Tungaloy
Member IMC Group

Tungaloy Report No. 418-E

MILLLINE Round insert milling cutters

NEW

FIXRMILL

TRP / ERP type

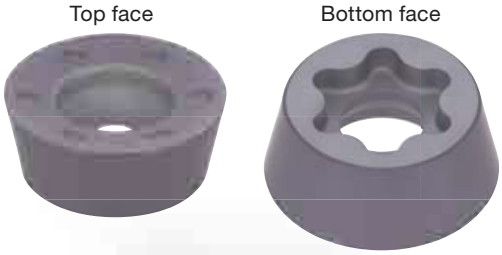
Incredible reliability when profile milling !

Ideal solution for three dime curved surfaces !

Innovative and safe anti-rotation system, featuring FIX insert location and higher clamping rigidity

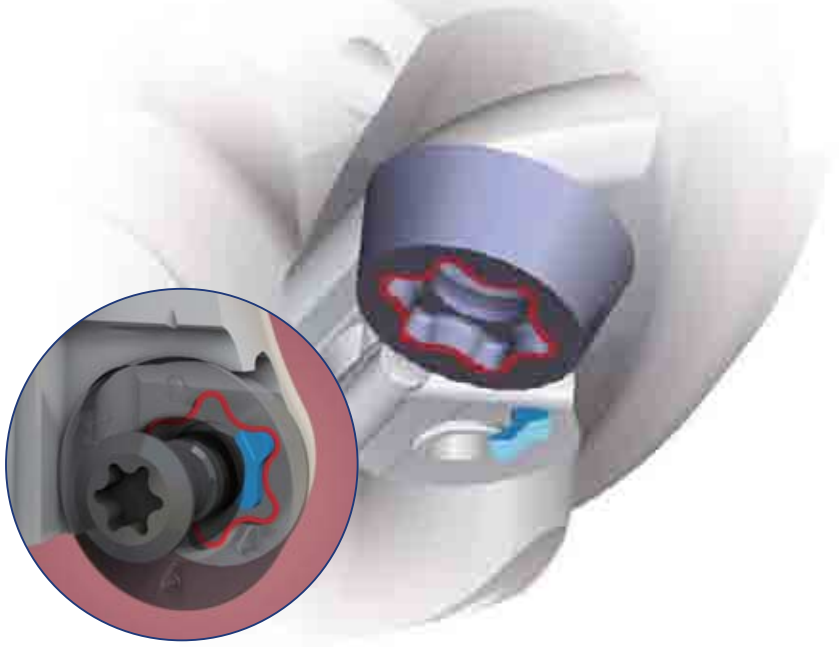
Anti-rotation system

- The fitting of protrusion and cavity guarantees secure indexing, which prevents insert rotation.
- The unique insert fixation in the pocket allows up to 6 indexes.
- Two types of chipbreakers are available,
  MJ: general purpose machining
  ML: low cutting force machining



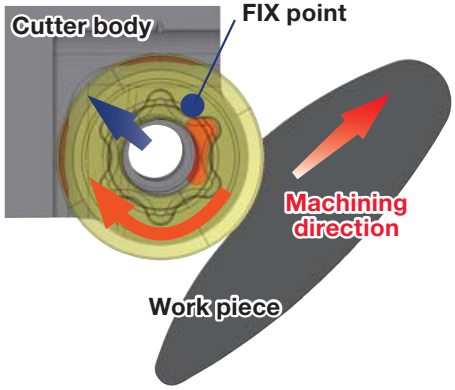
Simple, but rigid insert clamping system

- The FIX point of the protrusion and insert cavity ensures the cutting forces to push the insert to the pocket, offering rigid clamping.



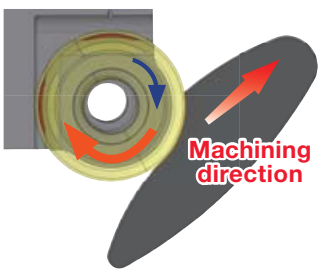
FIXRMILL

The cutting force pushes the insert into the insert seat, providing high clamping forces.



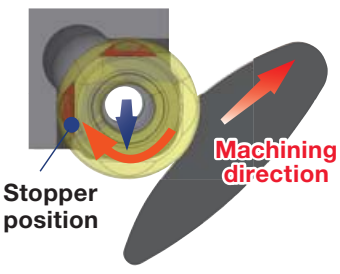
Screw-on clamping
(Without anti-rotating system)

Insert may rotate when machining.



Screw-on clamping + insert with flat contact face

Cutting force rotates the insert and reduces the contact area, making insert unstable



nsional cutting of

Grades

AH725

P K
Steel Cast Iron

For general purpose milling

- Provides high reliability in steel and cast iron machining
- Highly versatile grade with excellent wear and chipping resistance

AH130

M
Stainless

For general stainless steel milling

- Drastically reduces crater and notch wear
- Provides exceptionally reliable milling

Special Surface Technology
PREMIUMTEC
TUNGALOY

NEW

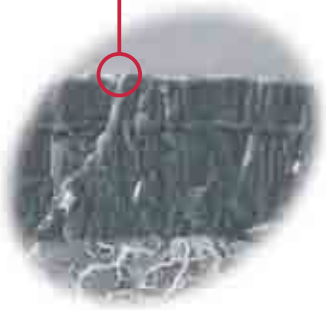
AH4035

M
Stainless

Ideal grade for high chromium content stainless steels

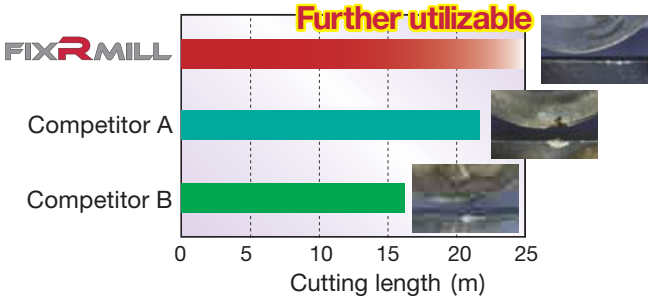
- Newly developed grade with exceptional balance of wear and chipping resistance.
- Drastically reduces flank wear and chipping, when machining stainless steels.

Special Surface Technology
PREMIUMTEC
TUNGALOY



■ Comparison of tool life

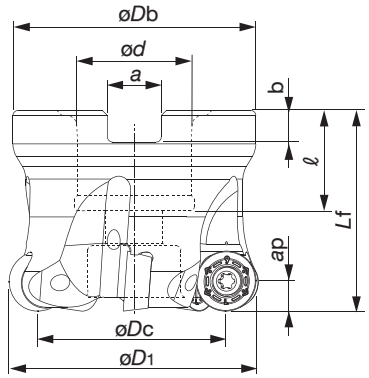
Longer tool life than competitor products



Cutter	: TRP12R050M22.0E05 (z = 5)
Insert	: RPMT1204EN-ML
Grade	: AH4035
Work material	: SUS420J1 / X20Cr13
Cutting speed	: *Vc* = 300 m/min
Feed per tooth	: *fz* = 0.5 mm/t
Depth of cut	: *ap* = 2.0 mm
Width of cut	: *ae* = 32.5 mm
Machine	: Horizontal M/C, BT40

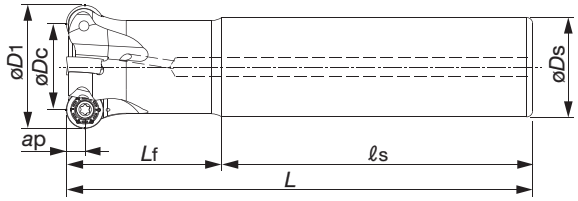
Cutter

Bore type



E/TRP12: Max. *ap* = 6.0 mm
E/TRP16: Max. *ap* = 8.0 mm

Shank type



Replacement parts

Description		Parts Cat. No.			
Applicable cutter		TRP12...	ERP12...	TRP16...	ERP16...
Clamping screw		CSTR-4L100		CSPB-5	
Wrench	Bit	BT15S	-	BLD IP20/S7	-
	Grip	H-TBS	-	H-TBS	-
Mono block type substitution wrench		-	T-15DB	-	IP-20D

Bore type

Cat. No.	Stock	No. of inserts	Dimensions (mm)								Weight (kg)	Air hole	Center bolt	Inserts
			øDc	*øD1*	*øDb*	*ød*	*ℓ*	*Lf*	*b*	*a*				
TRP12R050M22.0E05	●	5	38	50	47	22	20	40	6.3	10.4	0.3	with	CM10X30H	**RPMT1204EN-M***
TRP12R052M22.0E05	●	5	40	52	49	22	20	40	6.3	10.4	0.3			
TRP12R063M22.0E06	●	6	51	63	59	22	20	40	6.3	10.4	0.6			
TRP12R066M27.0E06	●	6	54	66	62	27	22	40	7	12.4	0.6		CM12X30H	
TRP16R063M22.0E05	●	5	47	63	59	22	20	40	6.3	10.4	0.6		CM10X30H	**RPMT1606EN-M***
TRP16R066M22.0E05	●	5	50	66	62	27	22	40	7	12.4	0.7		CM12X30H	

Shank type

Cat. No.	Stock	No. of inserts	Dimensions (mm)						Weight (kg)	Air hole	Inserts
			øDc	*øD1*	*øDs*	*ℓ* s	*Lf*	*L*			
ERP12R032M32.0-03	●	3	20	32	32	100	50	150	0.8	with	**RPMT1204EN-M***
ERP12R040M32.0-04	●	4	28	40	32	100	50	150	0.9		
ERP16R040M32.0-02	●	2	24	40	32	100	50	150	0.9		**RPMT1606EN-M***

Insert

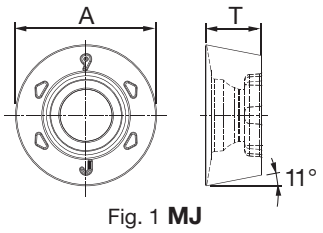


Fig. 1 **MJ**

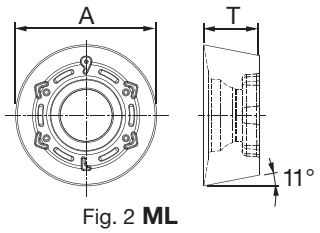
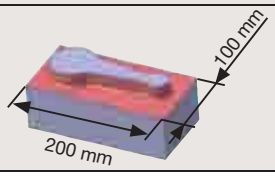
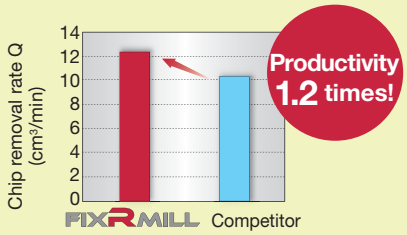
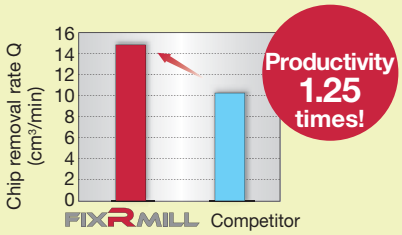


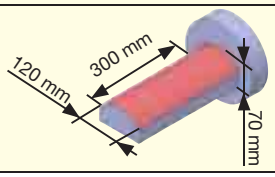
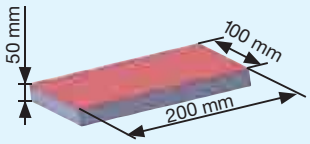
Fig. 2 **ML**

Cat. No.	Accuracy	Honing	Grades PREMIUMTEC			Dimensions (mm)		Shape	Cutters
			AH725	**AH4035**	**AH130**	A	T		
RPMT1204EN-MJ	**M**	with	●	●	●	12	4.76	Fig.1	**E/TRP12R**
RPMT1204EN-ML			●	●	●	12	4.76	Fig.2	
RPMT1606EN-MJ			●	●	●	16	6.35	Fig.1	**E/TRP16R**
RPMT1606EN-ML			●	●	●	16	6.35	Fig.2	

● : Stocked items

Practical examples

Workpiece type		Die	Machine part
Cutter		ERP12R032M32.0-03	TRP12R050M22.0E05
Insert		RPMT1204EN-ML	RPMT1204EN-ML
Grade		AH725	AH130
Work material		SKD61 / X40CrMoV5-1	Corrosion-resistant stainless steel
			
Cutting conditions	Cutting speed: *Vc* (m/min)	130	200
	Feed per tooth: *fz* (mm/t)	0.4	0.3
	Depth of cut: *ap* (mm)	1.0	1.0
	Width of cut: *ae* (mm)	26.0	< 50
	Method of machining	Profile milling	Profile milling on curved surface
	Coolant	Air blast	Wet
	Machine	Vertical M/C, BT40	5 axis M/C, BT50
Results		 Due to the high rigidity, 1.2 times higher productivity can be achieved without any chipping or vibration.	 Due to the high toughness and rigidity, higher cutting speed and feed is possible. This improves productivity by 25%.

Work piece type		Machine part	Machine part
Cutter		TRP12R050M22.0E05	TRP12R050M22.0E05
Insert		RPMT1204EN-MJ	RPMT1204EN-MJ
Grade		AH4035	AH725
Work material		SUS420J1 / X20Cr13	S55C / C55
			
Cutting conditions	Cutting speed: *Vc* (m/min)	300	160
	Feed per tooth: *fz* (mm/t)	0.5	0.5
	Depth of cut: *ap* (mm)	2.0	2.0
	Width of cut: *ae* (mm)	< 50	30.0
	Method of machining	Profile milling on curved surface	Face milling
	Coolant	Air blast	Air blast
	Machine	5 axis M/C, BT50	Vertical M/C, BT50
Results		 High wear resistance provides 1.15 times longer tool life.	 After 40 m of cutting, damage to the FixRMill is minimal and inserts can be utilized further. Competitor product has chipping after 14 m machining and has reached failure point.

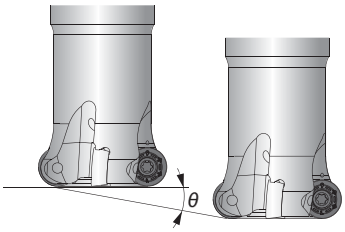
Standard cutting condition

Work material	Brinell hardness	Priority	Grade	Chip breaker	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)	
Carbon steels (S45C / C45, S55C / C55 etc.)	< 300 HB	First choice	**AH725**	**MJ**	120 - 250	0.3 - 0.7	
		for impact resistance	**AH130**	**MJ**	120 - 250	0.3 - 0.7	
Alloy steels (SCM440 / 42CrMo4, SCr415 / 17Cr3 etc.)	150 - 300 HB	First choice	**AH725**	**MJ**	100 - 250	0.2 - 0.6	
		for impact resistance	**AH130**	**MJ**	100 - 250	0.2 - 0.6	
Tool steels (SKD11 / X153CrMoV12 etc.)	< 300 HB	-	**AH725**	**ML**	80 - 180	0.2 - 0.4	
Stainless steels (SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3 etc.)	< 200 HB	First choice	**AH130**	**ML**	100 - 250	0.2 - 0.6	
		for impact resistance	**AH130**	**MJ**	100 - 250	0.2 - 0.6	
Stainless steels (SUS430 / X6Cr17 etc.)	< 200 HB	First choice	**AH4035**	**ML**	100 - 300	0.2 - 0.6	
		for impact resistance	**AH4035**	**MJ**	100 - 300	0.2 - 0.6	
Grey cast irons (FC250 / 250, FC300 / 300 etc.)	150 - 250 HB	-	**AH725**	**ML**	120 - 250	0.3 - 0.7	
Ductile cast irons (FCD400 / 400-15 etc.)	150 - 250 HB	-	**AH725**	**ML**	100 - 200	0.3 - 0.7	
Hardened steels (SKD61 / X40CrMoV5-1 etc.)	40 - 50 HRC	-	**AH725**	**MJ**	60 - 140	0.1 - 0.3	
Hardened steels (SKD11 / X153CrMoV12 etc.)	50 - 60 HRC	-	**AH725**	**MJ**	20 - 60	0.05 - 0.2	

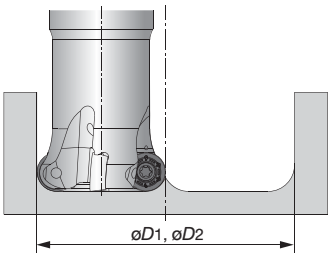
· Use air blast to remove chips from the work area in slot milling or pocketing operation.
· When machining at high cutting speeds of more than *Vc* = 1000 m/min, the dynamic balance of the tools must be adjusted.
· Cutting conditions are limited by machine power, workpiece rigidity and spindle output. When the cutting width or depth is large, set *Vc* and *fz* to the lower recommended values and check the machine power and vibration.

Application

■ Ramping



■ Helical contouring



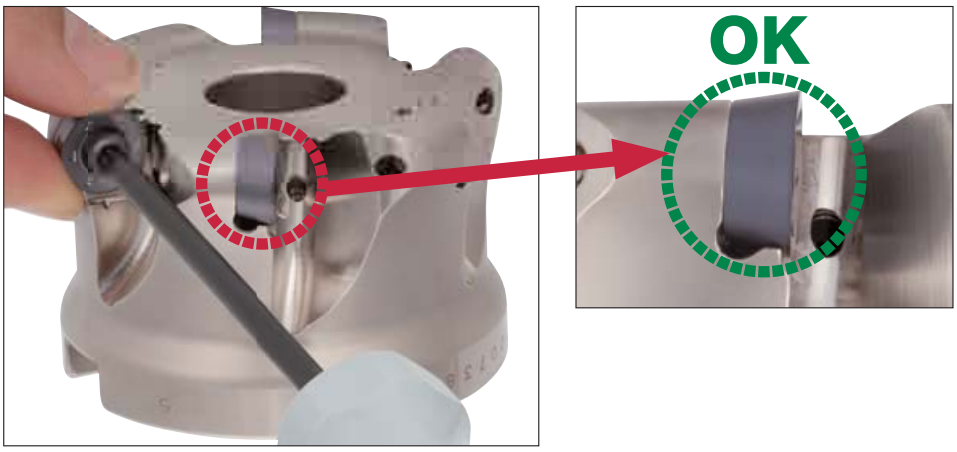
Cat. No.	Tool dia. *øDc* (mm)	Max. ramping angle *θ*	Min.machinable hole dia. *øD1* (mm)	Max.machinable hole dia. *øD2* (mm)
ERP12R032M32.0-03	32	8°	55	64
ERP12R040M32.0-04	40	6°	71	80
ERP16R040M32.0-02	40	7°	71	80
TRP12R050M22.0E05	50	3.5°	91	100
TRP12R052M22.0E05	52	3.5°	95	104
TRP12R063M22.0E06	63	2.5°	117	126
TRP12R066M22.0E06	66	2.5°	123	132
TRP16R063M22.0E05	63	3°	117	126
TRP16R066M22.0E05	66	3°	123	132

· When helical contouring, face milling on the bottom is required because uncut portions will remain around the center of the cavity.

	Tool dia.: ø*D*c (mm), Number of revolutions: *n* (min^{-1}), Feed speed: *V*f (mm/min), Depth of cut: *a*p = 2.0 mm														
	ø32		ø40			ø50		ø52		ø63			ø66		
	n	*V*f	*n*	*V*f		*n*	*V*f	*n*	*V*f	*n*	*V*f		*n*	*V*f	
				ERP12	ERP16						TRP12	TRP16		TRP12	TRP16
	1790	2690	1430	2860	1430	1150	2880	1100	2750	910	2730	2280	870	2610	2180
	*V*c = 180 m/min, *f*z = 0.5 mm/t														
	1790	2690	1430	2860	1430	1150	2880	1100	2750	910	2730	2280	870	2610	2180
	*V*c = 180 m/min, *f*z = 0.5 mm/t														
	1690	2030	1350	2160	1080	1080	2160	1040	2080	860	2060	1720	820	1970	1640
	*V*c = 170 m/min, *f*z = 0.4 mm/t														
	1690	2030	1350	2160	1080	1080	2160	1040	2080	860	2060	1720	820	1970	1640
	*V*c = 170 m/min, *f*z = 0.4 mm/t														
	1290	1160	1030	1240	620	830	1250	800	1200	660	1190	990	630	1130	950
	*V*c = 130 m/min, *f*z = 0.3 mm/t														
	1690	2030	1350	2160	1080	1080	2160	1040	2080	860	2060	1720	820	1970	1640
	*V*c = 170 m/min, *f*z = 0.4 mm/t														
	1690	2030	1350	2160	1080	1080	2160	1040	2080	860	2060	1720	820	1970	1640
	*V*c = 170 m/min, *f*z = 0.4 mm/t														
	1990	2390	1590	2540	1270	1270	2540	1220	2440	1010	2420	2020	960	2300	1920
	*V*c = 200 m/min, *f*z = 0.4 mm/t														
	1990	2390	1590	2540	1270	1270	2540	1220	2440	1010	2420	2020	960	2300	1920
	*V*c = 200 m/min, *f*z = 0.4 mm/t														
	1790	2690	1430	2860	1430	1150	2880	1100	2750	910	2730	2280	870	2610	2180
	*V*c = 180 m/min, *f*z = 0.5 mm/t														
	1490	2240	1190	2380	1190	950	2380	920	2300	760	2280	1900	720	2160	1800
	*V*c = 150 m/min, *f*z = 0.5 mm/t														
	990	590	800	640	320	640	640	610	610	510	610	510	480	580	480
	*V*c = 100 m/min, *f*z = 0.2 mm/t														
	400	140	320	150	75	250	150	240	144	200	140	120	190	137	114
	*V*c = 40 m/min, *f*z = 0.12 mm/t														

■ Notification point when clamping

· When installing the insert, please carefully locate the insert in the seat and fasten the screw.



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