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MillLine

MILLLINE

Tungaloy Report No. 418-G

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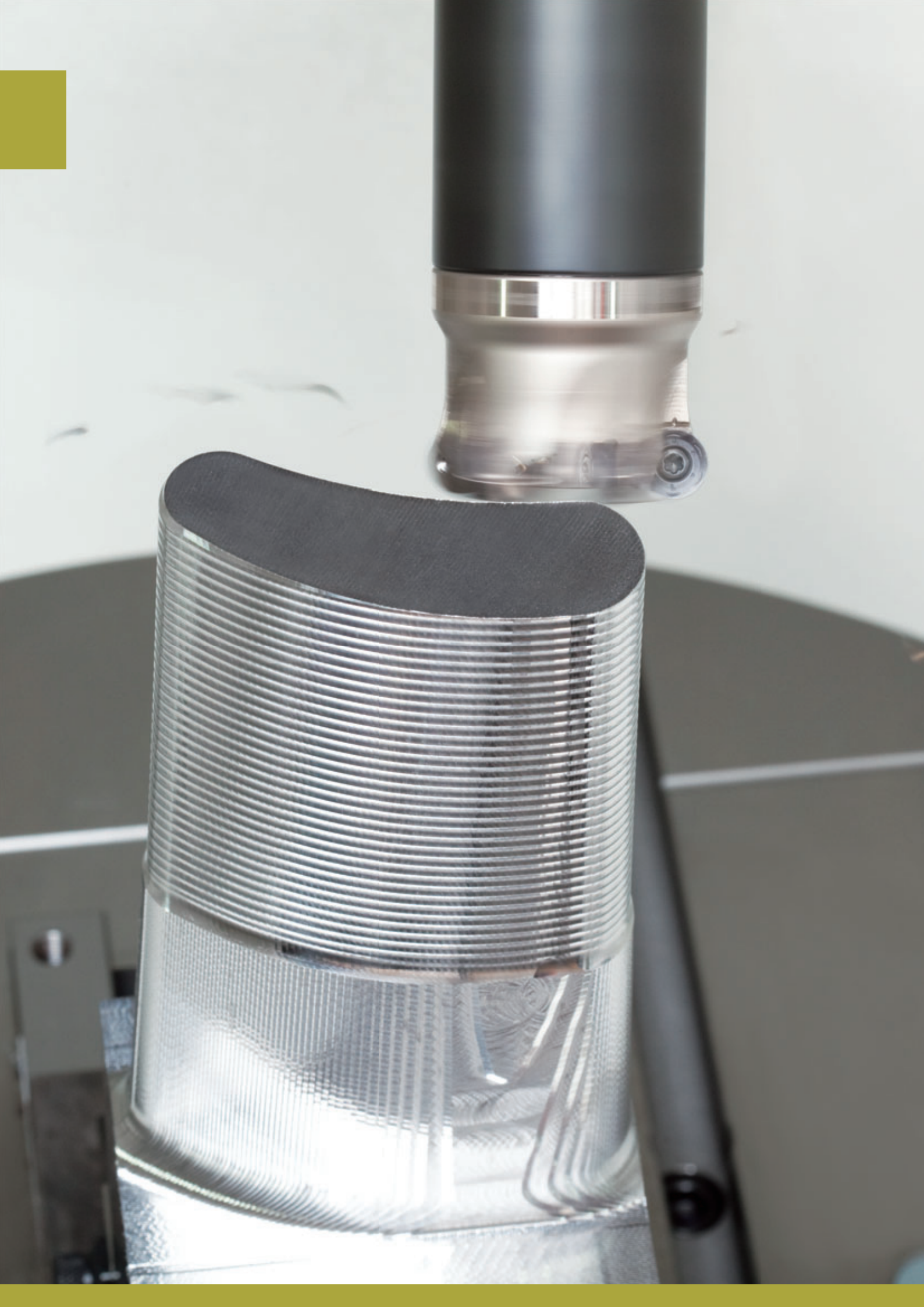
Incredible reliability
in profile milling!



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MillLine

FIXRMILL

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Ideal solution for three dimensional machining of profile surfaces!

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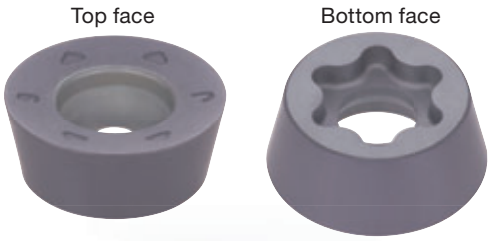
FIXRMILL
TUNGALOY

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

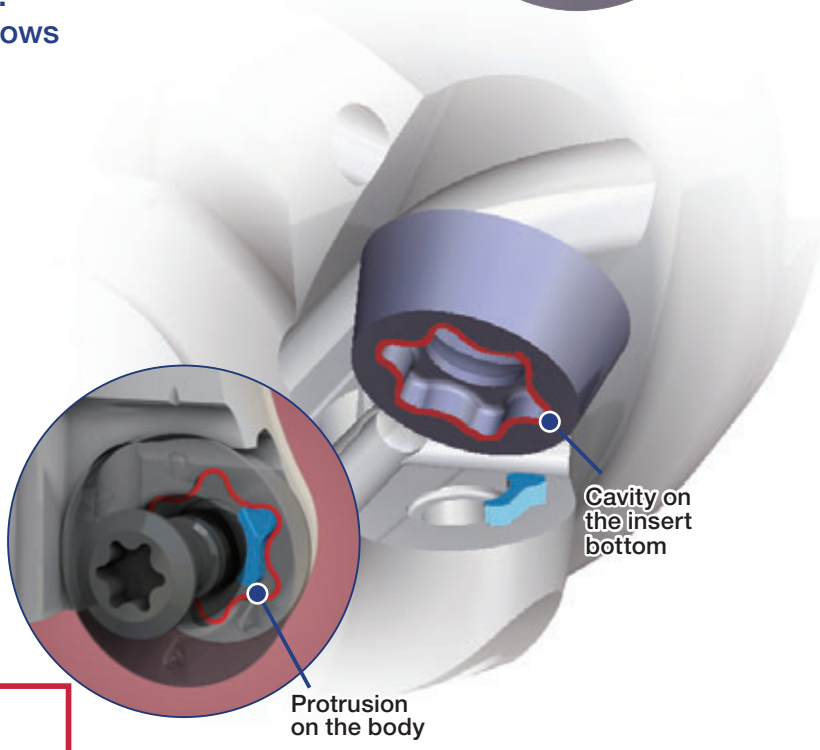
Special inserts with anti-rotation system

- 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.



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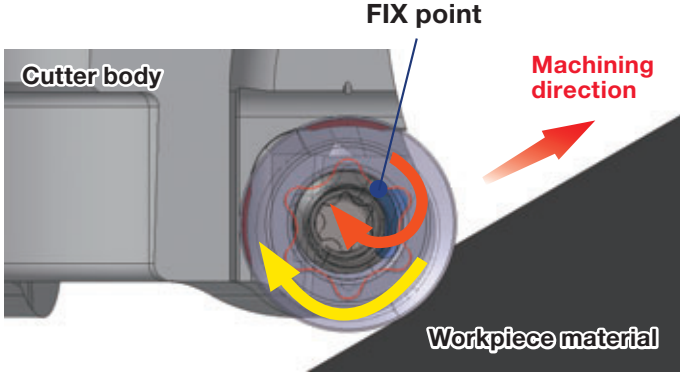
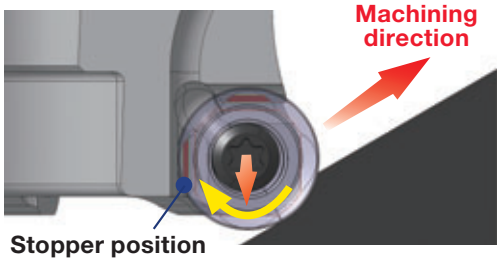
The cutting force pushes the insert into the insert seat, providing high clamping forces.



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

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



Grades

AH725

P Steel K 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

- Reduces crater and notch wear
- Provides exceptionally reliable milling

Special Surface Technology
PREMIUMTEC
TUNGALOY

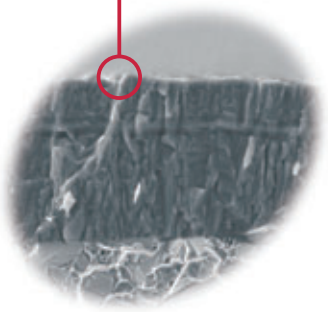
AH4035

M Stainless

Ideal grade for high chromium content stainless steels

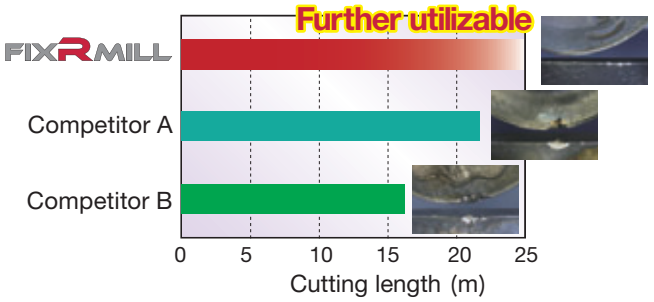
- Newly developed grade with exceptional balance of wear and chipping resistance
- Drastically reduces flank wear and chipping when machining stainless steels

Special Surface Technology
PREMIUMTEC
TUNGALOY



■ Comparison of tool life

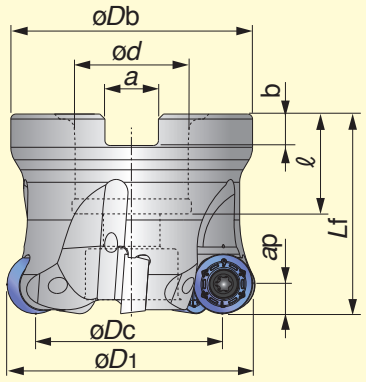
Longer tool life than competitors' products



Cutter	: TRP12R050M22.0E05 (z = 5)
Insert	: RPMT1204EN-ML
Grade	: AH4035
Workpiece	: 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



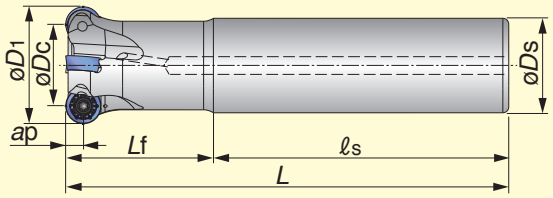
TRP10: Max. *ap* = 5 mm
TRP12: Max. *ap* = 6 mm
TRP16: Max. *ap* = 8 mm

Parts

Description		Parts Cat. No.		
Applicable cutter		**TRP10...**	**TRP12...**	**TRP16...**
Clamping screw		**CSPB-3.5S**	**CSTR-4L100**	**CSPB-5**
Wrench	Bit	**BLD IP15/S7**	**BT15S**	**BLD IP20/S7**
	Grip	**H-TBS**	**H-TBS**	**H-TBS**
Mono block type substitution wrench		-	-	-

Cat. No.	Stock	No. of inserts	Dimensions (mm)								Weight (kg)	Air hole	Center bolt	Inserts
			øD1	*øDc*	*øDb*	*ød*	*ℓ*	*Lf*	*b*	*a*				
TRP10R040M16.0E05	●	5	40	30	35	16	18	40	5.6	8.4	0.2	with	FSHM8-30H	RPMT10T3EN-M*
TRP12R050M22.0E05	●	5	50	38	47	22	20	40	6.3	10.4	0.3	with	CM10X30H	RPMT1204EN-M*
TRP12R052M22.0E05	●	5	52	40	49	22	20	40	6.3	10.4	0.3	with	CM10X30H	RPMT1204EN-M*
TRP12R063M22.0E06	●	6	63	51	59	22	20	40	6.3	10.4	0.6	with	CM10X30H	RPMT1204EN-M*
TRP12R066M27.0E06	●	6	66	54	62	27	22	40	7	12.4	0.6	with	CM12X30H	RPMT1204EN-M*
TRP16R063M22.0E05	●	5	63	47	59	22	20	40	6.3	10.4	0.6	with	CM10X30H	RPMT1606EN-M*
TRP16R066M27.0E05	●	5	66	50	62	27	22	40	7	12.4	0.7	with	CM12X30H	RPMT1606EN-M*

Shank type



ERP10: Max. *ap* = 5 mm
ERP12: Max. *ap* = 6 mm
ERP16: Max. *ap* = 8 mm

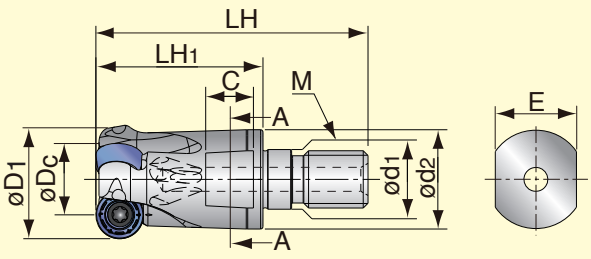
Parts

Description		Parts Cat. No.		
Applicable cutter		**ERP10...**	**ERP12...**	**ERP16...**
Clamping screw		**CSPB-3.5S**	**CSTR-4L100**	**CSPB-5**
Wrench	Bit	**BLD IP15/S7**	-	-
	Grip	**H-TBS**	-	-
Mono block type substitution wrench		-	**T-15DB**	**IP-20D**

Cat. No.	Stock	No. of inserts	Dimensions (mm)						Weight (kg)	Air hole	Inserts
			øD1	*øDc*	*øDs*	*ℓ* s	*Lf*	*L*			
NEW **ERP10R020M20.0-02**	●	2	20	10	25	100	50	150	0.3	with	RPMT10T3EN-M*
NEW **ERP10R025M25.0-02**	●	2	25	15	32	100	60	150	0.5	with	RPMT10T3EN-M*
NEW **ERP10R032M32.0-04**	●	4	32	22	32	100	70	150	0.8	with	RPMT10T3EN-M*
NEW **ERP10R035M32.0-04**	●	4	35	25	32	100	50	150	0.9	with	RPMT10T3EN-M*
ERP12R025M25.0-02	★	2	25	13	25	100	50	150	0.6	with	RPMT1204EN-M*
ERP12R032M32.0-03	●	3	32	20	32	100	50	150	0.8	with	RPMT1204EN-M*
ERP12R040M32.0-04	●	4	40	28	32	100	50	150	0.9	with	RPMT1204EN-M*
ERP16R040M32.0-02	●	2	40	24	32	100	50	150	0.9	with	RPMT1606EN-M*

● : Stocked items
★ : Available in 2015

Modular type



A-A cross section

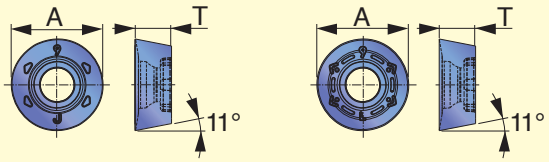
HRP10: Max. *ap* = 5 mm
HRP12: Max. *ap* = 6 mm

Parts

Description		Parts Cat. No.	
Applicable cutter		**HRP10R...**	**HRP12R...**
Clamping screw		**CSPB-3.5S**	**CSTR-4L100**
Wrench	Bit	**BLD IP15/S7**	**BT15S**
	Grip	**H-TBS**	**H-TBS**

Cat. No.	Stock	No. of Inserts	Dimensions (mm)									Weight (kg)	Air hole	Applicable Insert
			øD1	*øDc*	LH	LH1	C	E	*ød1*	*ød2*	M			
HRP10R020MM10-02	●	2	20	10	49	30	10	15	10.5	17.8	M10	0.1	with	RPMT10T3EN-M*
HRP10R025MM12-02	●	2	25	15	57	35	10	17	12.5	20.8	M12	0.1	with	RPMT10T3EN-M*
HRP10R032MM16-04	●	4	32	22	63	40	12	22	17.0	28.8	M16	0.2	with	RPMT10T3EN-M*
HRP12R025MM12-02	★	2	25	13	57	35	10	17	12.5	20.8	M12	0.2	with	RPMT1204EN-M*
HRP12R032MM16-03	●	3	32	20	63	40	12	22	17.0	28.8	M16	0.2	with	RPMT1204EN-M*

Insert



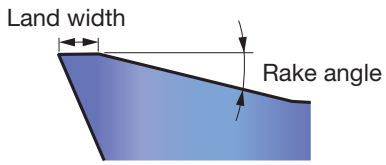
MJ **ML**

Cat. No.	Accuracy	Honing	Grades PREMIUMTEC			Dimensions (mm)		Cutters
			AH725	**AH4035**	**AH130**	A	T	
RPMT10T3EN-MJ	M	with	●	●	●	10	3.97	H/E/TRP10R...
RPMT10T3EN-ML	M	with	●	●	●	10	3.97	H/E/TRP10R...
RPMT1204EN-MJ	M	with	●	●	●	12	4.76	H/E/TRP12R...
RPMT1204EN-ML	M	with	●	●	●	12	4.76	H/E/TRP12R...
RPMT1606EN-MJ	M	with	●	●	●	16	6.35	E/TRP16R
RPMT1606EN-ML	M	with	●	●	●	16	6.35	E/TRP16R

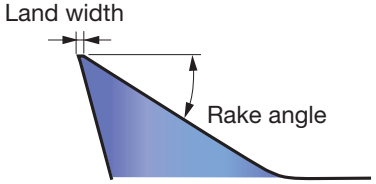
● : Stocked items
★ : Available in 2015

Chipbreaker

MJ chipbreaker



ML chipbreaker



Standard cutting condition

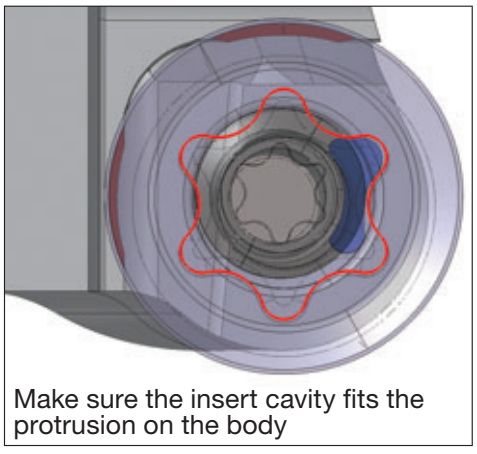
ISO	Workpiece material	Hardness	Priority	Grade	Chip-breaker	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
P	Carbon steels (S45C / C45, S55C / C55 etc.)	< 300 HB	First choice	**AH725**	**MJ**	120 - 250	0.3 - 0.7
		< 300 HB	for impact resistance	**AH130**	**MJ**	120 - 250	0.3 - 0.7
	Alloy steels (SCM440 / 42CrMo4, SCr415 / 17Cr3 etc.)	150 - 300 HB	First choice	**AH725**	**MJ**	100 - 250	0.2 - 0.6
		150 - 300 HB	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
M	Stainless steels (SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3 etc.)	< 200 HB	First choice	**AH130**	**ML**	100 - 250	0.2 - 0.6
		< 200 HB	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
		< 200 HB	for impact resistance	**AH4035**	**MJ**	100 - 300	0.2 - 0.6
K	Grey cast irons (FC250 / GG25 / 250 etc.)	150 - 250 HB	-	**AH725**	**ML**	120 - 250	0.3 - 0.7
	Ductile cast irons (FCD400 / GGG40 etc.)	150 - 250 HB	-	**AH725**	**ML**	100 - 200	0.3 - 0.7
H	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.

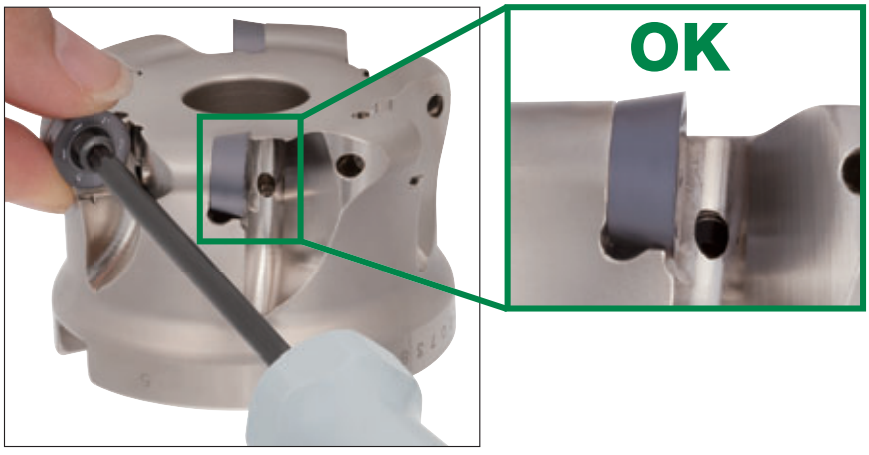
Tool dia.: øDc (mm), Number of revolutions: n (min-1), Feed speed: Vf (mm/min), Depth of cut: ap = 2.0 mm																
ø20		ø25		ø32			ø35		ø40				ø50		ø63	
n	Vf	n	Vf	n	Vf		n	Vf	n	Vf			n	Vf	n	Vf	
	E/HRP10		E/HRP10, E/HRP12		E/HRP10	E/HRP12		ERP10		TRP10	ERP12	ERP16		ERP12		TRP12	TRP16
2870	2870	2290	2290	1790	3580	2690	1640	3280	1430	3580	2860	1430	1150	2880	910	2730	2280
Vc = 180 m/min, fz = 0.5 mm/t																	
2870	2870	2290	2290	1790	3580	2690	1640	3280	1430	3580	2860	1430	1150	2880	910	2730	2280
Vc = 180 m/min, fz = 0.5 mm/t																	
2710	2160	2170	1740	1690	2700	2030	1550	2480	1350	2700	2160	1080	1080	2160	860	2060	1720
Vc = 170 m/min, fz = 0.4 mm/t																	
2710	2160	2170	1740	1690	2700	2030	1550	2480	1350	2700	2160	1080	1080	2160	860	2060	1720
Vc = 170 m/min, fz = 0.4 mm/t																	
2070	1240	1660	1000	1290	1550	1160	1180	1420	1030	1550	1240	620	830	1250	660	1190	990
Vc = 130 m/min, fz = 0.3 mm/t																	
2710	2160	2170	1740	1690	2700	2030	1550	2480	1350	2700	2160	1080	1080	2160	860	2060	1720
Vc = 170 m/min, fz = 0.4 mm/t																	
2710	2160	2170	1740	1690	2700	2030	1550	2480	1350	2700	2160	1080	1080	2160	860	2060	1720
Vc = 170 m/min, fz = 0.4 mm/t																	
3180	2540	2550	2040	1990	3180	2390	1820	2910	1590	3180	2540	1270	1270	2540	1010	2420	2020
Vc = 200 m/min, fz = 0.4 mm/t																	
3180	2540	2550	2040	1990	3180	2390	1820	2910	1590	3180	2540	1270	1270	2540	1010	2420	2020
Vc = 200 m/min, fz = 0.4 mm/t																	
2870	2870	2290	2290	1790	3580	2690	1640	3280	1430	3580	2860	1430	1150	2880	910	2730	2280
Vc = 180 m/min, fz = 0.5 mm/t																	
2390	2390	1910	1910	1490	2980	2240	1360	2720	1190	2980	2380	1190	950	2380	760	2280	1900
Vc = 150 m/min, fz = 0.5 mm/t																	
1590	630	1270	510	990	790	590	910	730	800	800	640	320	640	640	510	610	510
Vc = 100 m/min, fz = 0.2 mm/t																	
640	150	510	120	400	190	140	360	170	320	190	150	75	250	150	200	140	120
Vc = 40 m/min, fz = 0.12 mm/t																	

■ Notification for clamping

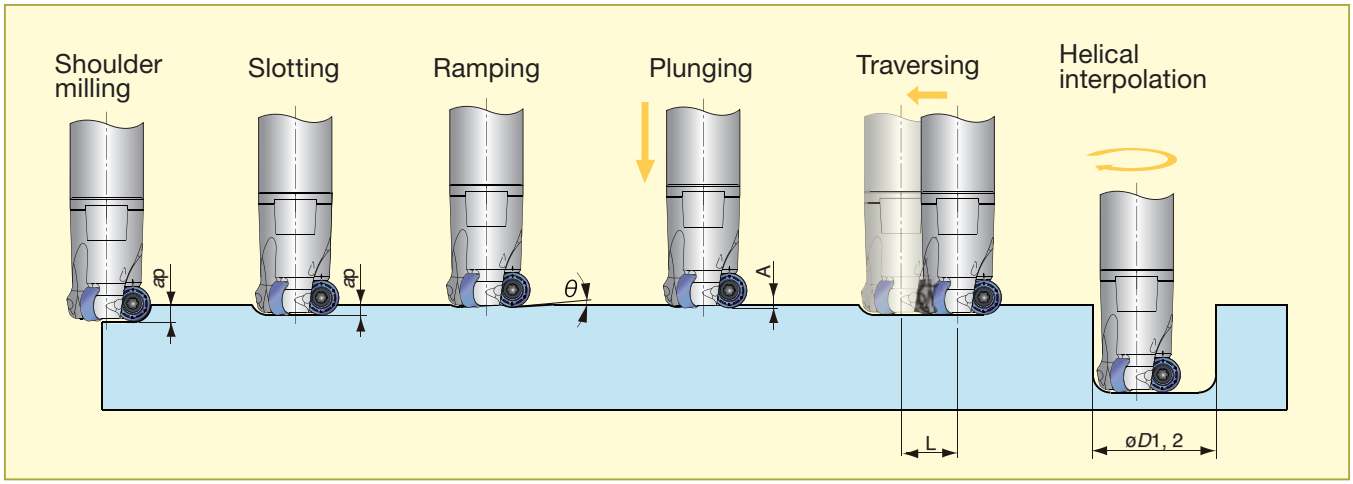
· When installing the insert, please carefully locate the insert in the seat and fasten the screw.



Make sure the insert cavity fits the protrusion on the body



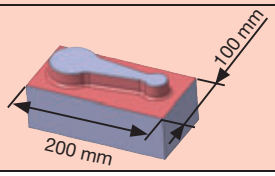
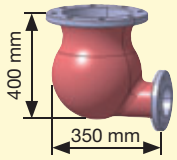
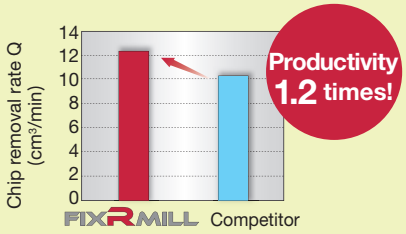
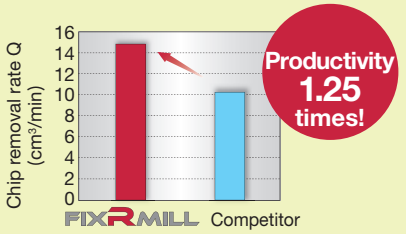
Machining applications

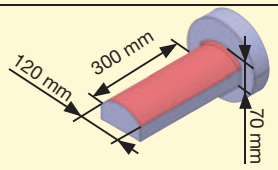
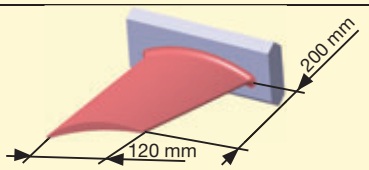
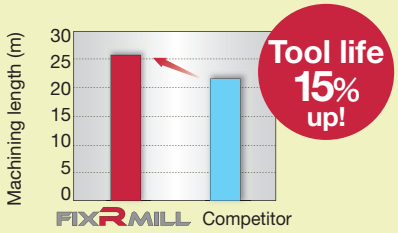
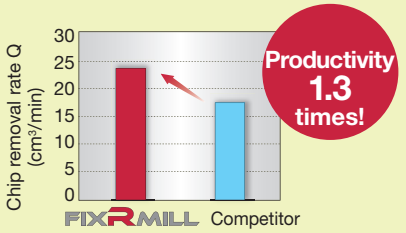


Cat. No.	Tool-ø øDc (mm)	Max. depth of cut ap (mm)	Max. ramping angle θ	Max. plunging A (mm)	Machining length for removing uncut portion L (mm)	Min. machining øD1 (mm)	*Max. machining øD2 (mm)
ERP10R020M20.0-02	20	5	2.2°	0.3	12	27	39
HRP10R020MM10-02	20	5	2.2°	0.3	12	27	39
ERP10R025M25.0-02	25	5	3.4°	0.7	16	35	49
HRP10R025MM12-02	25	5	3.4°	0.7	16	35	49
ERP12R025M25.0-02	25	6	4.4°	0.7	14	33	49
HRP12R025MM12-02	25	6	4.4°	0.7	14	33	49
ERP10R032M32.0-04	32	5	8.0°	2.5	23	46	63
HRP10R032MM16-04	32	5	8.0°	2.5	23	46	63
ERP10R035M32.0-04	35	5	8.2°	3.0	26	51	69
ERP12R032M32.0-03	32	6	10°	2.7	21	53	63
HRP12R032MM16-03	32	6	10°	2.7	21	53	63
ERP12R040M32.0-04	40	6	6.6°	2.7	29	59	79
ERP16R040M32.0-02	40	8	8.4°	2.7	25	53	79
TRP10R040M16.0E05	40	5	6.5°	3.0	31	61	79
TRP12R050M22.0E05	50	6	4.5°	2.7	39	79	99
TRP12R052M22.0E05	52	6	4.0°	2.7	41	83	103
TRP12R063M22.0E06	63	6	3.3°	2.7	52	105	125
TRP12R066M27.0E06	66	6	3.0°	2.7	55	111	131
TRP16R063M22.0E05	63	8	3.6°	2.7	48	99	125
TRP16R066M27.0E05	66	8	3.4°	2.7	51	105	131

*For flat bottom hole

Practical examples

Workpiece type		Die	Machine part
Cutter		ERP12R032M32.0-03	TRP12R050M22.0E05
Insert		RPMT1204EN-ML	RPMT1204EN-ML
Grade		AH725	AH130
Workpiece material		SKD61 / X40CrMoV5-1	Corrosion-resistant stainless steel
		 K	 M
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%.

Workpiece type		Machine part	Blade
Cutter		TRP12R050M22.0E05	ERP10R032M32.0-04
Insert		RPMT1204EN-MJ	RPMT10T3EN-ML
Grade		AH4035	AH4035
Workpiece material		SUS420J1 / X20Cr13	Martensitic stainless steel
		 M	 M
Cutting conditions	Cutting speed: *Vc* (m/min)	300	275
	Feed per tooth: *fz* (mm/t)	0.5	0.11
	Depth of cut: *ap* (mm)	2.0	0.5 - 1.0
	Width of cut: *ae* (mm)	< 50	< 32
	Method of machining	Profile milling on curved surface	Profile milling on curved surface
	Coolant	Air blast	Wet
	Machine	5 axis M/C, BT50	5 axis M/C, BT50
Results		 High wear resistance provides 1.15 times longer tool life.	 Due to the high rigidity, higher cutting speed and feed is possible without any chipping or vibration. This improves productivity by 30%.

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