

Tungaloy

Member IMC Group

Keeping the Customer First

Tungaloy Report No. 373-US

MILLLINE Round insert milling cutter

ROUNDSPLIT

TRC / ERC type

Serrated cutting edges to significantly reduce chattering!



Features

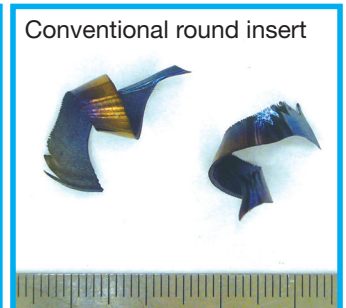
● Exceptionally improved chatter resistance

- The serrated cutting edges produce smaller chips.
- Reduced chatter even when machining with a long overhang

Comparison of chip shape



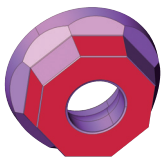
Work material : 1055 (200HB)
Cutting speed : $V_c = .500$ sfm
Feed per tooth : $f_z = .020$ ipt
Depth of cut : $a_p = .080$ inch
Width of cut : $a_e = 2.000$ inch



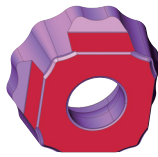
● Well-designed insert seat that is compatible for both types of insert

- Uniquely designed insert shape provides rigid clamping.

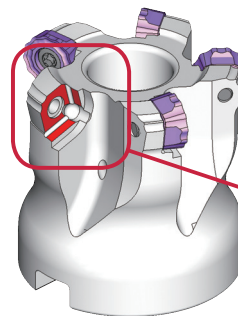
Note: The setting angle of each insert seat is slightly different.
When changing the cutting edges, please rotate the insert in the same seat.



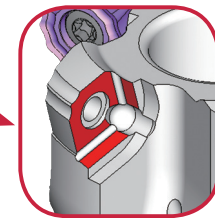
Round type
MJ type : 8 indexes



Serrated edge type
NMJ type : 4 indexes

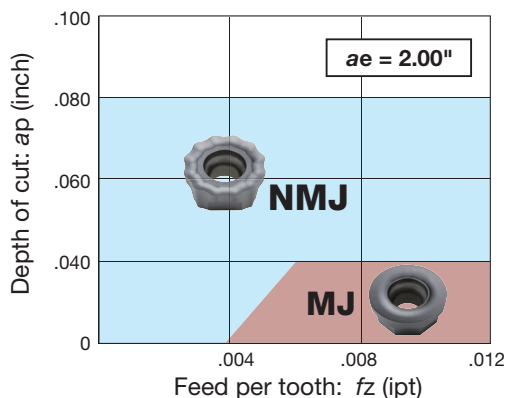


Insert seat with wide contact area

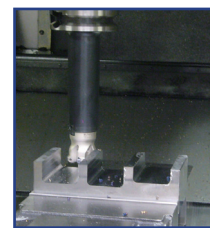
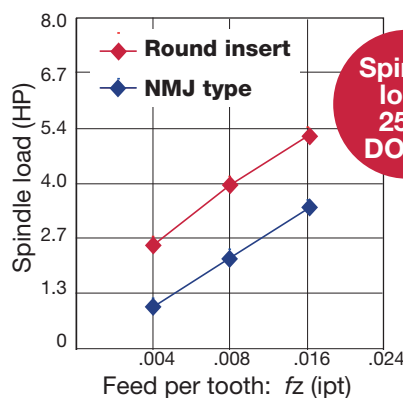


Cutting performance

Comparison of application areas



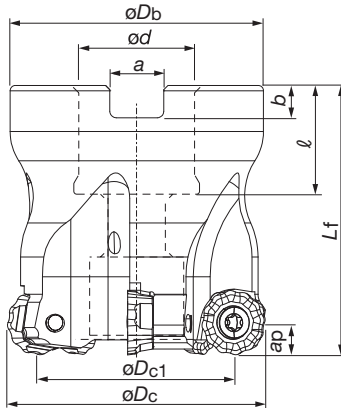
Comparison of spindle load



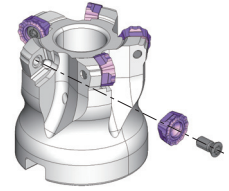
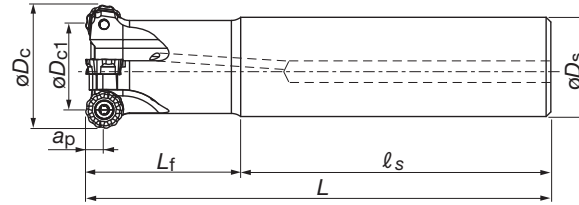
Work material : 1055 (200HB)
Tool dia : $\phi 2.000"$, $t = 5$
Cutting speed : $V_c = 500$ sfm
Width of cut : $a_e = 2.000"$ (Grooving)
Overhang : 9.520" ($L/D = 4.76$)
length

Milling cutter

Shell type



Shank type



Max. depth of cut
RCMT12 type : Max. $a_p = .236"$
RCMT16 type : Max. $a_p = .315"$

Replacement parts: Shell type

Description	Cat. No.		
Applicable cutter	TRC12R...	TRC16R200~400...	TRC16R500...
Clamping screw	CSTB-4L090	CSTB-5L120	CSTB-5L120
Wrench	Torx bit	BT15S	BT20S
	Grip	H-TBS	H-TB
	Mono block type substitution wrench	T-15D	T-20D

Shell type

Cat. No.	Stock	No. of inserts	Dimensions (inch)								Weight (lb)	Air hole	Center bolt *Option parts	Inserts
			ϕD_c	ϕD_{c1}	ϕD_b	ϕd	ℓ	L_f	b	a				
TRC12R200U0075A05	●	5	2.000	1.528	1.850	.750	.750	1.969	.197	.315	.88	with	C0.375x1.125H	RCMT1204*N-***
TRC12R250U0075A06	●	6	2.500	2.028	2.322	.750	.750	1.969	.197	.315	1.54	with	C0.375x1.125H	
TRC12R300U0100A07	●	7	3.000	2.528	2.835	1.000	1.024	2.480	.236	.374	2.86	with	C0.500x1.375H	
TRC16R200U0075A04	●	4	2.000	1.370	1.850	.750	.750	1.969	.197	.315	.88	with	C0.375x1.125H	RCMT1606*N-***
TRC16R250U0075A05	●	5	2.500	1.870	2.322	.750	.750	1.969	.197	.315	1.54	with	C0.375x1.125H	
TRC16R300U0100A06	●	6	3.000	2.370	2.835	1.000	1.024	2.480	.236	.374	2.86	with	C0.500x1.375H	
TRC16R400U0150A07	●	7	4.000	3.370	3.819	1.500	1.457	2.480	.394	.626	3.52	with	TMBA-0.750H	
TRC16R500U0150A08	●	8	5.000	4.370	3.780	1.500	1.457	2.480	.394	.626	7.93	with	TMBA-0.750H	

Replacement parts: Shank type

Description	Cat. No.	
Applicable cutter	ERC12R...	ERC16R...
Clamping screw	CSTB-4L090	CSTB-5L105
Wrench (substitution)	T-15DB (T-15D)	T-20DB (T-20D)

Shank type

type	Cat. No.	Stock	No. of inserts	Dimensions (inch)						Weight (lb)	Air hole	Inserts
				ϕD_c	ϕD_{c1}	ϕD_s	ℓ_s	L_f	L			
Standard	ERC12R125U0125W03	●	3	1.250	.778	1.250	2.250	2.750	5.000	1.32	with	RCMT1204*N-***
	ERC12R150U0125W04	●	4	1.500	1.028	1.250	2.660	2.340	5.000	1.43	with	
	ERC12R150U0150W04	●	4	1.500	1.028	1.500	2.660	2.340	5.000	1.83	with	
	ERC16R150U0125W02	●	2	1.500	.870	1.250	2.660	2.340	5.000	1.43	with	RCMT1606*N-***
	ERC16R150U0150W02	●	2	1.500	.870	1.500	2.660	2.340	5.000	1.83	with	
Long	ERC12R125U0125-03L	●	3	1.250	.778	1.250	3.750	2.250	6.000	2.05	with	RCMT1204*N-***
	ERC12R125U0125-03LM	●	3	1.250	.778	1.250	4.000	4.000	8.000	2.25	with	
	ERC12R150U0150-04L	●	4	1.500	1.028	1.500	4.000	2.000	6.000	2.42	with	
	ERC12R150U0125-04LM	●	4	1.500	1.028	1.250	4.000	4.000	8.000	2.36	with	
	ERC12R150U0150-04LM	●	4	1.500	1.028	1.500	4.000	4.000	8.000	3.08	with	RCMT1606*N-***
	ERC16R150U0150-02L	●	2	1.500	.870	1.500	4.000	2.000	6.000	2.38	with	
	ERC16R150U0125-02LM	●	2	1.500	.870	1.250	6.000	2.000	8.000	2.47	with	
Extra long	ERC16R150U0150-02LM	●	2	1.500	.870	1.500	4.000	4.000	8.000	3.08	with	RCMT1204*N-***
	ERC12R125U0125-03LL	●	3	1.250	.778	1.250	5.000	7.000	12.000	3.37	with	
	ERC12R125U0150-03LL	●	3	1.250	.778	1.500	5.000	7.000	12.000	4.19	with	
	ERC12R150U0150-04LL	●	4	1.500	1.028	1.500	10.000	2.000	12.000	5.29	with	
	ERC12R150U0125-04LX	●	4	1.500	1.028	1.250	5.000	7.000	12.000	3.55	with	
	ERC12R150U0150-04LX	●	4	1.500	1.028	1.500	5.000	7.000	12.000	4.41	with	
	ERC16R150U0125-02LL	●	2	1.500	.870	1.250	10.000	2.000	12.000	3.81	with	RCMT1606*N-***
	ERC16R150U0150-02LL	●	2	1.500	.870	1.500	10.000	2.000	12.000	5.29	with	
	ERC16R150U0150-02LX	●	2	1.500	.870	1.500	5.000	7.000	12.000	4.62	with	

● : Stocked items

Inserts

For general machining
Inserts with a serrated cutting edge

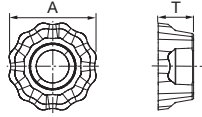


Fig. 1 **NMJ**

For general machining
Round insert

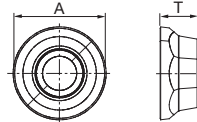


Fig. 2 **MJ**

For aluminum machining
Inserts with a serrated cutting edge

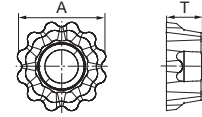
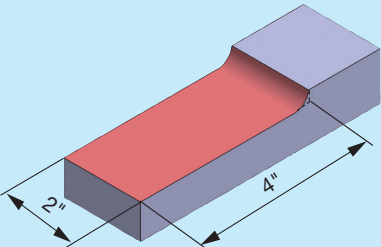
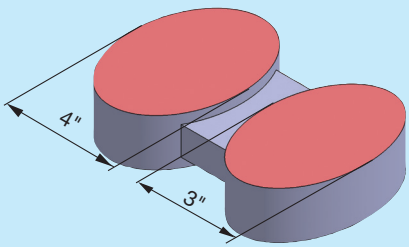
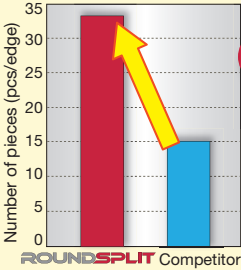
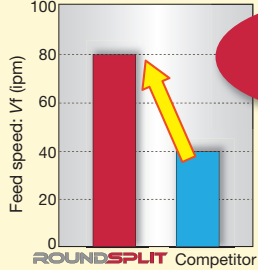


Fig. 3 **NAJ**

Cat. No.	Accuracy	Honing	Stock				Dimensions (inch)		Shape	Cutter
			Coated grades			Carbide				
			AH725	AH120	AH140	KS15F	A	T		
RCMT1204EN-NMJ	M	with	●	●	●		.472	.189	Fig. 1	TRC12 ERC12
RCMT1204EN-MJ	M	with	●	●	●		.472	.189	Fig. 2	
RCMT1204FN-NAJ	M	without				●	.472	.189	Fig. 3	
RCMT1606EN-NMJ	M	with	●	●	●		.630	.256	Fig. 1	TRC16 ERC16
RCMT1606EN-MJ	M	with	●	●	●		.630	.256	Fig. 2	
RCMT1606FN-NAJ	M	without				●	.630	.256	Fig. 3	

● : Stocked items

Practical examples

Workpiece type		Die & mold parts		Die & mold parts	
Milling cutter		TRC12R200U0075A05 (ø2.000", t = 5)		ERC12R125U0125W03 (ø1.250", t = 3)	
Insert		RCMT1204EN-NMJ		RCMT1204EN-NMJ	
Grade		AH725		AH725	
Work material		1049		Structural steel	
					
Cutting conditions	Cutting speed: Vc (sfm)	720		720	
	Feed per tooth: fz (ipt)	.004		.012	
	Depth of cut: ap (inch)	.220		.040	
	Width of cut: ae (inch)	1.250		.750	
	Process	Shoulder milling		Face milling	
	Coolant	Dry		Dry	
		Machine		Vertical M/C, CAT40	
Results					
		Pieces per edge increased by 2.2 times! ap: .080" → .220" Vf: 18 → 28 ipm NMJ chipbreaker with low cutting force provides high productivity.		Feed speed 2 times faster! NMJ chipbreaker with serrated edges allows feed speed to be doubled without chattering, even when machining low rigidity work pieces.	

Variation of inserts



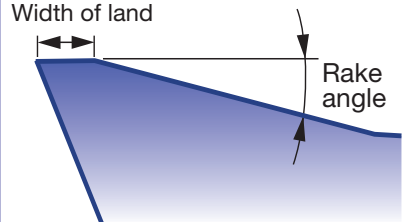
NMJ

P

M

K

Steel
Stainless
Cast iron



- **Chipbreaker to decrease cutting forces**
With serrated cutting edges



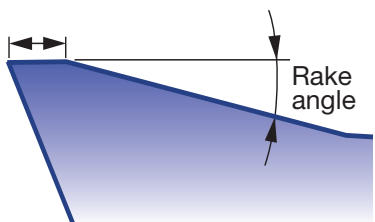
MJ

P

M

K

Steel
Stainless
Cast iron



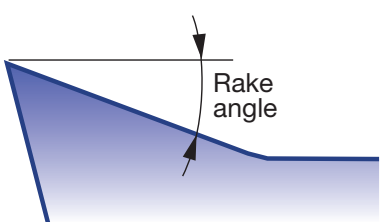
- **General purpose chipbreaker with round cutting edges**



NAJ

N

Non-ferrous



- **Chipbreaker for aluminum machining**
With serrated cutting edges

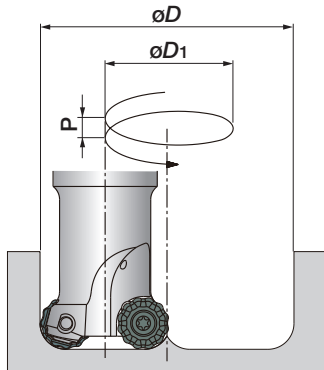
Standard cutting conditions

Work materials	Brinell hardness HB	Grades	Cutting Speed Vc (sfm)	Feed per tooth fz (in/t) each chipbreaker		
				NMJ	MJ	NAJ
Low carbon steels (1015, 1010 etc.)	~ 200	AH725	530 (300-720)	.010 (.007-.012)	.020 (.008-.028)	-
High carbon steels (1045, 1055 etc.)	200 ~ 300		500 (300-650)	.008 (.007-.010)		
Alloyed steels (4140, 5120 etc.)	150 ~ 300					
Tool steels (W1-8, T5 etc.)	~ 300		460 (300-600)			
Stainless steels (304, 316 etc.)	-	AH140	500 (300-600)	.008 (.006-.010)	.016 (.008-.024)	-
Gray cast irons (No.25, No.30 etc.)	150 ~ 250	AH120	600 (460-820)	.010 (.007-.012)	.020 (.008-.028)	-
Ductile cast irons (60-40-18 etc.)						
Aluminum alloys (Si < 13%)	-	KS15F	2600 (1600-4000)	-	-	.010 (.004-.012)
Aluminum alloys (Si ≥ 13%)	-		650 (300-1000)			
Super alloys (Inconel 718, Ti-6Al-4V etc.)	-	AH725	110 (60-160)	.008 (.006-.010)	.016 (.008-.024)	-

- To remove excessive chip accumulation use an air blast.
- When chips stick to the cutting edges (aluminum machining), use a water soluble coolant.
- When cutting an interrupted surface or a casted skin, the feed (fz) should be reduced to the lower recommended value shown in the above table.
- Cutting conditions are limited by machine power, work piece rigidity and spindle output. When the cutting width, depth or overhang length is large, set Vc and fz to the lower recommended values and check the machine power and vibration.

Machining capability

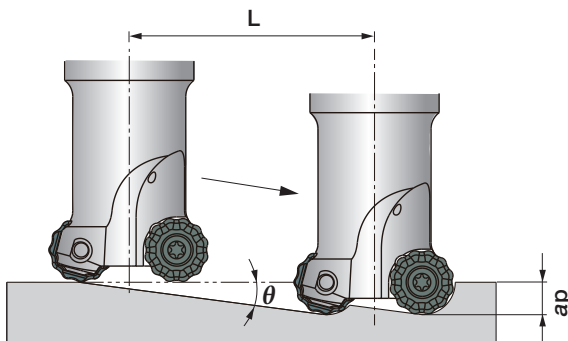
◆ Holmaking with helical feed



Cat. No.	Tool ϕ ϕD_c (inch)	Min. machining diameter (inch)		Max. machining diameter (inch)		Pitch P (inch)
		ϕD	ϕD_1	ϕD	ϕD_1	
ERC12R125U...	1.250	2.028	.778	2.421	1.171	< .236
ERC12R150U...	1.500	2.528	1.028	2.921	1.421	< .236
TRC12R200U...	2.000	3.528	1.528	3.921	1.921	< .236
TRC12R250U...	2.500	4.528	2.028	4.921	2.421	< .236
TRC12R300U...	3.000	5.528	2.528	5.921	2.921	< .236
ERC16R150U...	1.500	2.370	.870	2.921	1.421	< .315
TRC16R200U...	2.000	3.370	1.370	3.921	1.921	< .315
TRC16R250U...	2.500	4.370	1.870	4.921	2.421	< .315
TRC16R300U...	3.000	5.370	2.370	5.921	2.921	< .315
TRC16R400U...	4.000	7.370	3.370	7.921	3.921	< .315
TRC16R500U...	5.000	9.370	4.370	9.921	4.921	< .315

When holmaking with a helical feed, the pitch (P) needs to be set at lower values than that shown above.

◆ Ramping



Cat. No.	Tool ϕ ϕD_c (inch)	Max. ramping angle θ	L (mm): tool pass length when ramping angle is 2 degrees				
			ap (inch)				
			.079	.118	.158	.236	.315
ERC12R125U...	1.250	10°	2.244	3.346	4.488	6.732	9.016
ERC12R150U...	1.500	7°					
TRC12R200U...	2.000	4°					
TRC12R250U...	2.500	3°					
TRC12R300U...	3.000	2.4°					
ERC16R150U...	1.500	13°					
TRC16R200U...	2.000	7°					
TRC16R250U...	2.500	5.6°					
TRC16R300U...	3.000	4.4°					
TRC16R400U...	4.000	2.9°					
TRC16R500U...	5.000	2.2°					

Tool pass length: $L = ap / \tan \theta$, Ramping angle needs to be set at smaller than 2 degrees in order to prevent chips from getting tangled.



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