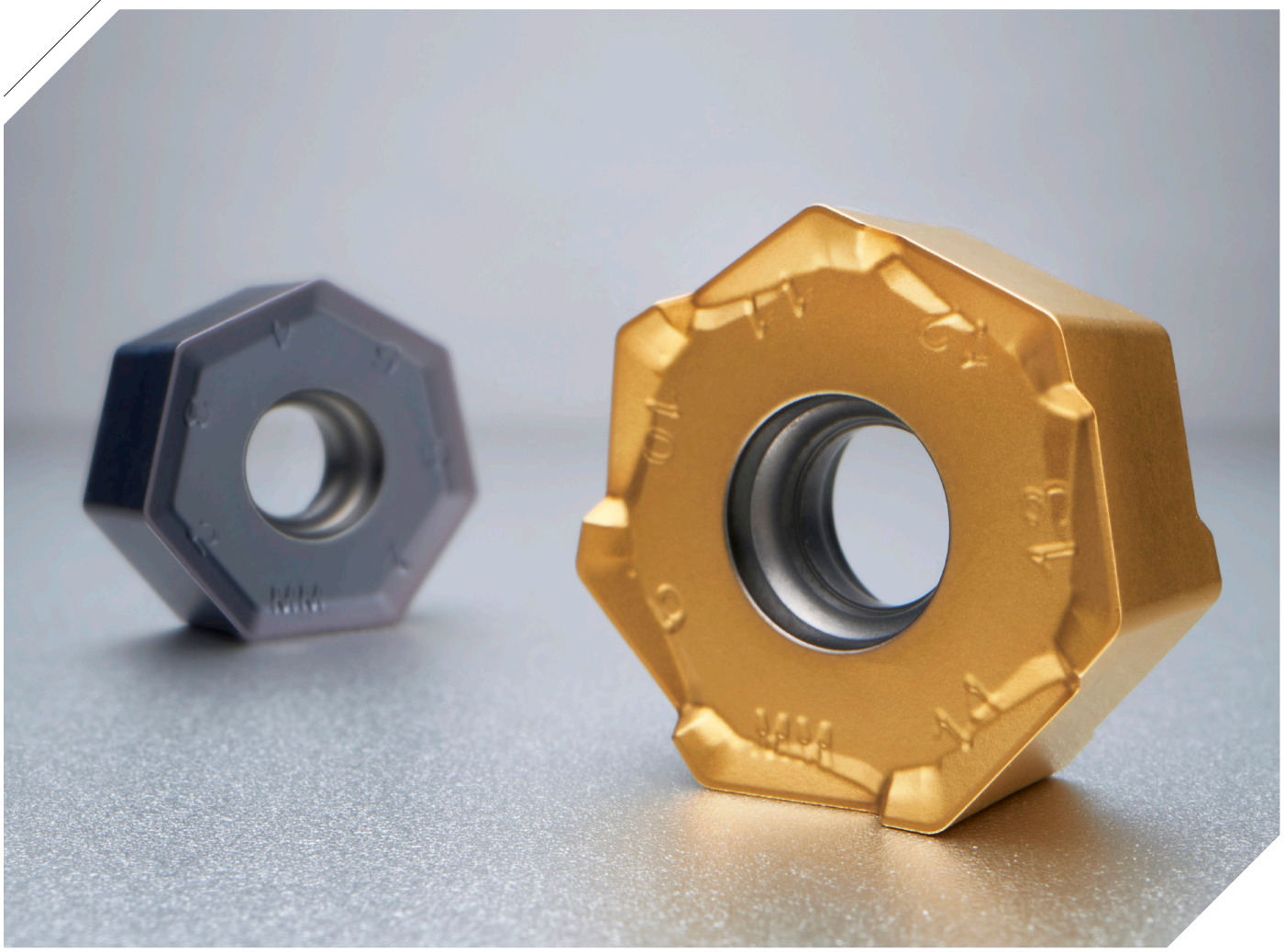
KORLOY
TECH-NEWS

RM14

Heptagonal face mill with 14 double-sided corners

- Minimized chattering of workpiece due to maximum lead angle and sharp cutting edge
- Reduced cutting resistance and improved chip emissions by high helix angle application



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Heptagonal face mill with 14 double-sided corners

RM14

In the various industries including automotive components business, workpieces are manufactured with casting for easy-producing complicated shapes and lowering cost. However, due to the characteristic of casting manufacturing, facing is necessary on each uneven facing surface for assembling. In casting machining, complicated shapes of workpiece and uneven surface creates low clamping force, chattering, unstable tool life, bad surface finish and even shortening life of equipment. KORLOY launches the double-sided face mill, RM14 to solve those troubles in machining.

RM14 designed with the maximum lead angle, 51˚ of heptagonal shape reduces cutting load and chattering comparing to the conventional face mill with lead angle, 45˚. Its strong wedge type clamping system ensures stable tool life even in poor cutting conditions.

In addition, there are two types of RM14 insert which are neutral (flat cutting edge) and right-handed (helix cutting edge) and it is possible for both of them to clamp to a single holder. The thicker RM14 insert with sharp cutting edge ensures good performance and stability and its optimal grade realizes long tool life.

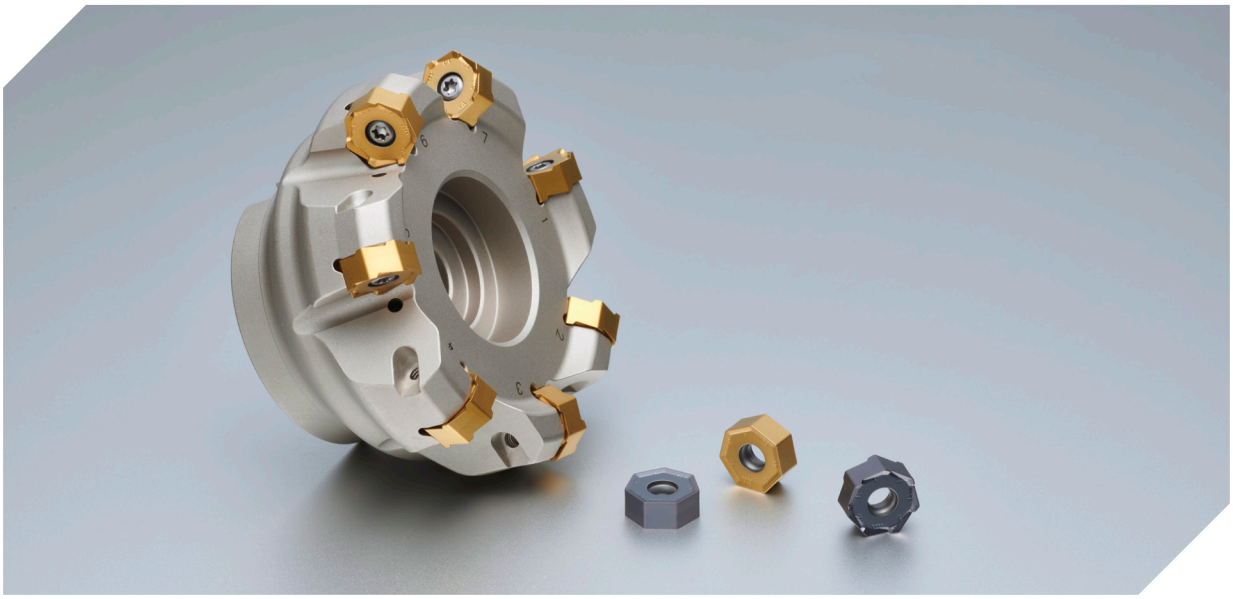
RM14 is an economic tool using maximum 14 corners and ensures stable machining and high productivity.

» Good performance
- Less cutting load due to high rake and high helix

» Improved surface finish
- Less chattering due to lead angle of 51˚
- Good chip evacuation

» Stable tool life
- High rigidity from thick insert

» Stable clamping system
- Wide supporting area and acute angled clamping structure



BROTECH

Code system

Cutter type

RM 14 X C M 080 R - 27 - 7 - XN06

- **RM** — Rich Mill
- **14** — No. of edges: 14 : 14 edges
- **X** — Approach angle: X : Special
- **C** — Type: C : Cutter
- **M** — Arbors type: M : Metric; A : Inch; None : Asia
- **080** — Tool Dia.: 080 : Ø80mm
- **R** — Coolant type & hand: R : Coolant, right-handed; NR : No coolant, right-handed
- **27** — Internal: 27 : Ø27mm
- **7** — No. of tooth: 7 : 7teeth
- **XN06** — Insert: XN06 : XNMX06

Recommended grade and cutting edge

● : 1st recommendation

Type	P			M			K		
	Type	C/B	Grade	Type	C/B	Grade	Type	C/B	Grade
Helix	●	○ ML ● MM	● PC3700 ○ PC5300 ○ PC5400	○	○ ML ○ MM	● PC9540 ○ PC5300	●	● ML ○ MM	● PC6510 ○ PC5300 ○ NCM535
Flat	○	○ ML ○ MM	● PC3700 ○ PC5300 ○ PC5400	●	● ML ○ MM	● PC9540 ○ PC5300	○	○ ML ○ MM	● PC6510 ○ PC5300 ○ NCM535

Recommended cutting conditions

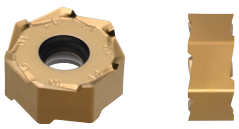
Workpiece				Specific cutting force (N/mm²)	Brinell hardness (HB)	Grade	C/B		Grade	C/B		ML/MM
ISO	Workpiece material	ISO	KS			PC3700	ML	MM	PC5300	ML	MM	
						vc (m/min)	fz (mm/t)		vc (m/min)	fz (mm/t)		ap (mm)
P	Carbon steel Mn < 1.65	C25	SM25C	1500	125	160	0.25	0.3	150	0.25	0.3	1~3
						215	**0.2**	**0.2**	**195**	**0.2**	**0.2**	
						270	0.1	0.1	240	0.1	0.1	
		C45	SM45C	1700	190	160	0.25	0.3	150	0.25	0.3	
						215	**0.2**	**0.2**	**195**	**0.2**	**0.2**	
						270	0.1	0.1	240	0.1	0.1	
	Low alloy steel ≤ 5%	42CrMo4	SCM440	1700	175	160	0.25	0.3	150	0.25	0.3	
						215	**0.2**	**0.2**	**195**	**0.2**	**0.2**	
						270	0.1	0.1	240	0.1	0.1	
	High alloy steel > 5%	X40CrMoV5-1	STD11 STD61	1950	200	150	0.2	0.25	130	0.2	0.25	1
						195	**0.15**	**0.2**	**170**	**0.15**	**0.2**	
						240	0.1	0.1	210	0.1	0.1	

Recommended cutting conditions

Workpiece				Specific cutting force (N/mm²)	Brinell hardness (HB)	Grade	C/B		Grade	C/B		ML/MM
ISO	Workpiece material	ISO	KS			PC9540	ML	MM	PC5300	ML	MM	
						vc (m/min)	fz (mm/t)		vc (m/min)	fz (mm/t)		ap (mm)
M	Ferritic/ Martensitic series	X6CrAl13 X6Cr17	STS405 STS430	1800	200	120	0.2	0.25	120	0.2	0.25	1~3
						160	**0.1**	**0.15**	**160**	**0.1**	**0.15**	
						200	0.05	0.1	200	0.05	0.1	
		X12CrS13 X6CrMo17-1	STS416 STS434	2850	330	110	0.22	0.25	110	0.22	0.25	
						150	**0.12**	**0.15**	**150**	**0.12**	**0.15**	
						190	0.05	0.1	190	0.05	0.1	
		X12Cr13	STS403 STS410	2350	330	100	0.2	0.25	100	0.2	0.25	
						140	**0.1**	**0.15**	**140**	**0.1**	**0.15**	
						180	0.05	0.1	180	0.05	0.1	
	Austenite series	X5CrNI18-9 X5CrNiMo17-12-2 XCrNiMo17-12-3	STS304 STS316	2000	180	70	0.2	0.25	90	0.2	0.25	
						95	**0.1**	**0.15**	**120**	**0.1**	**0.15**	
						120	0.05	0.1	150	0.05	0.1	
	Austenite-ferritic series (Duplex)	-	-	2450	260	60	0.2	0.25	70	0.2	0.25	
						80	**0.1**	**0.15**	**95**	**0.1**	**0.15**	
						110	0.05	0.1	120	0.05	0.1	

Workpiece				Specific cutting force (N/mm²)	Brinell hardness (HB)	Grade	C/B		Grade	C/B		ML/MM
ISO	Workpiece material	ISO	KS			PC6510	ML	MM	PC5300	ML	MM	
						vc (m/min)	fz (mm/t)		vc (m/min)	fz (mm/t)		ap (mm)
K	Gray cast iron	200	GC200	900	180	140	0.25	0.3	120	0.25	0.3	1~3
						180	**0.2**	**0.2**	**160**	**0.2**	**0.2**	
						230	0.1	0.1	200	0.1	0.1	
	Ductile cast iron	500-7	GCD500	870	155	120	0.25	0.3	110	0.25	0.3	
						160	**0.2**	**0.2**	**145**	**0.2**	**0.2**	
						200	0.1	0.1	180	0.1	0.1	

Features of insert per types

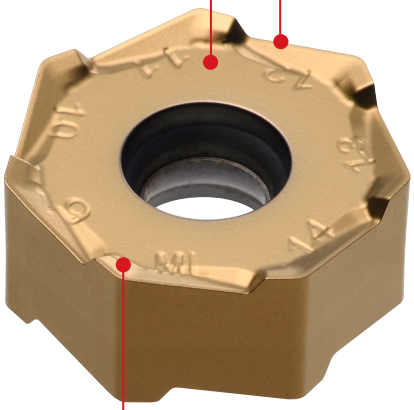
Type		Feature	Application range
Helix		• Right handed type • High helix cutting edge	• 1st recommended for P and K series cutting • For high speed and high feed machining
Flat		• Neutral type • Flat cutting edge	• 1st recommended for M series cutting • Applicable for both right handed and left handed

Insert features

- Wide supporting area of insert ensures stable clamping system.
- High rake angle cutting edge reduces cutting load and increases chip evacuation.
- Thicker insert realizes stability in machining.

Wider clamping area
- More stable machining

High helix cutting edge
- Better machinability
- Less cutting load

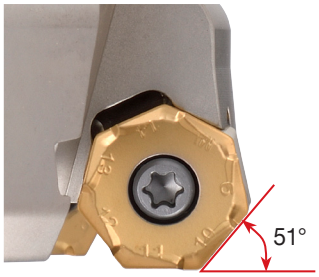


High rake angle chip breaker
- Less cutting load
- Better chip evacuation

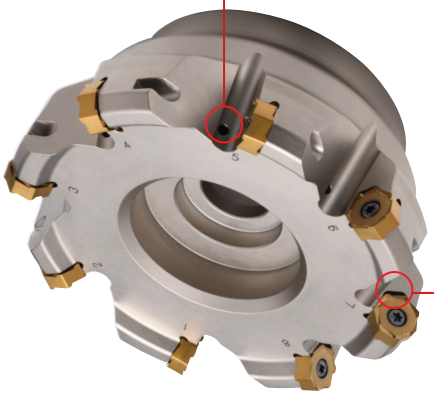
Thicker insert
- High cutting edge strength

Cutter features

- The biggest heptagonal lead angle reduces chatter in machining.
- Wedge type clamping system ensures stable clamping.
- Stepped machining is available without interruption of side wall of insert.

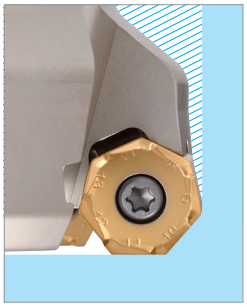


The biggest heptagonal lead angle
- Reduced workpiece chattering by reducing axial force



Internal coolant system
- Improved chip evacuation
- Increased tool life due to cooling insert

Wedge clamping system
- Stable clamping system with an acute angle structure

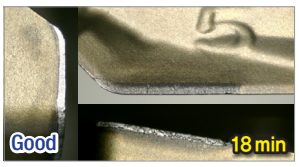


Preventing interruption of side wall
- Prevented interruption of side wall by using the most number of corners in deep facing (heptagonal 14 double-sided corners)

Performance evaluation

Wear resistance

Workpiece	Ductile cast iron (600-3)
Cutting condition	vc (m/min) = 250, fz (mm/t) = 0.2, ap (mm) = 2, wet
Tool	**Insert** XNMX0606XNR-ML (PC6510) **Holder** RM14XCM080R-27-6-XN06



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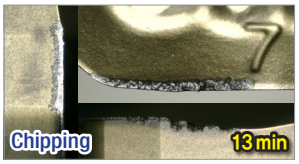

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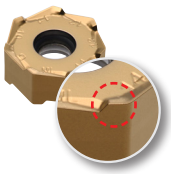
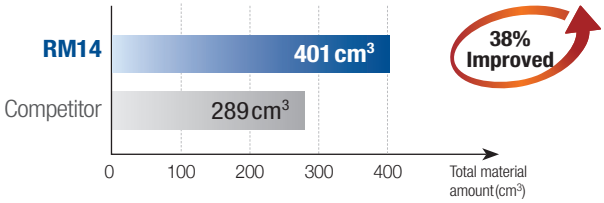


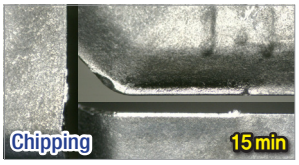


- Material removal rate Q (cm^3/min) : 22.3
- Cutting time (min) : 18min

Wear resistance

(* : DIN)

Workpiece	Heat resistance stainless steel (1.4849 *)
Cutting condition	vc (m/min) = 100, fz (mm/t) = 0.2, ap (mm) = 2, dry
Tool	**Insert** XNMX060608-ML (PC9540) **Holder** RM14XCM080R-27-6-XN06



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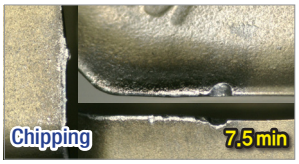

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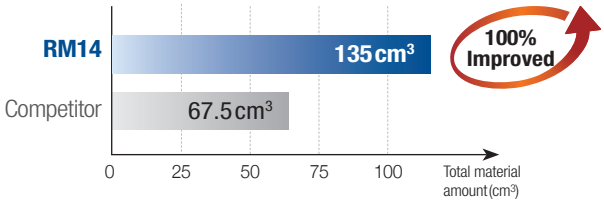
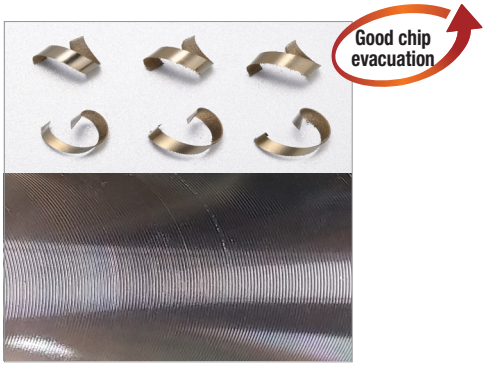


- Material removal rate Q (cm^3/min) : 9
- Cutting time (min) : 15min

Surface finish

Workpiece	Stainless steel (X5CrNiMo17-12 - 2)
Cutting condition	vc (m/min) = 100, fz (mm/t) = 0.15, ap (mm) = 2, ae (mm) = 50, dry
Tool	**Insert** XNMX0606XNR-ML (PC9540) **Holder** TRM14XCM080R-27-6-XN06



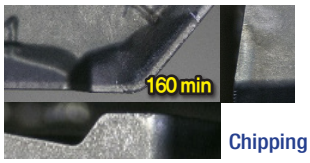
[RM14]

[Competitor]

Performance evaluation

Wear resistance

Workpiece	Carbon steel (C45)
Cutting condition	vc (m/min) = 200, fz (mm/t) = 0.2, ap (mm) = 2, dry
Tool	Insert XNMX0606XNR-MM (PC5300) Holder RM14XCM080R-27-6-XN06



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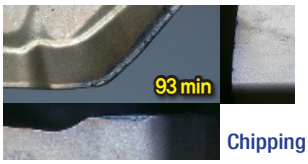

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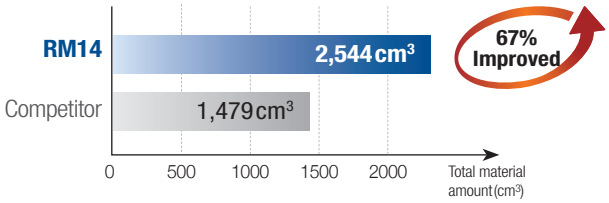
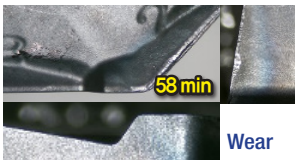


- Material removal rate Q (cm^3/min) : 15.9
- Cutting time (min) : 160min

Wear resistance

Workpiece	Alloy steel (42CrMo4)
Cutting condition	vc (m/min) = 200, fz (mm/t) = 0.2, ap (mm) = 3, dry
Tool	Insert XNMX060608-MM (PC5300) Holder RM14XCM080R-27-6-XN06



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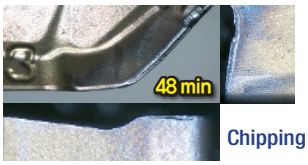

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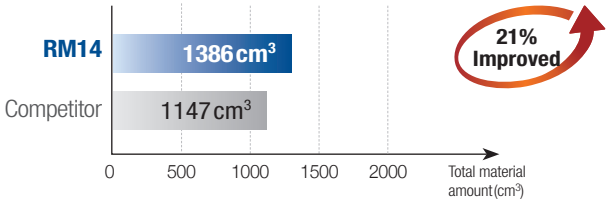
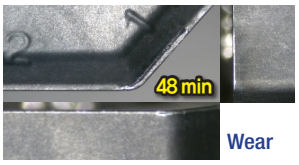


- Material removal rate Q (cm^3/min) : 23.9
- Cutting time (min) : 58min

Wear resistance

Workpiece	Stainless steel (X12Cr13)
Cutting condition	vc (m/min) = 165, fz (mm/t) = 0.15, ap (mm) = 2, ae (mm) = 50, dry
Tool	Insert XNMX060608-MM (PC5300) Holder RM14XCM080R-27-6-XN06



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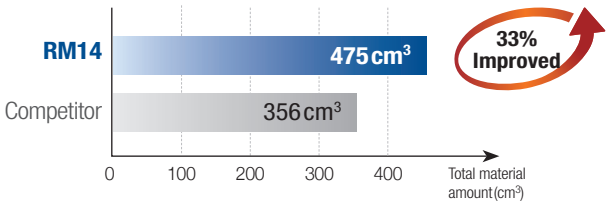
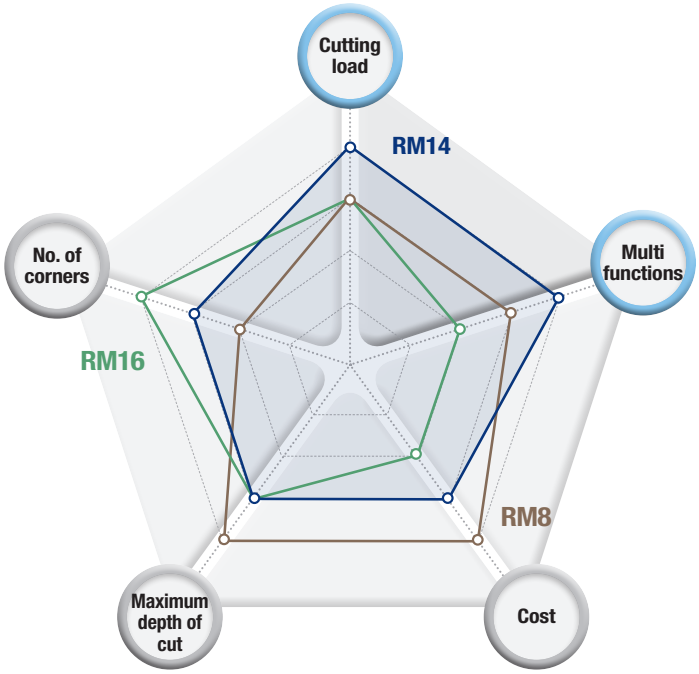


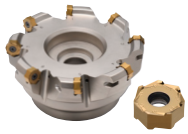
- Material removal rate Q (cm^3/min) : 9.9
- Cutting time (min) : 48min

Tool selection guide



RM14

- Less cutting load
- Multi-functional machining (preventing interruption in deep machining)

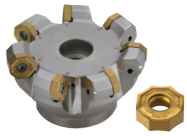


RM8

- The maximum depth of cut
- High competitive price

RM16

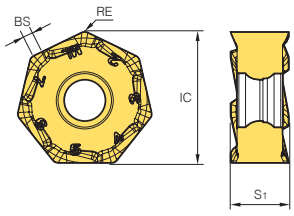
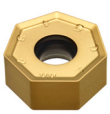
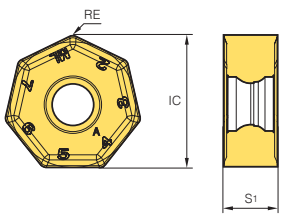
- The most no. of corners



Tool	Cutting load	Multi functions	Cost	Maximum depth of cut	No. of corners
RM14	★★★★	★★★★	★★★	★★★	★★★
RM8	★★★	★★★	★★★★	★★★★	★★
RM16	★★★	★★	★★	★★★	★★★★

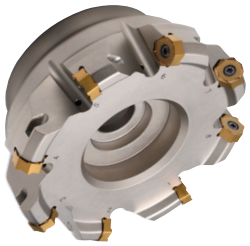
Insert

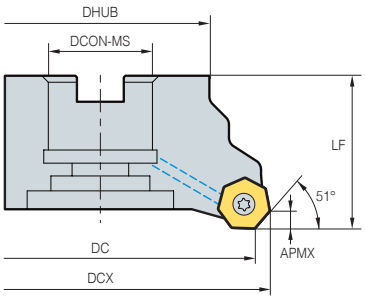
(mm)

Insert	Designation	Dimension					Coated							Geometry
		IC	BS	S1	RE	APMX	NCM535	PC3700	PC6510	PC9540	PC5300	PC5400	PC5535	
	XNMX0606XNR-ML	14	0.98	6.5	0.8	3.5	●		●	●	●	●	●	
	XNMX0606XNR-MM (New)							●	●		●			
	XNMX060608-ML	14	-	6.0	0.8	4.8				●	●	●	●	
	XNMX060608-MM (New)							●	●		●			

●: Stock item

RM14XCM-XN06





(mm)

	Designation	Stock		DC	DCX	DHUB	DCON-MS	LF	APMX	kg
RM14XCM	050R-22-5-XN06	●	5	50	58.6	42	22	40		0.34
	050R-22-6-XN06	●	6	50	58.6	42	22	40		0.34
	063R-22-6-XN06	●	6	63	71.6	42	22	40		0.51
	063R-22-8-XN06	●	8	63	71.6	42	22	40		0.58
	080R-27-6-XN06	●	6	80	88.6	57	27	50		0.98
	080R-27-8-XN06	●	8	80	88.6	57	27	50		1.08
	080R-27-10-XN06	●	10	80	88.6	57	27	50	3.5	1.07
	100R-32-10-XN06	●	10	100	108.6	67	32	63		1.59
	100R-32-12-XN06	●	12	100	108.6	67	32	63		1.59
	125R-40-12-XN06	●	12	125	133.6	90	40	63		3.43
	125R-40-14-XN06	●	14	125	133.6	90	40	63		3.42
	160NR-40-16-XN06	●	16	160	168.6	110	40	63		4.86
	160NR-40-18-XN06	●	18	160	168.6	110	40	63		4.84

※ In applying XNMX060608-□□, Max. ap= 4.8mm
※ None: Order made

● : Stock item

Available inserts


XNMX-ML


XNMX-ML


XNMX-MM


XNMX-MM

Designation		Coated						
		NCM535	PC3700	PC6510	PC9540	PC5300	PC5400	PC5535
XNMX	0606XNR-ML	●		●	●	●	●	●
	0606XNR-MM		●	●		●		
	060608-ML				●	●	●	●
	060608-MM		●	●		●		

● : Stock item

Available arbors

Designation		DCON-MS	Available arbors
RM14XCM	050R	22	BT□□-FMC22-□□
	063R		
	080R	27	BT□□-FMC27-□□
	100R	32	BT□□-FMC32-□□
	125R	40	BT□□-FMC40-□□
	160R		

Parts

Specification	Screw	Wrench
		
∅50 ~ ∅160	FTKA0412B	TW15S

⚠ For the safe metalcutting

- Use safety supplies such as protective gloves to prevent possible injury while touching the edge of tools.
- Use safety glasess or safety cover to hedge possible dangers. Inappropriate usage or excessive cutting condition may lead tool's breakage or even the fragment's scattering.
- Clamp the workpiece tightly enough to prevent its movement while its machining.
- Properly manage the tool change phase because the inordinately used tool can be easily broken under the excessive cutting load or severe wear, and it may threat the operator's safety.
- Use safety cover because chips evacuated during cutting are hot and sharp and may cause burns and cuts. To remove chips safely, stop machining, put on protective gloves, and use a hook or other tools.
- Prepare for fire prevention measures as the use of the non-water soluble cutting oil may cause fire.
- Use safety cover and other safety supplies because the spare parts or the inserts can be pulled out due to centrifugal force while high speed machining.

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