H Hard materials

- PVD grade with high wear resistance
- Suitable for difficult-to-cut materials and high-hardened steel

AH120
P Steel K Cast iron

- PVD grade with a well-balanced wear and fracture resistance
- Ideal for general machining of steel and stainless steel

AH140
P Steel M Stainless

- PVD grade with high chipping resistance
- Suitable for workpieces required interrupted cutting and stainless steel

T3225 TUNGALOY / T1215 TUNGALOY

Special Surface Technology PREMIUMTEC TUNGALOY

Enhanced coating resistance to chipping and peeling

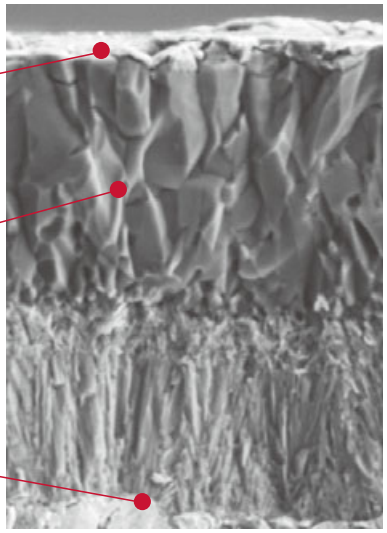
- Special surface post-treatment technology improves surface smoothness

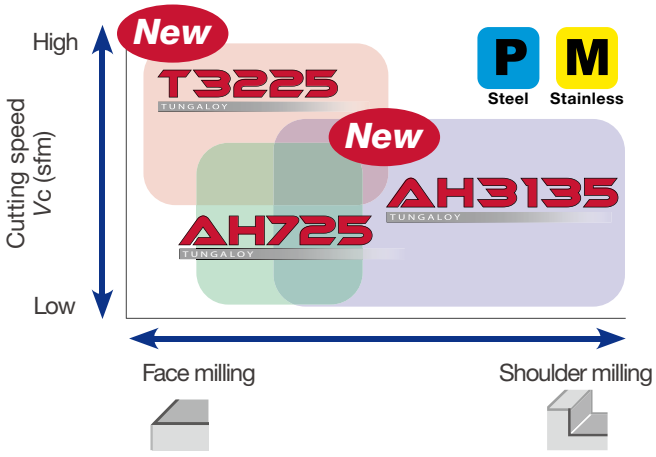
Superior wear resistance in high speed cutting

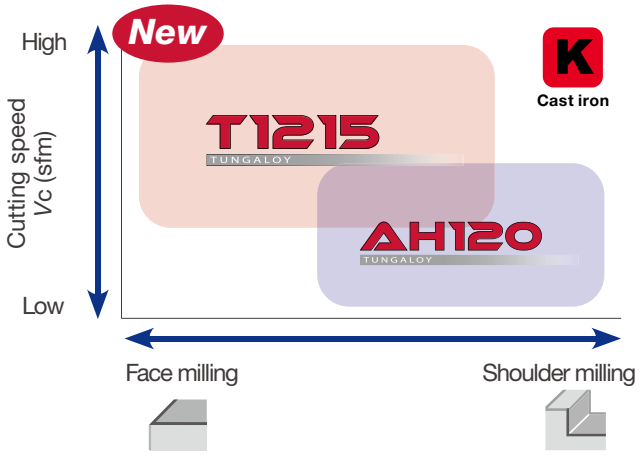
- A thick alumina (Al_2O_3) layer improves insert life in high cutting temperatures generated during high speed machining

Enhanced coating resistant to peeling

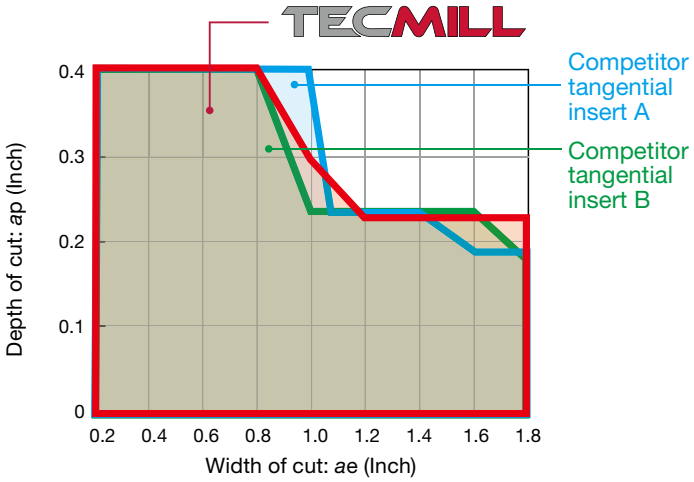
- Strong adhesion between the carbide substrate and the coating layer improves coating resistance to peeling







APPLICATION RANGE

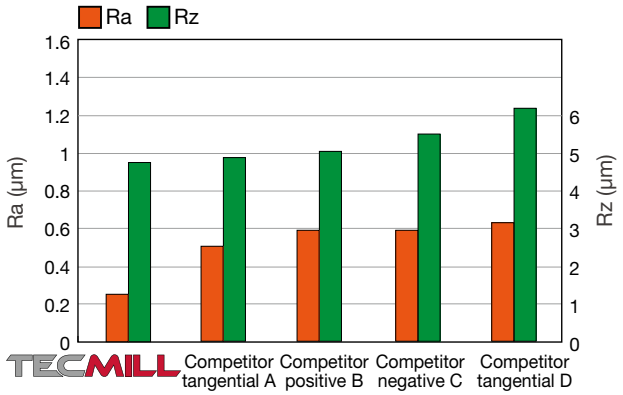


Cutter	: TPM11R200U0075A05 (ø2.0", z = 5)
Insert	: LMMU110708PNER-MJ AH3135
Workpiece material	: 1055
Cutting speed	: *Vc* = 600 sfm
Feed per tooth	: *fz* = 0.008 ipt
Number of revolutions	: *n* = 1146 min^{-1}
Coolant	: Dry
Machine	: Vertical M/C, CAT50

TecMill maximizes the application area of tangential inserts.

CUTTING PERFORMANCE

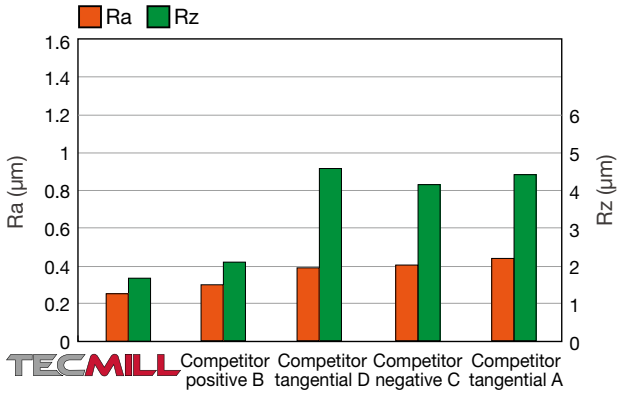
Surface finish: Carbon steel



P

Cutter	: TPM11R200U0075A05 (ø20", z = 5)
Insert	: LMMU110708PNER-MJ AH3135
Workpiece material	: (SAE) 1055
Cutting speed	: *Vc* = 820 sfm
Feed per tooth	: *fz* = 0.004 ipt
Number of revolutions	: *n* = 1591 min^{-1}
Depth of cut	: *ap* = 0.06"
Cutting width	: *ae* = 1.57"
Coolant	: Dry
Machine	: Vertical M/C, CAT50

Surface finish: Stainless steel



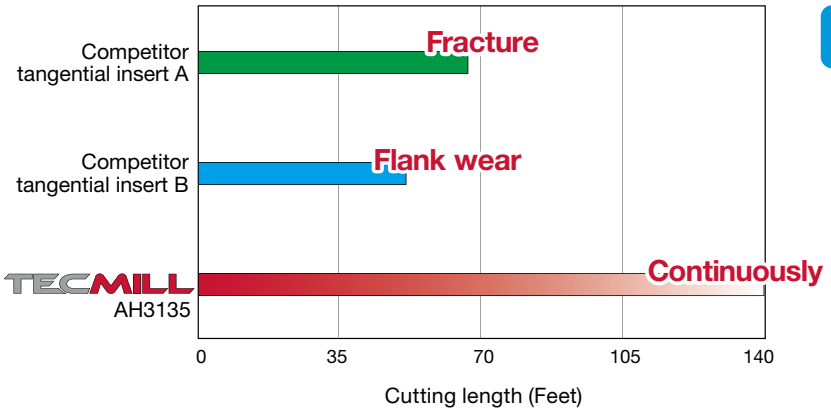
M

Cutter	: TPM11R200U0075A5 (ø20", z = 5)
Insert	: LMMU110708PNER-MJ AH3135
Workpiece material	: 304
Cutting Speed	: *Vc* = 492 sfm
Feed per tooth	: *fz* = 0.1 ipt
Number of revolutions	: *n* = 955 min^{-1}
Depth of cut	: *ap* = 0.08"
Cutting width	: *ae* = 1.57"
Coolant	: Wet
Machine	: Vertical M/C, CAT50

Surface roughness: Highly reliable insert and body provide excellent surface roughness compared to the competitors including positive inserts and tangential inserts.

CUTTING PERFORMANCE

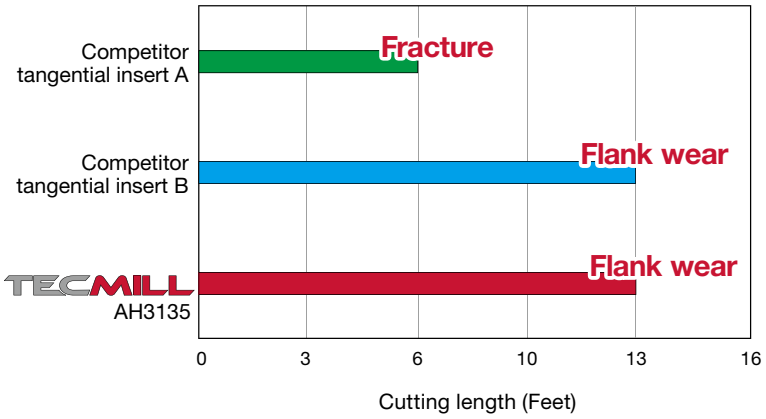
Tool life: Carbon steel



P

Cutter	: TPM11R200U0075A05 (ø20" , z = 5)
Insert	: LMMU110708PNER-MJ AH3135
Workpiece material	: (SAE) 1055
Cutting speed	: *Vc* = 600 sfm
Feed per tooth	: *fz* = 0.008 ipt
Number of revolutions	: *n* = 1146 min^{-1}
Depth of cut	: *ap* = 0.20"
Cutting width	: *ae* = 1.20"
Coolant	: Dry
Machine	: Vertical M/C, CAT50

Tool life: Cast iron



K

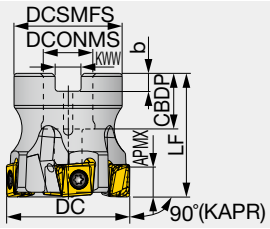
Cutter	: TPM11R200U0075A05 (ø20", z = 5)
Insert	: LMMU110708PNER-MJ T1215
Workpiece material	: No.250B
Cutting speed	: *Vc* = 820 sfm
Feed per tooth	: *fz* = 0.008 ipt
Number of revolutions	: *n* = 1592 min^{-1}
Depth of cut	: *ap* = 0.20"
Cutting width	: *ae* = 0.79"
Coolant	: Dry
Machine	: Vertical M/C, CAT50

Tool life:
Due to tough cutting edges and a new grade, tool life is increased to 200% at the maximum.

TPM11,16

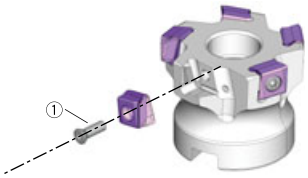
Square shoulder mills with LMMU type tangential clamped insert with 4 edges

A.R. = +5° ~ +6°, R.R. = +9° ~ +13°



Right hand (R) shown.

Inch	APMX	DC	CICT	DCSMFS	LF	DCONMS	CBDP	KWW	b	WT(lb)	Air hole	Insert
TPM11R200U0075A05	0.380	2.000	5	1.772	1.575	0.750	0.750	0.315	0.197	0.660	with	LMMU110708PNER-MJ
TPM11R250U0075A06	0.380	2.500	6	1.772	1.575	0.750	0.750	0.315	0.197	1.100	with	LMMU110708PNER-MJ
TPM11R300U0100A06	0.380	3.000	6	2.165	1.969	1.000	0.750	0.374	0.236	1.980	with	LMMU110708PNER-MJ
TPM11R300U0100A08	0.380	3.000	8	2.165	1.969	1.000	0.750	0.374	0.236	1.980	with	LMMU110708PNER-MJ
TPM11R400U0150A08	0.380	4.000	8	3.071	1.969	1.500	1.063	0.626	0.394	3.300	with	LMMU110708PNER-MJ
TPM11R400U0150A11	0.380	4.000	11	3.071	1.969	1.500	1.063	0.626	0.394	3.300	with	LMMU110708PNER-MJ
TPM16R300U0100A05	0.590	3.000	5	2.165	1.969	1.000	0.750	0.374	0.236	1.980	with	LMMU160908PNER-MJ
TPM16R400U0150A06	0.590	4.000	6	3.071	1.969	1.500	1.063	0.626	0.394	3.080	with	LMMU160908PNER-MJ
TPM16R500U0150A07	0.590	5.000	7	3.071	2.480	1.500	1.063	0.626	0.394	5.950	with	LMMU160908PNER-MJ



SPARE PARTS



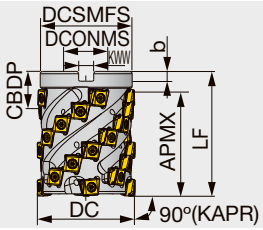


Designation	Clamping screw	Grip	Center bolt 1	Torx bit	Wrench
TPM11R2**U0075A...	SM35-114-H0	-	C0.375X1.125H	-	T-15DF
TPM11R300U0100A...	SM35-114-H0	-	C0.500X1.375H	-	T-15DF
TPM11R400U0150A...	SM35-114-H0	-	TMBA-0.750H	-	T-15DF
TPM16R300U0100A05	CSTB-5L159	H-TB	C0.500X1.375H	BT20S	-
TPM16R400U0150A06	CSTB-5L159	H-TB	TMBA-0.750H	BT20S	-
TPM16R500U0150A07	CSTB-5L159	H-TB	TMBA-0.750H	BT20S	-

TLM11

Square shoulder mills for roughing with LMMU type tangential clamped insert with 4 edges

A.R. = +5° ~ +6°, R.R. = +9° ~ +13°



Inch	APMX	DC	ZEFP	CICT	DCSMFS	LF	DCONMS	CBDP	KWW	b	WT(lb)	Air hole	Insert
TLM11R200U0075A03	2.303	2.000	3	21	1.850	2.750	0.750	0.750	0.315	0.157	1.780	with	LMMU1107...
TLM11R250U0100A04	2.634	2.500	4	32	2.323	3.250	1.000	1.024	0.374	0.236	3.330	with	LMMU1107...

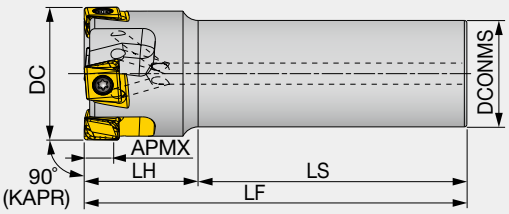
SPARE PARTS

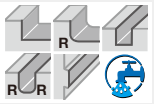


Designation	Clamping screw	Center bolt	Wrench
TLM11R200U0075A03	SM35-114-H0	SD06-A3	T-15DF
TLM11R250U0100A04	SM35-114-H0	SD08-98	T-15DF

EPM11

Square shoulder endmills with LMMU type tangential clamped insert with 4 edges





Right hand (R) shown.

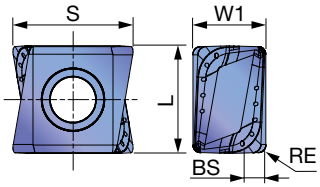
Inch	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(lb)	Air hole	Insert
EPM11R125U0125W03	0.381	1.250	3	1.250	2.250	1.750	4.000	1.150	with	LMMU1107...
EPM11R150U0125W04	0.381	1.500	4	1.250	2.250	1.750	4.000	1.320	with	LMMU1107...

SPARE PARTS

Designation	Clamping screw	Wrench
EPM11...	SM35-114-H0	T-15DF

INSERTS

LMMU11/16-MJ



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

★ : First choice
☆ : Second choice

Designation	RE	APMX	Coated						S	L	W1	BS
			AH3135	AH725	AH120	AH140	T1215	T3225				
LMMU110708PNER-MJ	0.031	0.382	●	●	●	●	●	●	0.461	0.413	0.280	0.079
LMMU110716PNER-MJ	0.063	0.382	●	●	●	●	●	●	0.453	0.413	0.280	0.047
LMMU110724PNER-MJ	0.094	0.382		●	●	●			0.445	0.413	0.280	0.016
LMMU110732PNER-MJ	0.126	0.382		●	●	●			0.437	0.413	0.280	-
LMMU160908PNER-MJ	0.031	0.594	●	●	●	●	●	●	0.681	0.630	0.374	0.094
LMMU160916PNER-MJ	0.063	0.594	●	●	●	●			0.673	0.630	0.374	0.063
LMMU160924PNER-MJ	0.094	0.594		●	●	●			0.665	0.630	0.374	0.031
LMMU160932PNER-MJ	0.126	0.594		●	●	●			0.661	0.630	0.374	-

● : New product
● : Line up

STANDARD CUTTING CONDITIONS

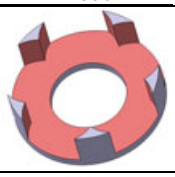
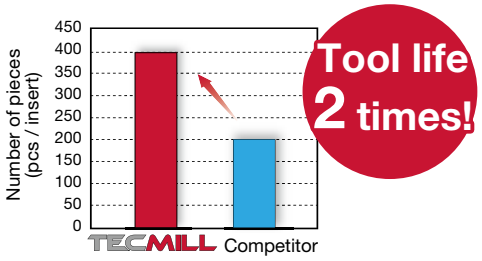
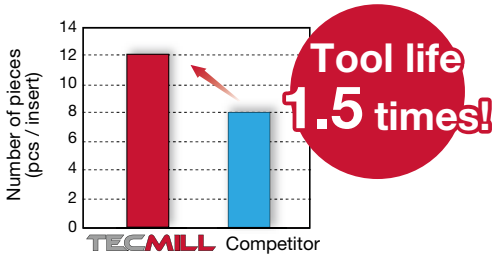
Bore, shank type

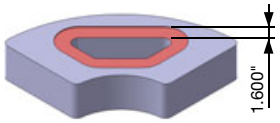
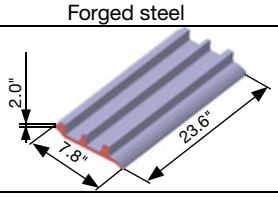
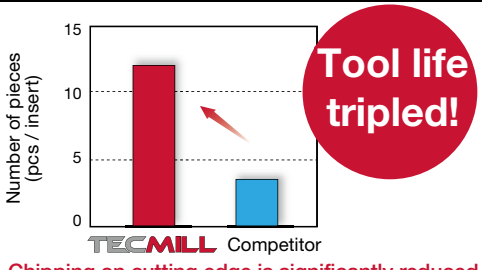
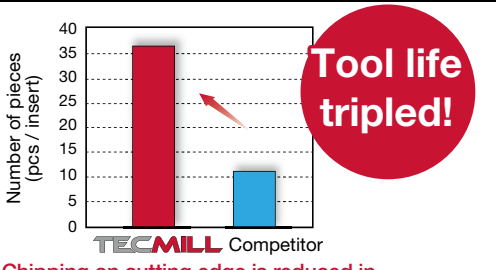
ISO	Workpiece materials		Hardness	Priority	Grades	Cutting speed *Vc* (sfm)	Feed per tooth *fz* (ipt)
P	Low carbon steel (1010, 1015, etc.)		- 200 HB	First choice	AH3135	330 - 820	0.005- 0.012
			- 200 HB	Priority on wear resistance	T3225	490 - 1150	0.003 - 0.008
	Carbon steel and alloy steel (1055, 4140, etc.)		- 300 HB	First choice	AH3135	330 - 760	0.004 - 0.010
			- 300 HB	Priority on wear resistance	T3225	490 - 1150	0.003 - 0.008
	Prehardend steel (NAK80, PX5, etc.)		30 - 40 HRC	First choice	AH3135	330 - 760	0.004 - 0.010
			30 - 40 HRC	Priority on wear resistance	T3225	400 - 1150	0.003 - 0.008
M	Stainless steel (304, etc.)		-	First choice	AH3135	300 - 590	0.004 - 0.010
K	Grey cast iron (No.250B, etc.)		150 - 250 HB	First choice	AH120	460 - 820	0.005 - 0.012
			150 - 250 HB	Priority on wear resistance	T1215	400 - 1150	0.003 - 0.008
	Ductile cast iron (65-45-12, 80-55-06, etc.)		150 - 250 HB	First choice	AH120	360 - 660	0.005 - 0.012
			150 - 250 HB	Priority on wear resistance	T1215	400 - 1150	0.003 - 0.008
S	Titanium alloys (Ti-6Al-4V, etc.)		-	First choice	AH725	100 - 200	0.003 - 0.008
	Superalloys (Inconel718, etc.)		-	First choice	AH725	66 - 165	0.002 - 0.004
H	Hardened steel	(H13, etc.)	40 - 50 HRC	First choice	AH725	150 - 230	0.003 - 0.006
		(D2, etc.)	50 - 60 HRC	First choice	AH725	130 - 215	0.002 - 0.004

Roughing type

ISO	Workpiece materials		Hardness	Priority	Grades	Cutting speed *Vc* (sfm)	Feed per tooth *fz* (ipt)
P	Low carbon steel (1010, 1015, etc.)		- 200 HB	First choice	AH3135	330 - 820	0.004 - 0.010
			- 300 HB	Priority on wear resistance	T3225	490 - 1150	0.004 - 0.008
	Carbon steel and alloy steel (1055, 4140, etc.)		- 300 HB	First choice	AH3135	330 - 660	0.004 - 0.008
			- 300 HB	Priority on wear resistance	T3225	490 - 985	0.004 - 0.008
	Prehardend steel (NAK80, PX5, etc.)		30 - 40 HRC	First choice	AH3135	330 - 660	0.004 - 0.008
			30 - 40 HRC	Priority on wear resistance	T3225	400 - 985	0.004 - 0.008
M	Stainless steel (304, etc.)		-	First choice	AH3135	300 - 490	0.004 - 0.010
K	Grey cast iron (No.250B, etc.)		150 - 250 HB	First choice	AH120	330 - 820	0.004 - 0.010
			150 - 250 HB	Priority on wear resistance	T1215	400 - 1150	0.004 - 0.010
	Ductile cast iron (65-45-12, 80-55-06, etc.)		150 - 250 HB	First choice	AH120	330 - 660	0.004 - 0.010
			150 - 250 HB	Priority on wear resistance	T1215	400 - 1150	0.004 - 0.010
S	Titanium alloys (Ti-6Al-4V, etc.)		-	First choice	AH725	66 - 165	0.002 - 0.006
	Superalloys (Inconel718, etc.)		-	First choice	AH725	66 - 130	0.002 - 0.004
H	Hardened steel	(H13, etc.)	40 - 50 HRC	First choice	AH725	100 - 200	0.003 - 0.006
		(D2, etc.)	50 - 60 HRC	First choice	AH725	80 - 180	0.002 - 0.004

PRACTICAL EXAMPLE

	Workpiece type	Planetary carrier	Gear case housing
	Cutter	Special (ø3.07", z = 2)	TPM11R200U0075A05 (ø2.0", z = 5)
	Insert	LMMU160932PNER-MJ	LMMU110708PNER-MJ
	Grade	AH3135	T1215
	Workpiece material	1035	65-45-12
		 P	 K
Cutting conditions	Cutting speed: *Vc* (sfm)	820	574
	Feed per tooth: *fz* (ipt)	0.004	0.006
	Feed speed: *Vf* (ipm)	7.9	33.1
	Depth of cut: *ap* (Inch)	1.57	0.16
	Width of cut: *ae* (Inch)	1.18	0.79
	Machining	Plunging	Shoulder milling
	Coolant	Dry	Dry
	Machine	Vertical M/C, CAT50	Vertical M/C, CAT50
	Results	 Tool life was doubled with AH3135 due to the combination of the substrate for high fracture resistance and the coating for high wear resistance.	 Tool life was extended by 1.5 times due to T1215 with high wear resistance.

	Workpiece type	Case	Shoe
	Cutter	TPM16R100M31.7-06 (ø4", z = 6)	TLM11R050M22.0E03 (ø2", z = 3)
	Insert	LMMU160908PNER-MJ	LMMU110708PNER-MJ
	Grade	AH725	AH140
	Workpiece material	Stainless steel	Forged steel
		 M	 K
Cutting conditions	Cutting speed: *Vc* (sfm)	330	330
	Feed per tooth: *fz* (ipt)	0.012	0.004
	Feed speed: *Vf* (ipm)	-	7.5
	Depth of cut: *ap* (Inch)	0.400	1.69
	Width of cut: *ae* (Inch)	1.600	0.47
	Machining	Shoulder milling	Shoulder milling
	Coolant	Dry	Dry
	Machine	Vertical M/C, CAT50	Vertical M/C, CAT50
	Results	 Chipping on cutting edge is significantly reduced, and the machining cost is cut due to increased number of corners.	 Chipping on cutting edge is reduced in interrupted cutting and tool life is 3 times longer than the competitor.

MEMO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