

MillLine

FIXRMILL

www.tungaloyamerica.com

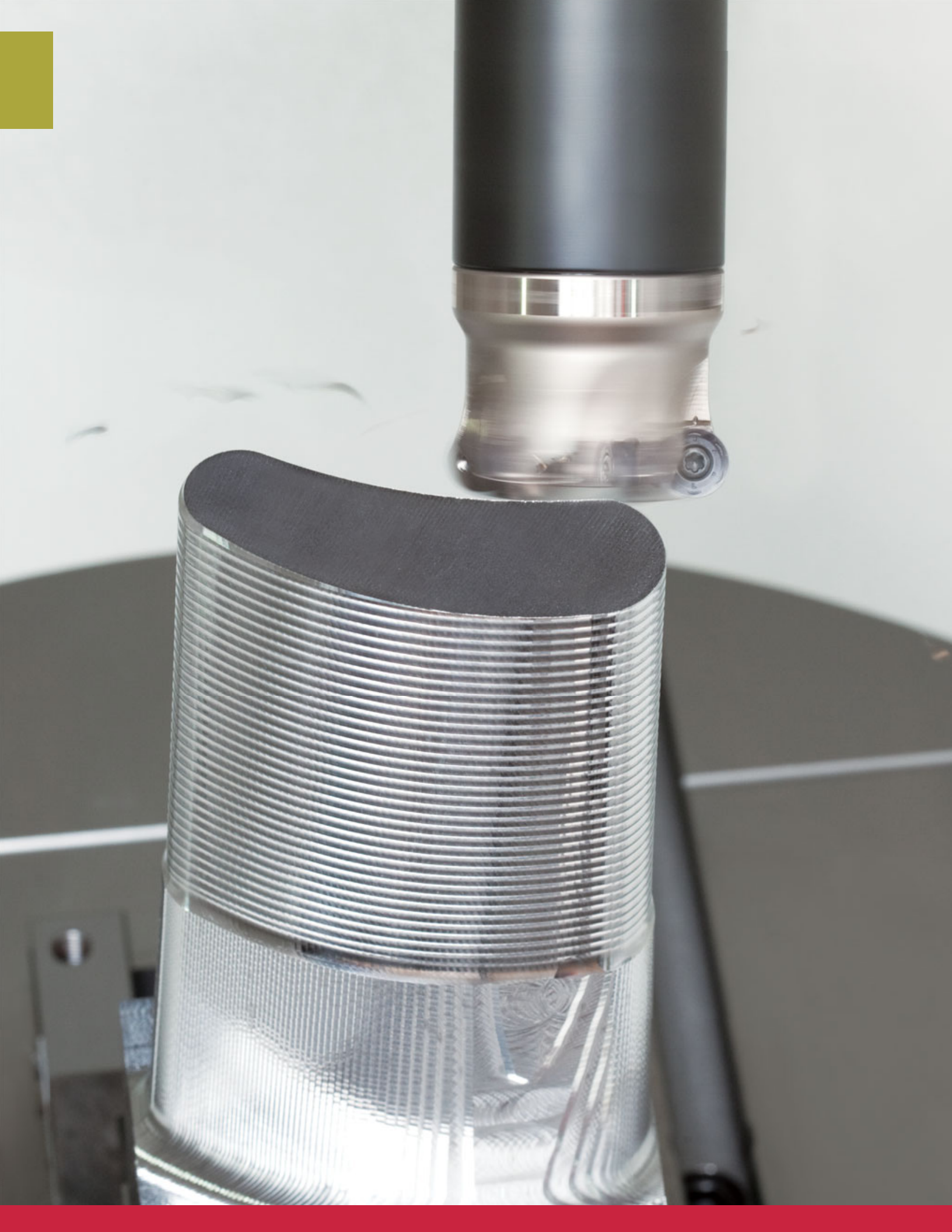
Tungaloy Report No. 418-US

FIXR-MILL

Incredible reliability when profile milling !



Member IMC Group
Tungaloy





**Ideal solution for three dimensional
machining of profile surfaces!**

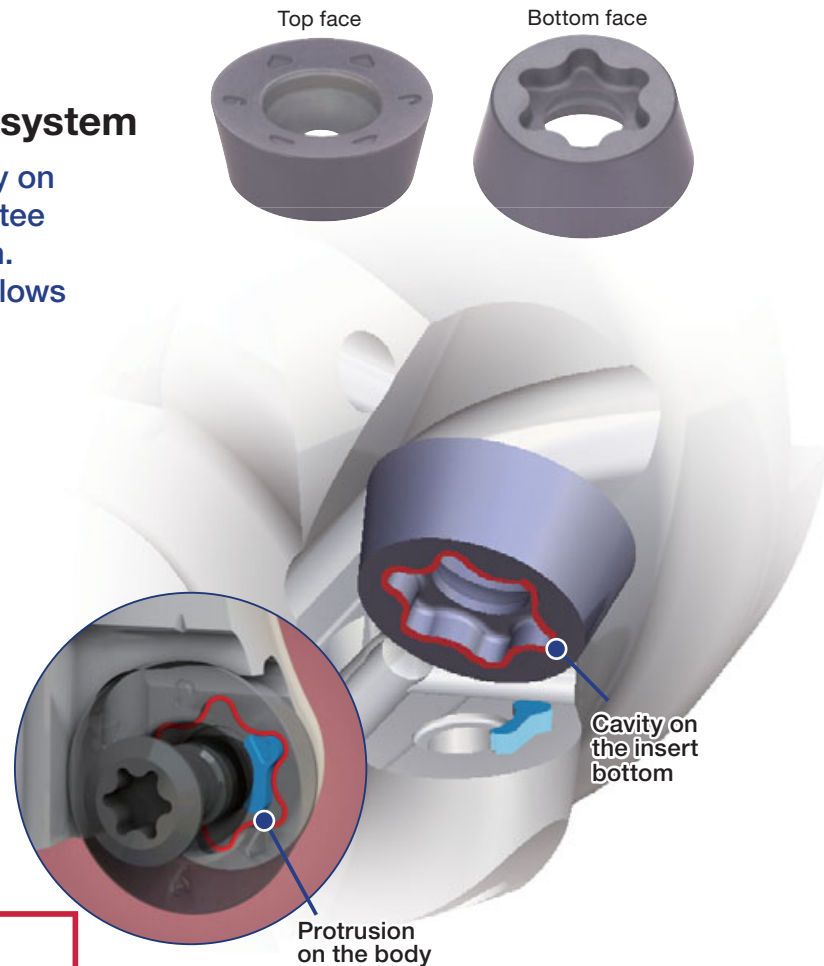
Innovative and safe anti-rotation system, featuring FIX insert location and higher clamping rigidity

Special inserts with anti-rotation system

- The protrusion on the body and the cavity on the insert bottom fit each other to guarantee exact indexing and prevent 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

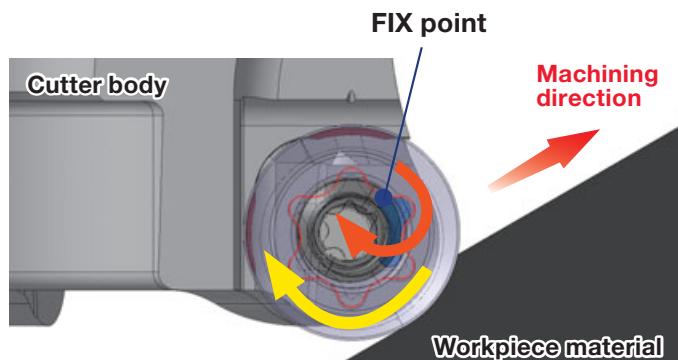
Rigid insert clamping system

- The location of the FIX point on the protrusion and the cavity ensures that the insert is pushed inside into the pocket due to the cutting forces, offering rigid clamping.



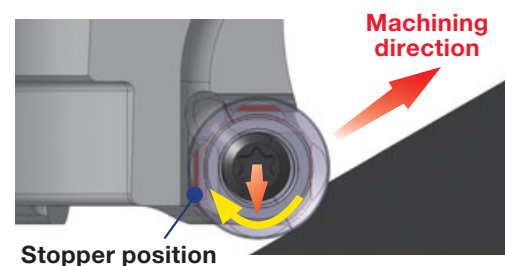
FIXR MILL

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



Screw-on clamping + problem with insert with flat contact face

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



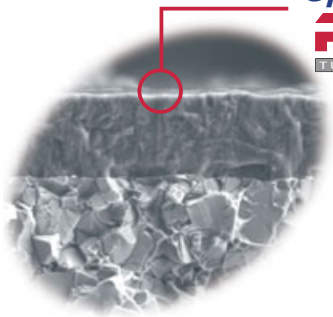
Grades

I AH725



For general purpose milling

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



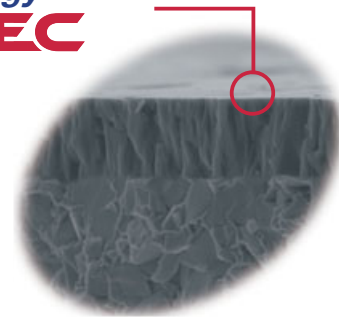
Special Surface Technology
PREMIUMTEC
TUNGALOY

I AH130



For stainless steel milling

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



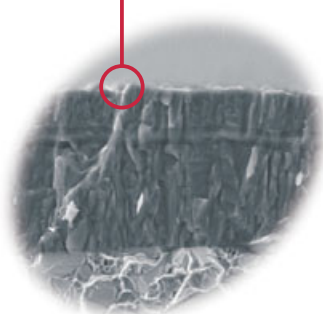
I AH4035



Ideal grade for high chromium content stainless steels

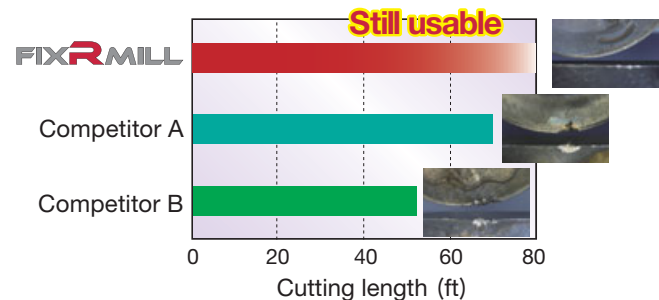
- Newly developed grade with exceptional balance of wear and chipping resistance.
- Drastically reduces flank wear and chipping, when machining stainless steels.

Special Surface Technology
PREMIUMTEC
TUNGALOY



■ Comparison of tool life

Longer tool life than competitor products

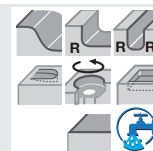
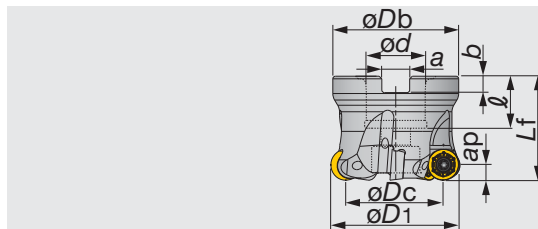


Cutter	: TRP12R200U0075A05 (z = 5)
Insert	: RPMT1204EN-ML
Grade	: AH4035
Workpiece material	: 420
Cutting speed	: $V_c = 1000$ sfm
Feed per tooth	: $f_z = 0.020$ ipt
Depth of cut	: $a_p = 0.080$ "
Width of cut	: $a_e = 1.280$ "
Machine	: Horizontal M/C, CAT40

TRP12/16

Radius cutter series bore type with anti-rotation system

A.R. = +4°, R.R. = -4°



Inch	Max. ap	ϕD_c	z	ϕD_1	ϕD_b	ϕd	ℓ	L_f	b	a	lb	Air hole	Insert
TRP12R200U0075A05	0.236	1.526	5	2.000	1.850	0.750	0.750	1.575	0.197	0.315	0.66	with	RPMT1204EN-M*
TRP12R250U0100A06	0.236	2.026	6	2.500	2.323	1.000	1.024	1.969	0.236	0.374	1.32	with	RPMT1204EN-M*
TRP16R250U0100A05	0.315	1.869	5	2.500	2.323	1.000	1.024	1.969	0.236	0.374	1.32	with	RPMT1606EN-M*

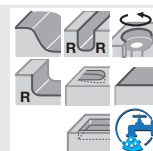
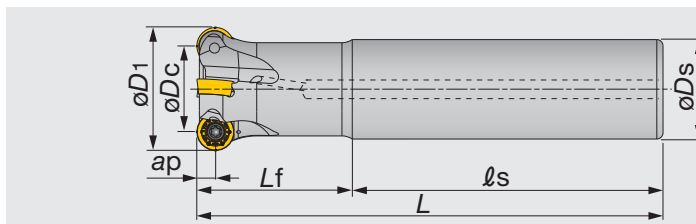
SPARE PARTS

Designation	Clamping screw	Grip	Lubricant	Center bolt (Optional parts)	Torx bit
TRP12R...	CSTR-4L100	H-TBS	M-1000	(C0.375X1.125H)	BT15S
TRP16R...	CSPB-5	H-TBS	M-1000	(C0.375X1.125H)	BLDIP20/S7

ERP10/12/16

Radius cutter series shank type with anti-rotation system

A.R. = +10° ~ +4°, R.R. = -2° ~ -8.5°



Inch	Max. ap	ϕD_c	z	ϕD_1	ϕD_s	ℓ_s	L_f	L	Air hole	Insert
ERP10R100U0100-02	0.197	0.606	2	1.000	1.000	4.000	2.000	6.000	with	RPMT10T3EN-M*
ERP10R125U0125-04	0.197	0.856	4	1.250	1.250	4.000	2.000	6.000	with	RPMT10T3EN-M*
ERP10R150U0125-04	0.197	1.106	4	1.500	1.250	4.000	2.000	6.000	with	RPMT10T3EN-M*
ERP12R125U0125-03	0.236	0.776	3	1.250	1.250	4.000	2.000	6.000	with	RPMT1204EN-M*
ERP12R150U0125-04	0.236	1.034	4	1.500	1.250	4.000	2.000	6.000	with	RPMT1204EN-M*
ERP16R150U0125-02	0.315	0.866	2	1.500	1.250	4.000	2.000	6.000	with	RPMT1606EN-M*

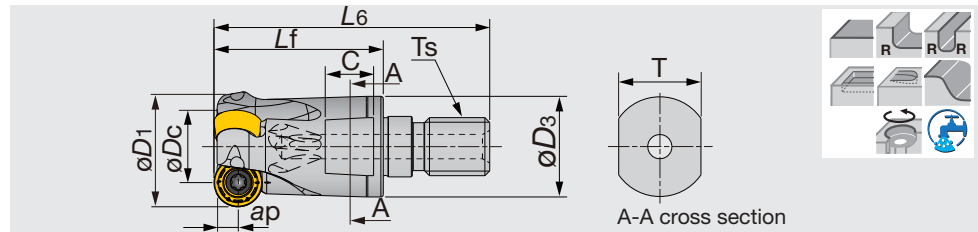
SPARE PARTS

Designation	Clamping screw	Lubricant	Wrench
ERP10R...	CSPB-3.5S	M-1000	IP-15D
ERP12R...	CSTR-4L100	M-1000	T-15DB
ERP16R...	CSPB-5	M-1000	IP-20D

HRP-M

Radius cutter series modular type (TungFlex) with anti-rotation system

A.R. = 1°~ 4°, R.R. = -8.5°~ 2°



Metric	Max. ap	øDc	z	øD1	L6	Lf	C	T	øD3	Ts	Kg	Air hole	Insert
HRP10R020MM10-02	5	10	2	20	49	30	10	15	17.8	M10	0.1	with	RPMT10T3...
HRP10R025MM12-02	5	15	2	25	57	35	10	17	20.8	M12	0.1	with	RPMT10T3...
HRP10R032MM16-04	5	22	4	32	63	40	12	22	28.8	M16	0.2	with	RPMT10T3...
HRP12R032MM16-03	6	20	3	32	63	40	12	22	28.8	M16	0.2	with	RPMT1204...

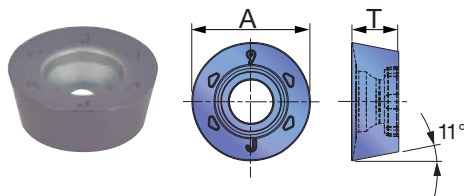
SPARE PARTS



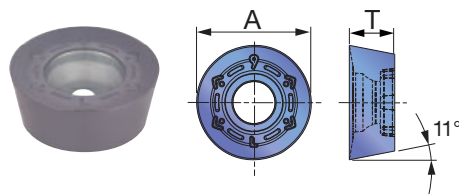
Designation	Clamping screw	Lubricant	Wrench	
			Bit	Grip
HRP10R...	CSPB-3.5S	M-1000	BLD IP15/S7	H-TBS
HRP12R...	CSTR-4L100	M-1000	BT15S	H-TBS

INSERT

RPMT-MJ



RPMT-ML



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

★ : First choice
☆ : Second choice

Designation	Max. ap	Coated										A	T
		AH130	AH725	AH4035									
RPMT10T3EN-MJ	0.197	●	●	●								0.394	0.156
RPMT10T3EN-ML	0.197	●	●	●								0.394	0.156
RPMT1204EN-MJ	0.236	●	●	●								0.472	0.187
RPMT1204EN-ML	0.236	●	●	●								0.472	0.187
RPMT1606EN-MJ	0.315	●	●	●								0.630	0.250
RPMT1606EN-ML	0.315	●	●	●								0.630	0.250

● : Line up

STANDARD CUTTING CONDITIONS

ISO	Workpiece material	Hardness	Priority	Grade	Chip-breaker	Cutting speed Vc (sfm)	Feed per tooth fz (ipt)
P	Carbon steels (1045, 1055 etc.)	< 300 HB	First choice	AH725	MJ	400 - 830	0.012 - 0.028
		< 300 HB	For impact resistance	AH130	MJ	400 - 830	0.012 - 0.028
	Alloy steels (4140(H) etc.)	150 - 300 HB	First choice	AH725	MJ	330 - 830	0.008 - 0.024
		150 - 300 HB	For impact resistance	AH130	MJ	330 - 830	0.008 - 0.024
	Tool steels (W1-10, M2 etc.)	< 300 HB	-	AH725	ML	260 - 590	0.008 - 0.016
M	Stainless steels (304, 316 etc.)	< 200 HB	First choice	AH130	ML	330 - 830	0.008 - 0.024
		< 200 HB	For impact resistance	AH130	MJ	330 - 830	0.008 - 0.024
	Stainless steels (420, 430 etc.)	< 200 HB	First choice	AH4035	ML	330 - 1000	0.008 - 0.024
		< 200 HB	For impact resistance	AH4035	MJ	330 - 1000	0.008 - 0.024
K	Gray cast irons (No.25, No.30 etc.)	150 - 250 HB	-	AH725	ML	400 - 830	0.012 - 0.028
	Ductile cast irons (60-40-18 etc.)	150 - 250 HB	-	AH725	ML	330 - 660	0.012 - 0.028
S	Heat-resistant alloys Inconel718, etc.	-	-	AH725	MJ	200 - 530	0.006 - 0.010
	Titanium alloys Ti-6Al-4V, etc.	-	-	AH725	ML	200 - 530	0.006 - 0.010
H	Hardened steels (H13 etc.)	40 - 50 HRC	-	AH725	MJ	200 - 460	0.004 - 0.012
	Hardened steels (D2 etc.)	50 - 60 HRC	-	AH725	MJ	70 - 200	0.002 - 0.008

- 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 = 3281 sfm, the dynamic balance of the tools must be adjusted.

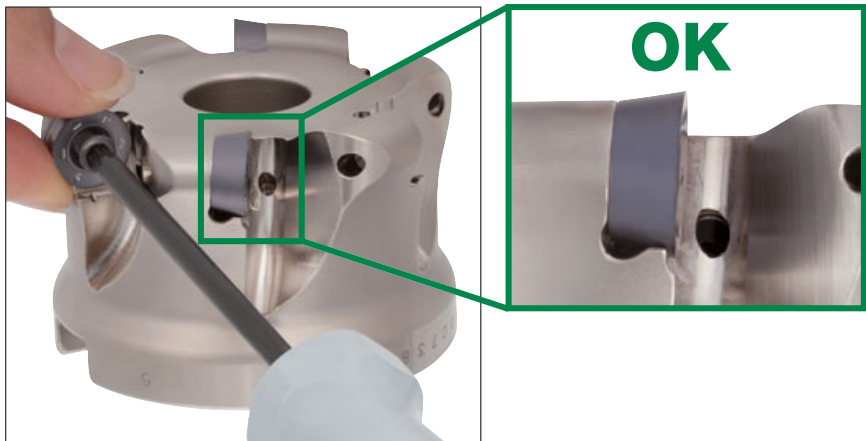
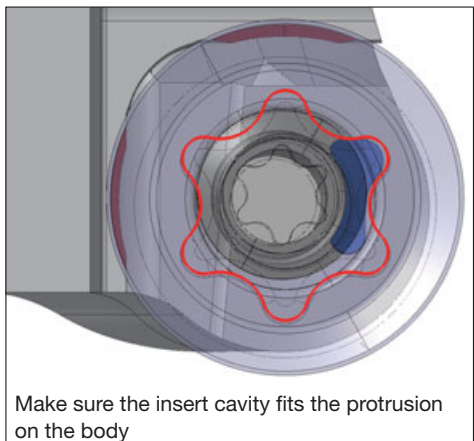
- Cutting conditions are limited by machine power, workpiece rigidity and spindle output. When the cutting width or depth is large, set Vc and fz to the lower recommended values and check the machine power and vibration.

Tool dia.: ϕD_c (in), Number of revolutions: n (rpm), Feed speed: V_f (ipm), Depth of cut: $a_p = 0.078"$

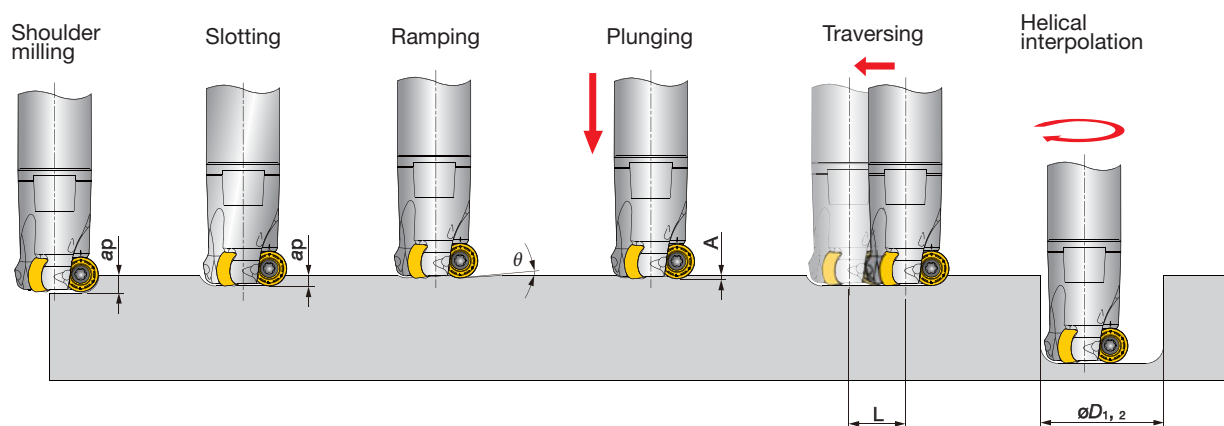
$\phi 1.000$		$\phi 1.250$		$\phi 1.500$		$\phi 2.000$		$\phi 2.500$	
n	V_f	n	V_f	n	V_f	n	V_f	n	V_f
			ERP10 ERP12		ERP10/12 ERP16				TRP12 TRP16
2250	90	1790	143 110	1430	120 60	1150	110	910	110 90
					$V_c = 590 \text{ sfm}, f_z = 0.020 \text{ ipt}$				
2250	90	1790	143 110	1430	120 60	1150	110	910	110 90
					$V_c = 590 \text{ sfm}, f_z = 0.020 \text{ ipt}$				
2140	68	1690	108 80	1350	90 45	1080	85	860	80 70
					$V_c = 560 \text{ sfm}, f_z = 0.016 \text{ ipt}$				
2140	51	1690	81 60	1350	90 45	1080	85	860	80 470
					$V_c = 560 \text{ sfm}, f_z = 0.012 \text{ ipt}$				
1600	38	1290	62 45	1030	50 25	830	50	660	45 40
					$V_c = 420 \text{ sfm}, f_z = 0.016 \text{ ipt}$				
2140	68	1690	108 80	1350	90 45	1080	52	860	80 70
					$V_c = 560 \text{ sfm}, f_z = 0.016 \text{ ipt}$				
2140	68	1690	108 80	1350	90 45	1080	52	860	80 70
					$V_c = 560 \text{ sfm}, f_z = 0.016 \text{ ipt}$				
2520	81	1990	127 95	1590	110 55	1270	100	1010	95 80
					$V_c = 660 \text{ sfm}, f_z = 0.016 \text{ ipt}$				
2520	81	1990	127 95	1590	110 55	1270	100	1010	95 80
					$V_c = 660 \text{ sfm}, f_z = 0.016 \text{ ipt}$				
2250	90	1790	143 110	1430	120 60	1150	110	910	110 90
					$V_c = 590 \text{ sfm}, f_z = 0.020 \text{ ipt}$				
1910	76	1490	119 90	1190	100 50	950	90	760	90 75
					$V_c = 500 \text{ sfm}, f_z = 0.020 \text{ ipt}$				
1340	21	1070	34 25	890	28 14	670	27	530	25 21
					$V_c = 350 \text{ sfm}, f_z = 0.008 \text{ ipt}$				
1340	21	1070	34 25	890	28 14	670	27	530	25 21
					$V_c = 350 \text{ sfm}, f_z = 0.008 \text{ ipt}$				
1260	20	990	32 25	800	25 15	640	25	510	25 20
					$V_c = 330 \text{ sfm}, f_z = 0.008 \text{ ipt}$				
530	5	400	8 6	320	10 5	250	10	200	10 8
					$V_c = 140 \text{ sfm}, f_z = 0.005 \text{ ipt}$				

Notification for clamping

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



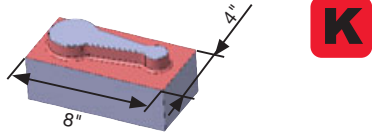
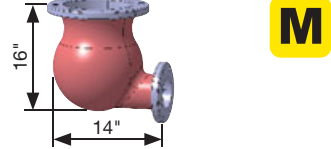
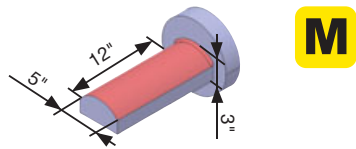
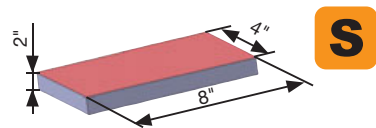
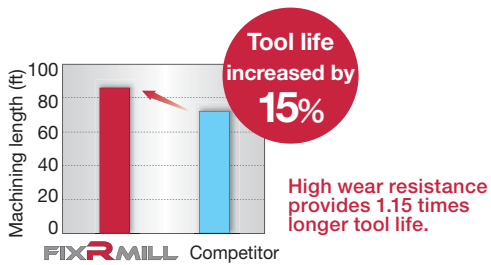
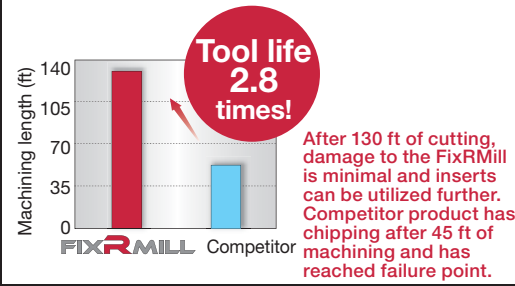
APPLICATION RANGE



Inch	Tool- ϕ ϕD_c (in)	Max. depth of cut a_p (in)	Max. ramping angle θ°	Max. plunging depth A (in)	Machining length for removing uncut portion L (in)	Min. machining diameter ϕD_1 (in)	*Max. machining diameter ϕD_2 (in)
ERP10R100U0100-02	1.000	0.197	3	0.0276	0.630	1.457	1.969
ERP10R125U0125-04	1.250	0.197	8	0.0984	0.866	1.811	2.441
ERP10R150U0125-04	1.500	0.197	6	0.0984	1.142	2.283	2.953
ERP12R125U0125-03	1.250	0.236	8.3	0.0906	0.787	1.693	2.441
ERP12R150U0125-04	1.500	0.236	4	0.0630	1.063	2.244	2.953
ERP16R150U0125-02	1.500	0.315	6	0.0709	0.906	2.008	2.953
TRP12R200U0075A05	2.000	0.236	4	0.0984	1.575	3.189	3.937
TRP12R250U0100A06	2.500	0.236	2.7	0.0906	2.047	4.213	4.921
TRP16R250U0100A05	2.500	0.315	3	0.0906	1.890	3.976	4.921

*For flat bottom hole

Practical examples

Work piece type		Die	Machine part
Cutter		ERP12R125U0125-03	TRP12R200U0075A05
Insert		RPMT1204EN-ML	RPMT1204EN-ML
Grade		AH725	AH130
Work material		H13	Corrosion-resistant stainless steel
			
Cutting conditions	Cutting speed: V_c (sfm)	430	660
	Feed per tooth: f_z (ipt)	0.016	0.012
	Depth of cut: ap (inch)	0.039	0.039
	Width of cut: ae (inch)	1.0	< 2.0
	Method of machining	Profile milling	Profile milling on curved surface
	Coolant	Air blast	Wet
	Machine	Vertical M/C, CAT40	5 axis M/C, CAT50
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		TRP12R200U0075A05	TRP12R200U0075A05
Insert		RPMT1204EN-MJ	RPMT1204EN-MJ
Grade		AH4035	AH725
Work material		420	1055
			
Cutting conditions	Cutting speed: V_c (sfm)	1000	530
	Feed per tooth: f_z (ipt)	0.020	0.020
	Depth of cut: ap (inch)	0.079	0.079
	Width of cut: ae (inch)	< 2.0	1.2
	Method of machining	Profile milling on curved surface	Face milling
	Coolant	Air blast	Air blast
	Machine	5 axis M/C, CAT50	Vertical M/C, CAT50
Results		 High wear resistance provides 1.15 times longer tool life.	 After 130 ft of cutting, damage to the FixRMILL is minimal and inserts can be utilized further. Competitor product has chipping after 45 ft of machining and has reached failure point.

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