MillLine

TECMILL

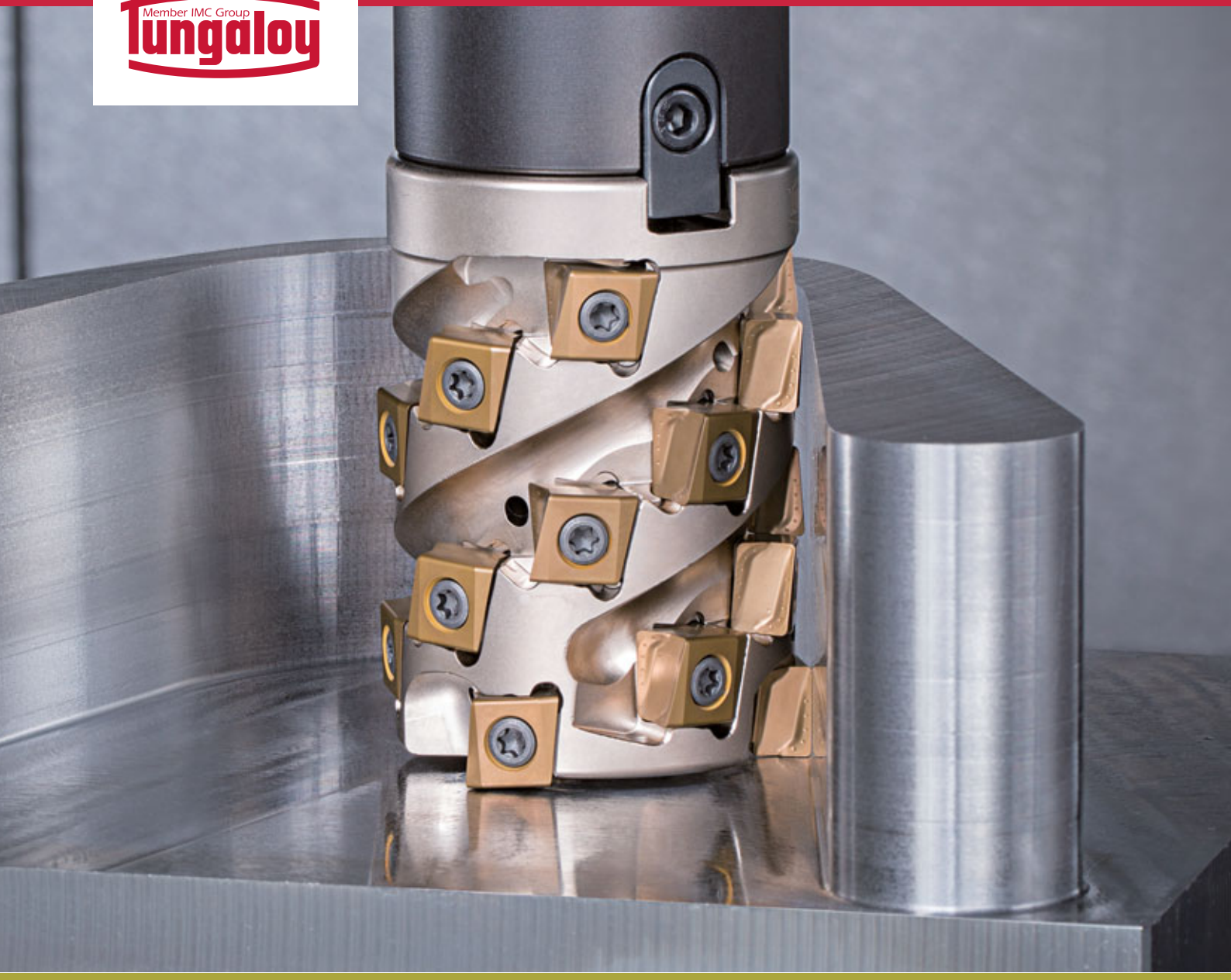
SM TOOLS®

www.tungaloy.com

Tungaloy Report No. 374-G

Unprecedented stability in roughing / finishing due to highly reliable tangential insert

Member IMC Group Tungaloy



INDUSTRY 4.0

FEED the SPEED!

ACCELERATED MACHINING

MillLine

TECMILL

TUNGALOY

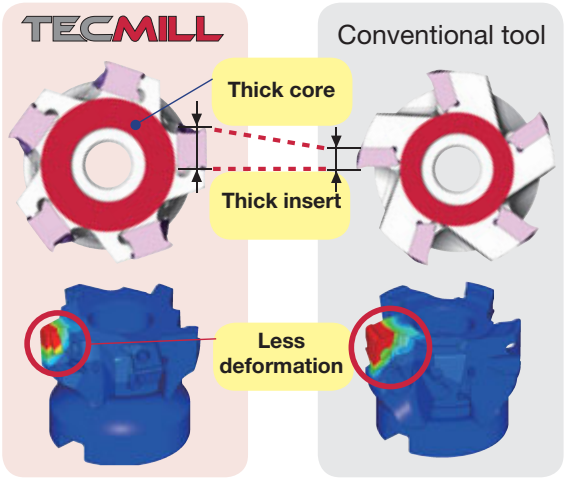
High productivity and stable cutting with large depth of cut in shouldering and finishing

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

Reliable operation

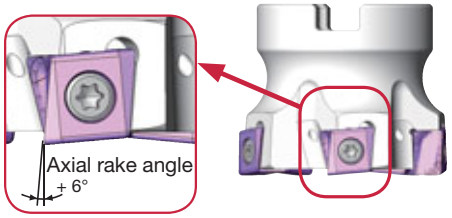
Delivers high productivity with large depth of cut

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



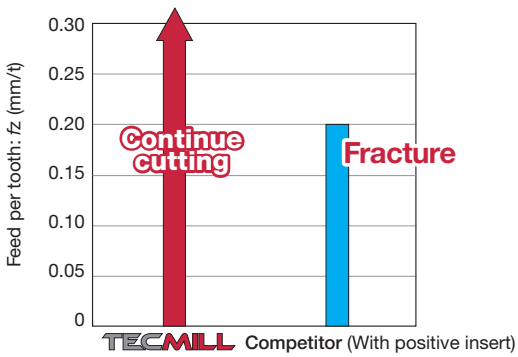
4-cornered insert

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



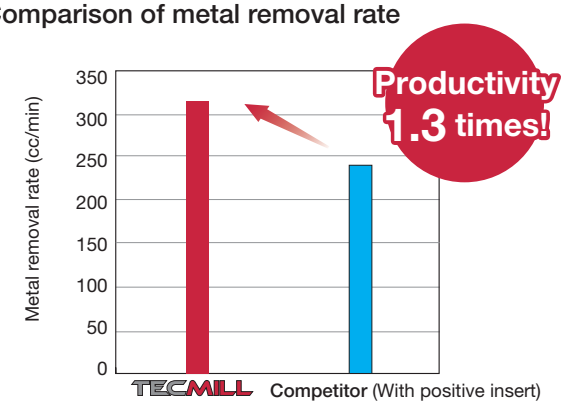
CUTTING PERFORMANCE

■ Comparison of cutting edge toughness



Workpiece : S55C / C55 (200HB)
Tool ø : ø50 mm
Cutting speed : *Vc* = 250 m/min
Depth of cut : *ap* = 3 mm
Width of cut : *ae* = 12.5 mm

■ Comparison of metal removal rate



Workpiece : S55C / C55 (200HB)
Tool ø : ø63 mm
Cutting speed : *Vc* = 150 m/min
Feed per tooth
TECMILL : *fz* = 0.2 mm/t (z = 6)
Competitor : *fz* = 0.15 mm/t (z = 6)
Depth of cut : *ap* = 10 mm
Width of cut : *ae* = 35 mm
Cutting fluids : Dry

Rich grade lineup for every kind 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 / T1215

Special Surface Technology PREMIUMTEC

Enhanced coating resistance to chipping and peeling

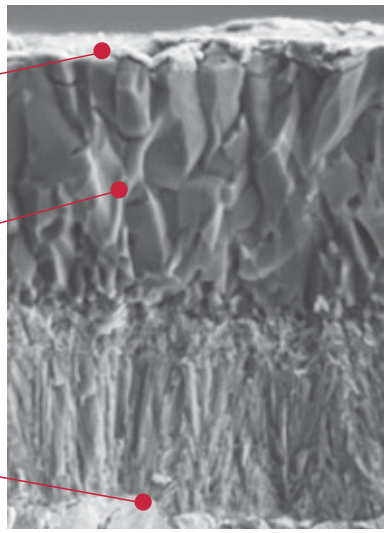
- Special surface post-treatment technology improves surface smoothness

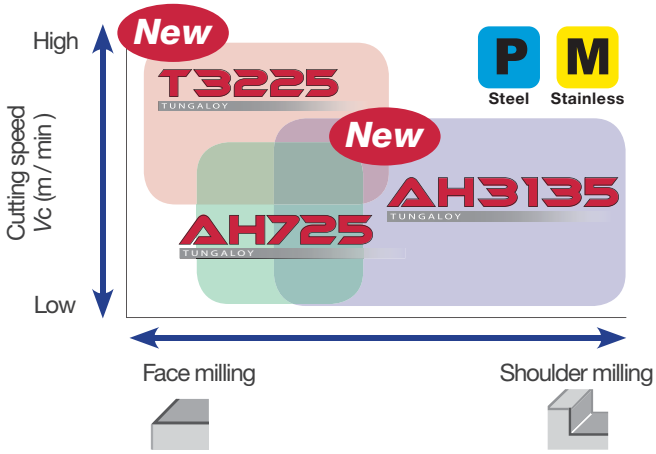
Superior wear resistance in high speed cutting

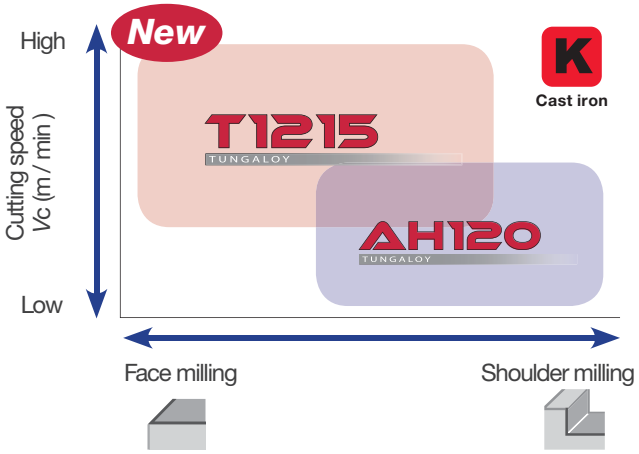
- A thick alumina (Al_2O_3) layer improves insert life in a high cutting temperature generated during high speed machining

Enhanced coating resistance to peeling

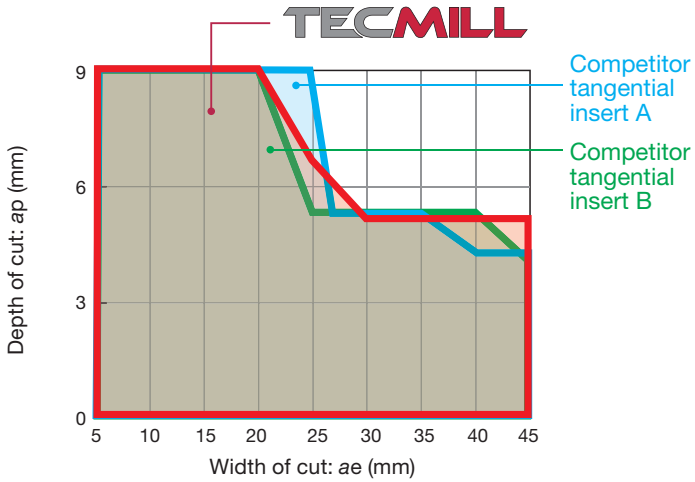
- Strong adhesion between the carbide substrate and the coating layer improves coating resistance to peeling







APPLICATION RANGE

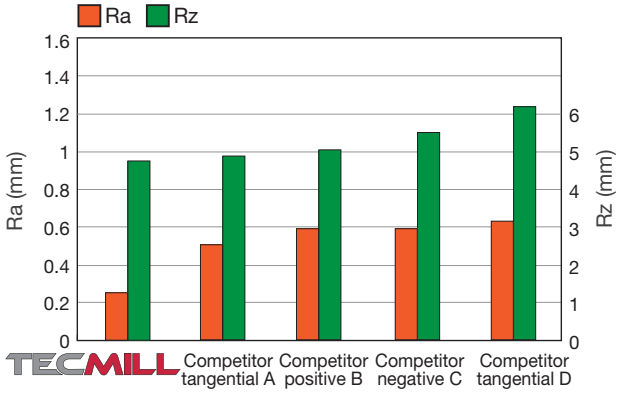


Cutter	: TPM11R050M22.0E05 (ø*D*c = 50 mm, z = 5)
Insert	: LMMU110708PNER-MJ AH3135
Workpiece material	: S55C / C55
Cutting speed	: *V*c = 180 m/min
Feed per tooth	: *f*z = 0.2 mm/t
Feed speed	: *V*f = 1146 mm/min
Number of revolutions	: *n* = 1146 min^{-1}
Coolant	: Dry
Machine	: Vertical M/C, BT50

TecMill maximizes the application area of tangential inserts.

CUTTING PERFORMANCE

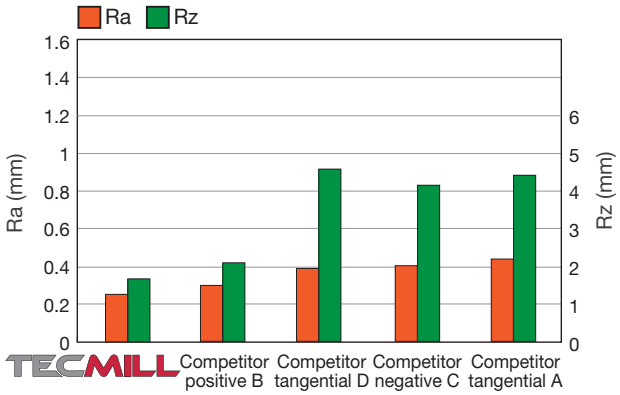
Surface finish: Carbon steel



P

Cutter	: TPM11R050M22.0E05 (ø*D*c = 50 mm, z = 5)
Insert	: LMMU110708PNER-MJ AH3135
Workpiece material	: S55C / C55
Cutting speed	: *V*c = 250 m/min
Feed per tooth	: *f*z = 0.1 mm/t
Feed speed	: *V*f = 636.6 mm/min
Number of revolutions	: *n* = 1591 min^{-1}
Depth of cut	: *a*p = 1.5 mm
Cutting width	: *a*e = 40 mm
Coolant	: Dry
Machine	: Vertical M/C, BT50

Surface finish: Stainless steel



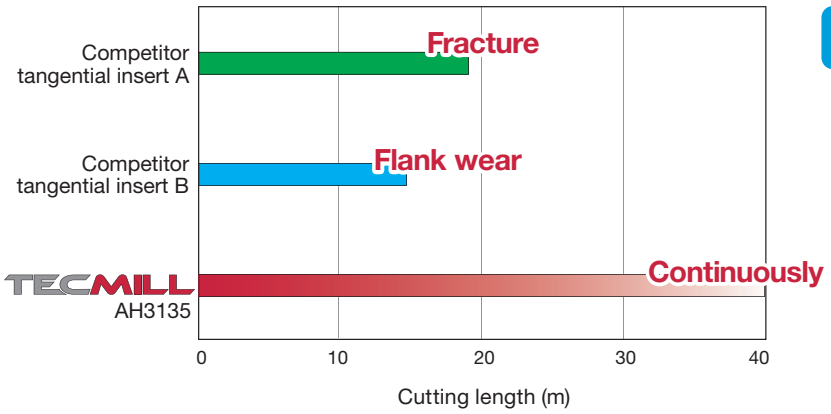
M

Cutter	: TPM11R050M22.0E05 (ø*D*c = 50 mm, z = 5)
Insert	: LMMU110708PNER-MJ AH3135
Workpiece material	: SUS304 / X5CrNi18-9
Cutting spee	: *V*c = 150 m/min
Feed per tooth	: *f*z = 0.1 mm/t
Feed speed	: *V*f = 477 mm/min
Number of revolutions	: *n* = 955 min^{-1}
Depth of cut	: *a*p = 2 mm
Cutting width	: *a*e = 40 mm
Coolant	: Wet
Machine	: Vertical M/C, BT50

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

CUTTING PERFORMANCE

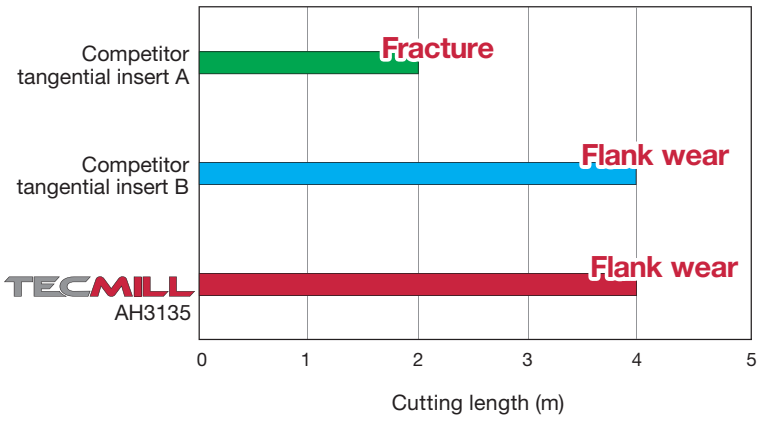
Tool life: Carbon steel



P

Cutter	: TPM11R050M22.0E05 (ø*D*c = 50 mm, z = 5)
Insert	: LMMU110708PNER-MJ AH3135
Workpiece material	: S55C / C55
Cutting speed	: *V*c = 180 m/min
Feed per tooth	: *f*z = 0.2 mm/t
Feed speed	: *V*f = 229 mm/min
Number of revolutions	: *n* = 1146 min^{-1}
Depth of cut	: *a*p = 5 mm
Cutting width	: *a*e = 30 mm
Coolant	: Dry
Machine	: Vertical M/C, BT50

Tool life: Cast iron



K

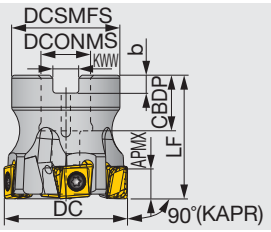
Cutter	: TPM11R050M22.0E05 (ø*D*c = 50 mm, z = 5)
Insert	: LMMU110708PNER-MJ T1215
Workpiece material	: FC250 /GG25 / 250
Cutting speed	: *V*c = 250 m/min
Feed per tooth	: *f*z = 0.2 mm/t
Feed speed	: *V*f = 318 mm/min
Number of revolutions	: *n* = 1592 min^{-1}
Depth of cut	: *a*p = 5 mm
Cutting width	: *a*e = 20 mm
Coolant	: Dry
Machine	: Vertical M/C, BT50

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

TPM11,16

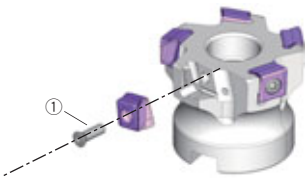
Square shoulder mills with LMMU type tangential clamped insert with 4 edges

A.R. = +5° ~ +6°, R.R. = +9° ~ +13°



.Right hand (R) shown

Designation	APMX	DC	CICT	DCSMFS	LF	DCONMS	CBDP	KWW	b	WT(kg)	Air hole	Insert
TPM11R050M22.0-05	9.7	50	5	41	40	22	20	10	6	0.3	with	LMMU1107...
TPM11R050M22.0E05	9.7	50	5	41	40	22	20	10.4	6.3	0.3	with	LMMU1107...
TPM11R063M22.0-06	9.7	63	6	41	40	22	20	10	6	0.5	with	LMMU1107...
TPM11R063M22.0E06	9.7	63	6	41	40	22	20	10.4	6.3	0.5	with	LMMU1107...
TPM11R080M25.4-07	9.7	80	7	46	50	25.4	26	9.5	6	0.9	with	LMMU1107...
TPM11R080M25.4-09	9.7	80	9	46	50	25.4	26	9.5	6	1	with	LMMU1107...
TPM11R100M31.7-08	9.7	100	8	60	50	31.75	32	12.7	8	1.4	with	LMMU1107...
TPM11R100M31.7-11	9.7	100	11	60	50	31.75	32	12.7	8	1.5	with	LMMU1107...
TPM16R080M25.4-05	15.1	80	5	46	50	25.4	26	9.5	6	1	with	LMMU1609...
TPM16R100M31.7-06	15.1	100	6	60	50	31.75	32	12.7	8	1.6	with	LMMU1609...
TPM16R125M38.1-07	15.1	125	7	80	63	38.1	38	15.9	10	3	with	LMMU1609...



SPARE PARTS



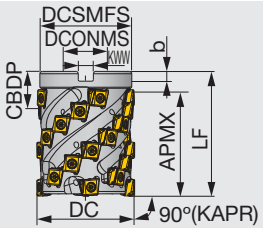


Designation	①Clamping screw	Grip	Center bolt	Center bolt 1	Torx bit
TPM11R050, 063...	CSTB-3.5L110	H-TB	-	CM10X30H	BT15S
TPM11R080M...	CSTB-3.5L110	H-TB	-	CM12X30H	BT15S
TPM11R100M...	CSTB-3.5L110	H-TB	TMBA-M16H	-	BT15S
TPM16R080M25.4-05	CSTB-5L159	H-TB	-	CM12X30H	BT20S
TPM16R100M31.7-06	CSTB-5L159	H-TB	TMBA-M16H	-	BT20S
TPM16R125M38.1-07	CSTB-5L159	H-TB	TMBA-M20H	-	BT20S

TLM11

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

A.R. = +5° ~ +6°, R.R. = +9° ~ +13°



Designation	APMX	DC	ZEFP	CICT	DCSMFS	LF	DCONMS	CBDP	KWW	b	WT(kg)	Air hole	Insert
TLM11R050M22.0E03	58.5	50	3	21	47	70	22	20	10.4	6.3	0.8	with	LMMU1107...
TLM11R063M25.4-04	66.9	63	4	32	59	80	25.4	26	9.5	6	1.4	with	LMMU1107...

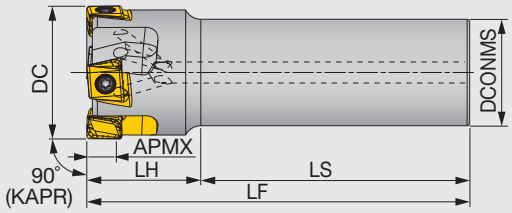
SPARE PARTS




Designation	Clamping screw	Grip	Center bolt	Torx bit
TLM11R050M22.0E03	SM35-114-H0	H-TB	SD06-A3	BT15S
TLM11R063M25.4-04	SM35-114-H0	H-TB	SD08-98	BT15S

EPM11

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



.Right hand (R) shown

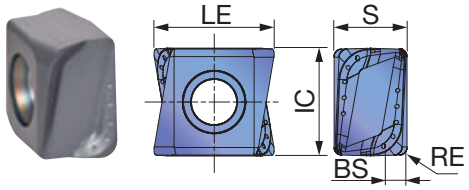
Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EPM11R032M32.0-03	9.7	32	3	32	80	35	115	0.6	with	LMMU1107...
EPM11R040M32.0-04	9.7	40	4	32	80	35	115	0.7	with	LMMU1107...
EPM11R050M32.0-04	9.7	50	4	32	80	40	120	0.9	with	LMMU1107...
EPM11R063M32.0-06	9.7	63	6	32	80	40	120	1.2	with	LMMU1107...
EPM11R080M32.0-07	9.7	80	7	32	80	40	120	1.6	with	LMMU1107...

SPARE PARTS

Designation	Clamping screw	Wrench
EPM11...	CSTB-3.5L110	T-15DB

INSERTS

LMMU11/16-MJ



		AH3135	AH725	AH120	AH140	T1215	T3225
P	Steel	★	☆				☆
M	Stainless	★			☆		
K	Cast iron			★		☆	
N	Non-ferrous						
S	Superalloys	☆	★	☆			
H	Hard materials		★				

★: First choice
☆: Second choice

Designation	RE	APMX	Coated						LE	IC	S	BS
			AH3135	AH725	AH120	AH140	T1215	T3225				
LMMU110708PNER-MJ	0.8	9.7	●	●	●	●	●	●	11.7	10.5	7.1	2
LMMU110716PNER-MJ	1.6	9.7	●	●	●	●	●	●	11.7	10.5	7.1	1.2
LMMU110724PNER-MJ	2.4	9.7		●	●	●			11.7	10.5	7.1	0.4
LMMU110732PNER-MJ	3.2	9.7		●	●	●			11.7	10.5	7.1	-
LMMU160908PNER-MJ	0.8	15.1	●	●	●	●	●	●	17.3	16	1	2.4
LMMU160916PNER-MJ	1.6	15.1	●	●	●	●	●		17.3	16	1	1.6
LMMU160924PNER-MJ	2.4	15.1		●	●	●			17.3	16	1	0.8
LMMU160932PNER-MJ	3.2	15.1		●	●	●			17.3	16	1	-

●: New product
●: Line up

STANDARD CUTTING CONDITIONS

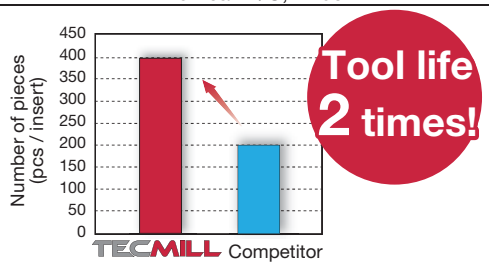
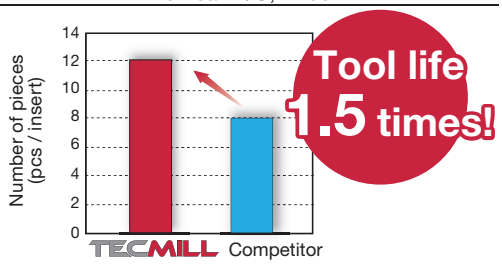
Bore, shank type

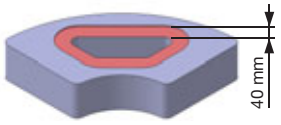
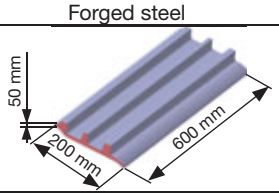
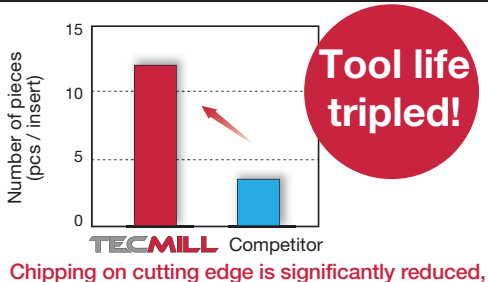
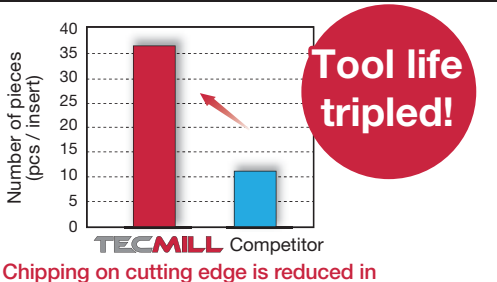
ISO	Workpiece materials		Hardness	Priority	Grades	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
P	Low carbon steel (S15C / C15E4, SS400 / E275A, etc.)		- 200 HB	First choice	AH3135	100 - 250	0.12- 0.3
			- 200 HB	Priority on wear resistance	T3225	150 - 350	0.08 - 0.2
	Carbon steel and alloy steel (S55C / C55, SCM440 / 42CrMo4, etc.)		- 300 HB	First choice	AH3135	100 - 230	0.1 - 0.25
			- 300 HB	Priority on wear resistance	T3225	150 - 350	0.08 - 0.2
	Prehardend steel (NAK80, PX5, etc.)		30 - 40 HRC	First choice	AH3135	100 - 230	0.1 - 0.25
			30 - 40 HRC	Priority on wear resistance	T3225	120 - 350	0.08 - 0.2
M	Stainless steel (SUS304 / X5CrNi18-9, etc.)		-	First choice	AH3135	90 - 180	0.1 - 0.25
K	Grey cast iron (FC250 / 250, etc.)		150 - 250 HB	First choice	AH120	140 - 250	0.12 - 0.3
			150 - 250 HB	Priority on wear resistance	T1215	120 - 350	0.08 - 0.2
	Ductile cast iron (FCD400, FCD600 / 600-3, etc.)		150 - 250 HB	First choice	AH120	110 - 200	0.12- 0.3
			150 - 250 HB	Priority on wear resistance	T1215	120 - 350	0.08 - 0.2
S	Titanium alloys (Ti-6Al-4V, etc.)		-	First choice	AH725	30 - 60	0.08 - 0.2
	Superalloys (Inconel718, etc.)		-	First choice	AH725	20 - 50	0.06 - 0.1
H	Hardened steel	(SKD61 / X40CrMoV5-1, etc.)	40 - 50 HRC	First choice	AH725	45 - 70	0.08 - 0.15
		(SKD11 / X153CrMoV12, etc.)	50 - 60 HRC	First choice	AH725	40 - 65	0.06 - 0.1

Roughing type

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	100 - 250	0.1- 0.25
			- 300 HB	Priority on wear resistance	T3225	150 - 350	0.1 - 0.2
	Carbon steel and alloy steel (S55C / C55, SCM440 / 42CrMo4, etc.)		- 300 HB	First choice	AH3135	100 - 200	0.1 - 0.2
			- 300 HB	Priority on wear resistance	T3225	150 - 300	0.1 - 0.2
	Prehardend steel (NAK80, PX5, etc.)		30 - 40 HRC	First choice	AH3135	100 - 200	0.1 - 0.2
			30 - 40 HRC	Priority on wear resistance	T3225	120 - 300	0.1 - 0.2
M	Stainless steel (SUS304 / X5CrNi18-9, etc.)		-	First choice	AH3135	90 - 150	0.1 - 0.25
K	Grey cast iron (FC250 / 250, etc.)		150 - 250 HB	First choice	AH120	100 - 250	0.1 - 0.25
			150 - 250 HB	Priority on wear resistance	T1215	120 - 350	0.1 - 0.25
	Ductile cast iron (FCD400, FCD600 / 600-3, etc.)		150 - 250 HB	First choice	AH120	100 - 200	0.1 - 0.25
			150 - 250 HB	Priority on wear resistance	T1215	120 - 350	0.1 - 0.25
S	Titanium alloys (Ti-6Al-4V, etc.)		-	First choice	AH725	20 - 50	0.06 - 0.15
	Superalloys (Inconel718, etc.)		-	First choice	AH725	20 - 40	0.06 - 0.1
H	Hardened steel	(SKD61 / X40CrMoV5-1, etc.)	40 - 50 HRC	First choice	AH725	30 - 60	0.08 - 0.15
		(SKD11 / X153CrMoV12, etc.)	50 - 60 HRC	First choice	AH725	25 - 55	0.06 - 0.1

PRACTICAL EXAMPLE

	Workpiece type	Planetary carrier	Gear case housing
	Cutter	Special (ø78 mm, z = 2)	TPM11R200U0075A05 (ø50.8 mm, z = 5)
	Insert	LMMU160932PNER-MJ	LMMU110708PNER-MJ
	Grade	AH3135	T1215
	Workpiece material	S35C  P	FCD450 / GGG45 / 450-10S  K
Cutting conditions	Cutting speed: *Vc* (m/min)	250	175
	Feed per tooth: *fz* (mm/t)	0.1	0.15
	Feed speed: *Vf* (m/min)	200	840
	Depth of cut: *ap* (mm)	40	4
	Width of cut: *ae* (mm)	30	20
	Machining	Plunging	Shoulder milling
	Coolant	Dry	Dry
	Machine	Vertical M/C, BT50	Vertical M/C, BT50
	Results	 Tool life was doubled with AH3135, 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 (ø100, z = 6)	TLM11R050M22.0E03 (ø50, z = 3)
	Insert	LMMU160908PNER-MJ	LMMU110708PNER-MJ
	Grade	AH725	AH140
	Workpiece material	Stainless steel  M	Forged steel  K
Cutting conditions	Cutting speed: *Vc* (m/min)	100	100
	Feed per tooth: *fz* (mm/t)	0.3	0.1
	Feed speed: *Vf* (m/min)	-	191
	Depth of cut: *ap* (mm)	10	43
	Width of cut: *ae* (mm)	40	12
	Machining	Shoulder milling	Shoulder milling
	Coolant	Dry	Dry
	Machine	Vertical M/C, BT50	Vertical M/C, BT50
	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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