RNM type

" Mirror Radius " Steel Shank

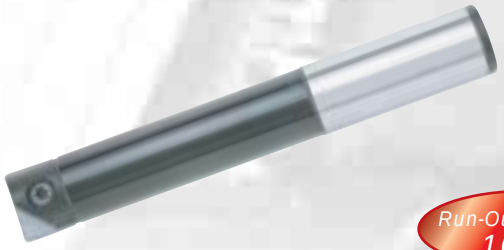
" Mirror Radius " Carbide Shank

" MRN Mirror Radius " Heads NEW

" HRM High Feed Mirror Radius " Inserts NEW

" Mirror Radius "

RNM Steel Shank



Run-Out accuracy
10 μm

RNM-S Type (Straight Neck)

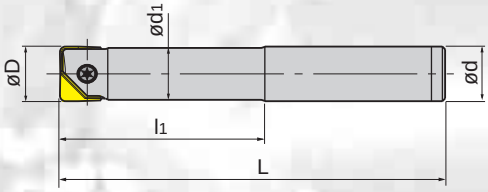


Fig.2 (Straight neck)

RNM-T Type (Taper Neck)

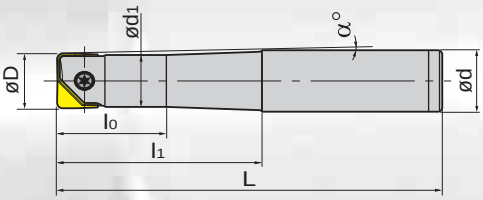
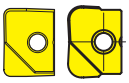
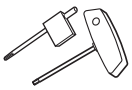


Fig.1 (Taper neck)

Body

Cat. No.	Stock	Fig.	Dimensions (mm)							Parts		
										Insert	Clamp Screw	Wrench
			øD	L	l0	l1	ød1	ød	α°			
RNMM-080053T-S12	●	1	8	110	18.5	53	7.2	12	2°10'	RNM-080 HRM-080	FSW-2506H (0.9 N-m)	A-07
RNML-080075T-S12	●			140	18.5	75			1°32'			
RNMM-100053T-S12	●	1	10	110	21	53	9	12	1° 5'	RNM-100 HRM-100	FSW-3007H (1.2 N-m)	A-08
RNML-100075T-S12	●			140	21	75			0°46'			
RNMM-120053S-S12	●	2	12	110		53	11	12	-	RNM-120-130 HRM-120	FSW-3509 (2.0 N-m)	A-10
RNML-120095T-S16	●	1		160	22	95		16	1°12'			
RNMM-160070S-S16	●			140	-	70			-	RNM-160-170 HRM-160	FSW-4013 (3.0 N-m)	A-15
RNMM-160090S-S16	●	2	16	160	-	90	15	16	-			
RNML-160100S-S16	●			200	-	100			-			
RNMM-200075S-S20	●			141	-	75			-	RNM-200-210 HRM-200	FSW-5016 (4.0 N-m)	A-20
RNMM-200105S-S20	●	2	20	180	-	105	19	20	-			
RNML-200125S-S20	●			250	-	125			-			
RNMM-250090S-S25	●			166	-	90			-	RNM-250-260	FSW-6020 (5.0 N-m)	A-30
RNMM-250140S-S25	●	2	25	220	-	140	24	25	-			
RNML-250150S-S25	●			300	-	150			-			
RNMM-300106S-S32	●			186	-	106			-	RNM-300	FSW-8025 (6.0 N-m)	A-40
RNMM-300140S-S32	●	2	30	220	-	140	29	32	-			
RNML-300175S-S32	●			350	-	175			-			
RNMM-320106S-S32	●			186	-	106			-	RNM-320	FSW-8025 (6.0 N-m)	A-40
RNMM-320140S-S32	●	2	32	220	-	140	31	32	-			
RNML-320175S-S32	●			350	-	175			-			

Note : Please see page 78~82 for cutting conditions.

" Mirror Radius "

Face Milling | Copy Milling | Pocket Milling | Helical Interpolation | Shoulder Milling | Shoulder Milling

RNM Carbide Shank

C Body carbide shank

Run-Out accuracy 10 μm

RNM-S-C Type (Straight Neck)

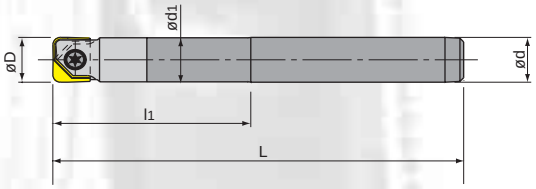


Fig.2 (Straight neck)

RNM-T-C Type (Taper Neck)

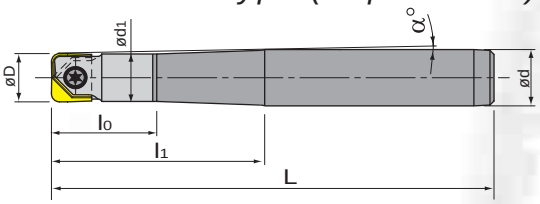


Fig.1 (Taper neck)

Body

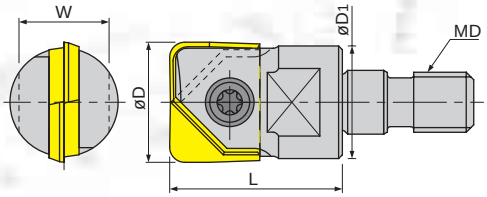
Cat. No.	Stock	Fig.	Dimensions (mm) øD	L	l0	l1	ød1	ød	α°	Parts: Insert	Clamp Screw	Wrench
NEW RNMS-080020U-S08C	●	2	8	70	-	20	7.8	8	-	RNM-080 HRM-080	FSW-2506H (0.9 N-m)	A-07
RNMM-080053T-S12C	●	1		110	20	53		12	2°			
RNML-080075S-S08C	●	2		140	-	75		8	-			
NEW RNMS-100025U-S10C	●	2	10	75	-	25	9.8	10	-	RNM-100 HRM-100	FSW-3007H (1.2 N-m)	A-08
NEW RNMM-100050S-S10C	●			110	-	50		10	-			
RNMM-100053T-S12C	●	1		110	22.5	53		12	1°			
RNML-100075S-S10C	●	2		140	-	75		10	-			
NEW RNMS-120030U-S12C	●		12	80	-	30	11.8		-	RNM-120-130 HRM-120	FSW-3509 (2.0 N-m)	A-10
RNMM-120053S-S12C	●	2		110	-	53		12	-			
RNML-120095S-S12C	●			160	-	95			-			
RNMM-160070S-S16C	●		16	140	-	70	15.8	16	-	RNM-160-170 HRM-160	FSW-4013 (3.0 N-m)	A-15
RNMM-160090S-S16C	●	2		160	-	90			-			
RNML-160150S-S16C	●			220	-	150			-			
RNMM-200075S-S20C	●		20	141	-	75	19.8	20	-	RNM-200-210 HRM-200	FSW-5016 (4.0 N-m)	A-20
RNMM-200105S-S20C	●			180	-	105			-			
NEW RNML-200150S-S20C	●	2		220	-	150			-			
RNML-200170S-S20C	●			250	-	170			-			
NEW RNML-200190S-S20C	●			260	-	190			-			
RNMM-250090S-S25C	●		25	166	-	90	24.8	25	-	RNM-250-260	FSW-6020 (5.0 N-m)	A-30
RNMM-250140S-S25C	●	2		220	-	140			-			
RNML-250220S-S25C	●			300	-	220			-			
RNMM-300106S-S32C	●		30	186	-	106	29.8	32	-	RNM-300	FSW-8025 (6.0 N-m)	A-40
RNMM-300140S-S32C	●	2		220	-	140			-			
RNML-300240S-S32C	●			350	-	240			-			
RNMM-320106S-S32C	●		32	186	-	106	31.8	32	-	RNM-320	FSW-8025 (6.0 N-m)	A-40
RNMM-320140S-S32C	●	2		220	-	140			-			
RNML-320240S-S32C	●			350	-	240			-			

Note : Please see page 78~82 for cutting conditions.

" Mirror Radius "

MRN Modular Head Type

NEW



Body

Cat. No.	Stock	Dimensions (mm)					Applicable Inserts	Clamp screw	Wrench
		øD	L	øD1	MD	W	 		
MBN-100-M6	●	**10**	18	9.7	**M6**	8	RNM-100 - HRM-100	FSW-3007H (1.2 N-m)	A-8
MBN-120-M6	●	**12**	20	11.5	**M6**	8	RNM-120 - RNM-130 HRM-120	FSW-3509 (2.0 N-m)	A-10
MRN-160-M8	●	**16**	23	15	**M8**	12	RNM-160 - RNM-170 HRM-160	FSW-4013 (3.0 N-m)	A-15
MRN-200-M10	●	**20**	30	19	**M10**	14	RNM-200 - RNM-210 HRM-200	FSW-5016 (4.0 N-m)	A-20
MRN-250-M12	●	**25**	35	24	**M12**	17	RNM-250 - RNM-260	FSW-6020 (5.0 N-m)	A-30
MRN-300-M16	●	**30**	43	29	**M16**	22	RNM-300	FSW-8025 (6.0 N-m)	A-40
MRN-320-M16	●	**32**	43	30	**M16**	22	RNM-320	FSW-8025 (6.0 N-m)	A-40

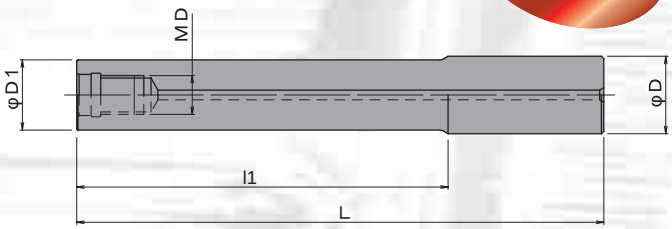
Note : Please see page 78~82 for cutting conditions.

MSN Straight Neck type *(Through Coolant Hole)*

- For high productivity
- High rigidity

NEW

C Body carbide shank



Body

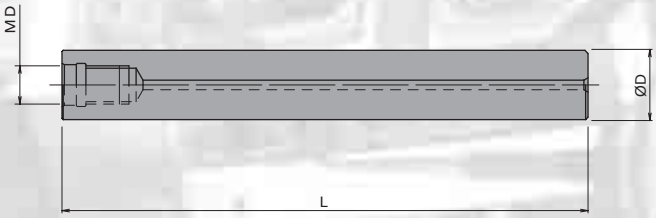
Cat. No.	Stock	Dimensions (mm)					Applicable head
		øD	l1	L	øD1	MD	
NEW MSN-M6-30-S10C	●	10	30	80	9.7	M6	MRN-100-M6
NEW MSN-M6-50-S10C	●		50	100			
NEW MSN-M6-80-S10C	●		80	130			
NEW MSN-M6-30-S12C	●	12	30	80	11.5	M6	MRN-120-M6
NEW MSN-M6-50-S12C	●		50	100			
NEW MSN-M6-80-S12C	●		80	130			
NEW MSN-M8-40-S16C	●	16	40	95	15.5	M8	MRN-160-M8
NEW MSN-M8-80-S16C	●		80	135			
NEW MSN-M8-120-S16C	●		120	175			
MSN-M10-40-S20C	●	20	40	100	19.5	M10	MRN-200-M10
MSN-M10-90-S20C	●		90	150			
MSN-M10-140-S20C	●		140	200			
MSN-M12-55-S25C	●	25	55	120	24	M12	MRN-250-M12
MSN-M12-105-S25C	●		105	170			
MSN-M12-155-S25C	●		155	22			
MSN-M16-55-S32C	●	32	55	120	29	M16	MRN-300-M16 MRN-320-M16
MSN-M16-105-S32C	●		105	170			
MSN-M16-155-S32C	●		155	220			
NEW MSN-M16-195-S32C	●		195	260			

" Mirror Radius "

MSN Straight Arbor Type (Through Coolant Hole)

- For high productivity
- High rigidity

NEW



Body

Cat. No.	Stock	Dimensions (mm)			Applicable holders
		ØD	L	MD	
MSN-M10-130S-S18C	●	18	130		MRN-200-M10
MSN-M10-190S-S18C	●		190		
MSN-M10-130S-S20C	●		130	M10	
MSN-M10-190S-S20C	●	20	190		
MSN-M10-250S-S20C	●		250		
MSN-M12-185S-S23C	●	23	185		MRN-250-M12
MSN-M12-265S-S23C	●		265		
MSN-M12-145S-S25C	●		145	M12	
MSN-M12-215S-S25C	●	25	215		
MSN-M12-285S-S25C	●		285		
MSN-M16-160S-S28C	●		160		MRN-300-M16 MRN-320-M16
MSN-M16-230S-S28C	●	28	230		
MSN-M16-310S-S28C	●		310		
MSN-M16-157S-S32C	●		157	M16	
MSN-M16-217S-S32C	●	32	217		
MSN-M16-287S-S32C	●		287		
MSN-M16-357S-S32C	●		375		

Note : Please see page 78~82 for cutting conditions.

Recommended tightening torque for modular head

Tread Size	Tightening Torque	Wrench Size mm.
M8	**23 Nm**	10,12
M10	**46 Nm**	14,15
M12	**80 Nm**	17
M16	**90 Nm**	22,26

Attention to mounting head !

Clean the conctat surface of head and carbide holder, and also confirm there is no gap between head and holder after tightening.
Please check and try to obtain good run-out.

" High Feed Mirror Radius "

High Feed Mirror Radius
" HRM "

From roughing to semi-finishing

The best suited for high speed & feed machining on raw mat'l to hardened mat'l.

Features:

1. Adopted new DV Value Coating gives longer tool life.
2. Positive geometry reduces cutting forces and chatter.
3. Able to use from roughing to semi-finishing consolidates no. of tools.
4. Able to use on Mirror Radius Body.
5. Achieves a huge machining time reduction!

■ Newly developed "VALUE COATING"

VALUE COATING gives stable and high-performance machining on high hardened materials and cast iron even with high speed dry condition, due to higher hardness and higher oxidation resistance than the existing DZ coating.

● **Characteristic value of various PVD coatings**

	TiN	TiCN	TiAlN	DV coat
Hardness	2,200	2,800	2,900	3,500
Oxidization temperature	400~500	300~400	700~800	1,000
Wear resistance	△	○	○	◎
Thermal resistance	△	×	○	◎

■ "S" shaped geometry

"S" shape geometry insert is suitable for high hardened material in high speed cutting and can cut more smoothly.

" High Feed Mirror Radius "

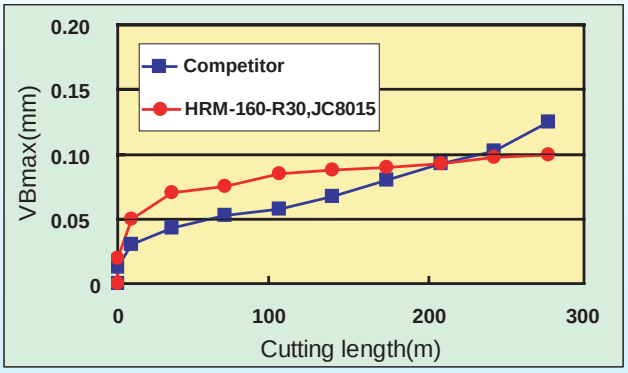
Cutting performance

Performance (Tool life comparison)

Tool life comparison on hardened die steel

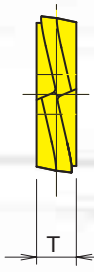
Material	Material: 1.2344
Hardness	**49HRC**
Tool	Body: RNMM-160090S-S16C Carbide shank) Insert: HRM-160-R30, JC8008 Overhung length: 90mm
Cutting conditions	Vertical MC V=150m/min, N=2,984min^{-1} F=3,851 mm/min, fr=1.2mm/rev Ap=0.25mm, Ae=8.4mm Air blow, up & down cut

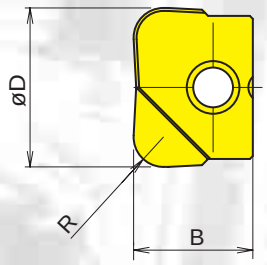
Result (V_B wear)



Cutting length: 280m

HRM Inserts for " Carbide Mirror Radius Body "



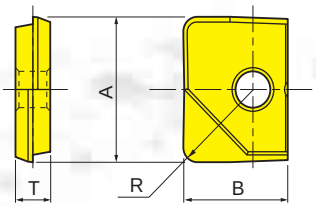


Cat.No.	PVD Coated			Uncoated	Dimensions (mm)			
	JC8008	JC8015	JC5015	KT9	R	øD	B	T
HRM-080-R20		●			2.0	8	7	2.4
HRM-100-R20		●			2.0	10	8.5	2.6
HRM-120-R20		●			2.0	12	10	3
HRM-160-R30		●			3.0	16	12	4
HRM-200-R30		●			3.0	20	15	5

Note: "HRM" inserts is exclusive use of Mirror-Radius. Please use only in Mirror Radius bodies.

" Mirror Radius "

■ RNM Inserts

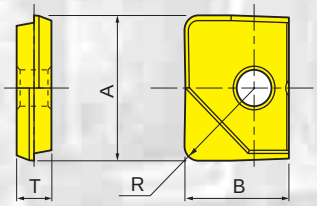


Cat. No.	Coated			Uncoated	Dimensions (mm)			
	JC5003	JC5015	NEW JC8015	KT9	R	A	B	T
RNM-080-R03	●	●	●	●	0.3	8	7	2.4
RNM-080-R05	●	●	●	●	0.5			
RNM-080-R10	●	●	●	●	1.0			
RNM-100-R03	●	●	●	●	0.3	10	8.5	2.6
RNM-100-R05	●	●	●	●	0.5			
RNM-100-R10	●	●	●	●	1.0			
RNM-100-R15	●	●	●	●	1.5			
RNM-100-R20	●	●	●	●	2.0			
RNM-120-R03	●	●	●	●	0.3	12	10	3
RNM-120-R05	●	●	●	●	0.5			
RNM-120-R10	●	●	●	●	1.0			
RNM-120-R15	●	●	●	●	1.5			
RNM-120-R20	●	●	●	●	2.0			
NEW RNM-130-R03		●			0.3	13	10	3
NEW RNM-130-R05		●			0.5			
NEW RNM-130-R10		●			1.0			
NEW RNM-130-R20		●			2.0			
RNM-160-R03	●	●	●	●	0.3	16	12	4
RNM-160-R05	●	●	●	●	0.5			
RNM-160-R10	●	●	●	●	1.0			
RNM-160-R15	●	●	●	●	1.5			
RNM-160-R20	●	●	●	●	2.0			
NEW RNM-170-R03		●			0.3	17	12	4
NEW RNM-170-R05		●			0.5			
NEW RNM-170-R10		●			1.0			
NEW RNM-170-R20		●			2.0			
RNM-200-R03	●	●	●	●	0.3	20	15	5
RNM-200-R05	●	●	●	●	0.5			
RNM-200-R10	●	●	●	●	1.0			
RNM-200-R15	●	●	●	●	1.5			
RNM-200-R20	●	●	●	●	2.0			
NEW RNM-200-R30		●			3.0			

● New product on request

" Mirror Radius "

■ RNM Inserts



Cat. No.	Coated			Uncoated	Dimensions (mm)			
	JC5003	JC5015	NEW JC8015	KT9	R	A	B	T
NEW RNM-210-R03		●			0.3	21	15	5
NEW RNM-210-R05		●			0.5			
NEW RNM-210-R10		●			1.0			
NEW RNM-210-R20		●			2.0			
RNM-250-R03	●	●	●		0.3	25	18.5	6
RNM-250-R05	●	●	●		0.5			
RNM-250-R10	●	●	●		1.0			
RNM-250-R15	●	●	●		1.5			
RNM-250-R20	●	●	●		2.0			
NEW RNM-250-R30		●			3.0			
NEW RNM-260-R03		●			0.3	26	18.5	6
NEW RNM-260-R05		●			0.5			
NEW RNM-260-R10		●			1.0			
NEW RNM-260-R20		●			2.0			
RNM-300-R03	●	●	●		0.3	30	22.5	7
RNM-300-R05	●	●	●		0.5			
RNM-300-R10	●	●	●		1.0			
RNM-300-R15	●	●	●		1.5			
RNM-300-R20	●	●	●		2.0			
NEW RNM-300-R30		●			3.0			
RNM-320-R03	●	●	●		0.3	32	23.5	7
RNM-320-R05	●	●	●		0.5			
RNM-320-R10	●	●	●		1.0			
RNM-320-R15	●	●	●		1.5			
RNM-320-R20	●	●	●		2.0			
NEW RNM-320-R30		●			3.0			

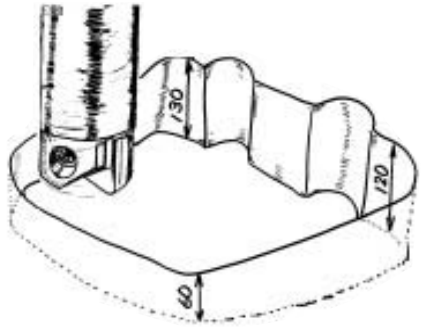
● New product on request

" Mirror Radius "

■ Cutting data for *"Mirror Radius" and "HRM"*

1. High speed and high accuracy machining

Finishing for inner side wall



Result

Excellent surface accuracy in spite of increased speed 1.7 times. Inclination was below 0.005mm. RNM could finish entire job at one time. Competitor needs2-3 times compensation.

Work	Part name	Injection mold for door inner panel
	Material	S55C
	Hardness	–
Tool	Tool No.	RNML-250150S-S25
	Insert No.	RNM-250-R10, JC5015
Cutting conditions	Cutting speed	393 m/min (5,000 min^{-1})
	Feed speed	2,500 mm/min
	Ap	0.1 mm
	Ae	0.5 mm (Z)
	Coolant	Dry cut
	Machine	MC

2. High efficient slot milling on boiler plate with High Feed Mirror Radius.

Overhung length 70mm Slot milling on pocket

Result

Reduced the machining time 2/3 of competitor's time.
No chipping occuered.

Work	Part name	Jig for welding robot
	Material	SS400(Boiler plate)
	Hardness	Soft
Tool	Tool No.	RNMM-160070S-S16C
	Insert No.	HRM-160-R30 JC8015
Cutting conditions	Cutting speed	126 (m/min) 2,500 (min^{-1})
	Feed speed	2,500 (mm/min) 1.0 (mm/rev)
	Ap	0.5 (mm)
	Ae	16 (mm) Full slotting
	Coolant	Water soluble oil
	Machine	MC

3. High speed roughing for High Feed Mirror Radius.

Overhung length 285mm 30' ramping until 70mm.

Result

Reduced the machining time less than half of competitor's time.
Less chatter and table machining.

Work	Part name	Injection mold for inner panel
	Material	SD61(4140)
	Hardness	28HRC
Tool	Tool No.	RNMM-160070S-S16C
	Insert No.	HRM-160-R30 JC8015
Cutting conditions	Cutting speed	181(m/min) 3,600 (min^{-1})
	Feed speed	4,000 (mm/min) 1.12 (mm/rev)
	Ap	0.5 (mm)
	Ae	8 (mm)
	Coolant	Air blow
	Machine	Horizontal MC 22kW

" Mirror Radius "

■ RNM Type

Table 1. Recommended cutting conditions for "MIRROR RADIUS"

Work Materials (Mat No.)	Hardness	Insert Grade	Cutting speed Vc (m/min)	feed rate : f R (mm/rev)							
				Maximum Ap or Ae (mm)							
				Cutter dia. : D (mm)							
				8	10	12	16	20	25	30	32
Grey cast iron (GG25, GG30)	160-260HB	JC5015	250	0.35	0.4	0.45	0.5	0.5	0.5	0.5	0.5
		JC5003		0.3	0.3	0.4	0.5	0.7	0.8	1.0	1.0
Nodular cast iron (GGG60, GGG70)	170-300HB	JC5015	200	0.3	0.35	0.35	0.4	0.4	0.4	0.4	0.4
		JC5003		0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Carbon steel (C50, C55)	180-280HB	JC5015	200	0.3	0.35	0.35	0.4	0.4	0.4	0.4	0.4
		JC5003		0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Low alloy steel (1.7225)	180-280HB	JC5015	180	0.28	0.32	0.32	0.36	0.36	0.36	0.36	0.36
		JC5003		0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Mold steel (1.2311, P20)	280-400HB	JC5015	150	0.25	0.28	0.28	0.32	0.32	0.32	0.32	0.32
		JC5003		0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Tool & die steel (1.2344, 1.2379)	180-255HB	JC5015	150	0.25	0.28	0.28	0.32	0.32	0.32	0.32	0.32
		JC5003		0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Hardened die steel (1.2344, 1.2379)	40-55HRC	JC5015	80	0.2	0.23	0.23	0.25	0.25	0.25	0.25	0.25
		JC5003		0.3	0.3	0.3	0.3	0.4	0.5	0.6	0.6
Stainless steel (1.4301, 1.4401)	150-250HB	JC5015	130	0.2	0.23	0.23	0.25	0.25	0.25	0.25	0.25
				0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Copper alloys	80-150HB	JC5015	250	0.35	0.4	0.4	0.5	0.5	0.5	0.5	0.5
		JC5003		0.4	0.5	0.6	0.8	1.0	1.2	1.6	1.6
Aluminum alloys	30-100HB	JC5003	300	0.35	0.4	0.4	0.5	0.5	0.5	0.5	0.5
				0.4	0.5	0.6	0.8	1.0	1.2	1.6	1.6
Graphite		JC5003	300	0.35	0.4	0.4	0.5	0.5	0.5	0.5	0.5
				0.4	0.5	0.6	0.8	1.0	1.2	1.6	1.6

Note: The figures to be adjusted according to the machine rigidity or work rigidity.

☹ Attention to mounting insert

1. **Clean the insert seat carefully.**
2. **Clean the insert, especially hole and location face.**
3. **Change the clamp screw when the screw gets worn out.** (10-15 inserts)
4. **Do not tighten the clamp screw too hard. (See table 2.)**

Table 2. Recommended torque

Cutting dia. (mm)	Recommended Torque
øD	N·m
8	0.9
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

" Mirror Radius "

H.S.C. recommended cutting conditions for MRN and MSN

Materials	Grades	Cutting speed Vc(m/min)	Tool dia. (mm) 16 / 17 N (min-1)	F (mm/min)	20 / 21 N (min-1)	F (mm/min)	25 / 26 N (min-1)	F (mm/min)	30 / 32 N (min-1)	F (mm/min)
			Max. D.O.C. & Max. Pick							
Gray cast iron (160-260HB)	JC5003	500	10,000	5,000	8,000	4,000	6,400	3,200	5,300	2,650
			Max. Ap=0.3, Max Ae=0.1xD							
Nodular cast iron (170-300HB)	JC5003	400	8,000	3,200	6,400	2,560	5,100	2,040	4,200	1,700
			Max. Ap=0.3, Max Ae=0.1xD							
Carbon steel (180-280HB)	JC5003	400	8,000	3,200	6,400	2,560	5,100	2,040	4,200	1,700
			Max. Ap=0.3, Max Ae=0.1xD							
Low alloy steel (180-280HB)	JC5003	350	7,000	2,660	5,600	2,130	4,500	1,710	3,700	1,400
			Max. Ap=0.3, Max Ae=0.1xD							
Mold Steel (280-400HB)	JC5003	350	7,000	2,300	5,600	1,850	4,500	1,490	3,700	1,220
			Max. Ap=0.3, Max Ae=0.1xD							
Tool & die steel (180-255HB)	JC5003	350	7,000	2,300	5,600	1,850	4,500	1,490	3,700	1,220
			Max. Ap=0.25, Max Ae=0.1xD							
Hardened die steel (40-55HRC)	JC5003	200	4,000	1,000	3,180	800	2,550	640	2,100	525
			Max. Ap=0.2, Max Ae=0.05xD							
Hardened die steel (56-63HRC)	JC5003	100	2,000	400	1,590	320	1,270	250	1,060	210
			Max. Ap=0.15, Max Ae=0.02xD							
Stainless steel (150-250HB)	JC5003	350	7,000	1,750	5,600	1,400	4,500	1,130	3,700	925
			Max. Ap=0.25, Max Ae=0.1xD							
Inconel, Titanium alloy (30-40HRC)	JC5003	90	1,790	450	1,430	360	1,150	290	955	240
			Max. Ap=0.2, Max Ae=0.05xD							
Copper alloy (80-150HB)	JC5003	350	7,000	3,500	5,600	2,800	4,500	2,250	3,700	1,850
			Max. Ap=0.3, Max Ae=0.1xD							
Aluminum alloy (30-100HB)	JC5003	600	12,000	6,000	9,600	4,800	7,650	3,800	6,350	3,200
			Max. Ap=0.4, Max Ae=0.1xD							

N: Spindle speed, F: Feed speed

Recommended cutting conditions for MRN and MSN

Materials	Grades	Cutting speed Vc(m/min)	Tool dia. (mm) 16 / 17 N (min-1)	F (mm/min)	20 / 21 N (min-1)	F (mm/min)	25 / 26 N (min-1)	F (mm/min)	30 / 32 N (min-1)	F (mm/min)
			Max. D.O.C. & Max. Pick							
Gray cast iron (160-260HB)	JC5003	300	6,000	3,000	4,800	2,400	3,800	1,900	3,180	1,590
			0.5		0.7		0.8		1.0	
Nodular cast iron (170-300HB)	JC5003	250	5,000	2,000	4,000	1,600	3,200	1,280	2,650	1,060
			0.4		0.5		0.6		0.8	
Carbon steel (180-280HB)	JC5003 JC5015	250	5,000	2,000	4,000	1,600	3,200	1,280	2,650	1,060
			0.4		0.5		0.6		0.8	
Low alloy steel (180-280HB)	JC5003 JC5015	250	5,000	1,900	4,000	1,520	3,200	1,210	2,650	1,000
			0.4		0.5		0.6		0.8	
Mold Steel (280-400HB)	JC5003 JC5015	250	5,000	1,650	4,000	1,320	3,200	1,060	2,650	880
			0.4		0.5		0.6		0.8	
Tool & die steel (180-255HB)	JC5003 JC5015	250	5,000	1,650	4,000	1,320	3,200	1,060	2,650	880
			0.4		0.5		0.6		0.8	
Hardened die steel (40-55HRC)	JC5003	135	2,700	675	2,150	540	1,720	430	1,430	360
			0.3		0.4		0.5		0.6	
Hardened die steel (56-63HRC)	JC5003	75	1,500	300	1,200	240	950	190	800	160
			0.18		0.2		0.25		0.3	
Stainless steel (150-250HB)	JC5003 JC5015	250	5,000	1250	4,000	1,000	3,200	800	2,650	660
			0.4		0.5		0.6		0.8	
Inconel, Titanium alloy (30-40HRC)	JC5003 JC5015	55	1,100	275	875	220	700	175	580	145
			0.25		0.3		0.35		0.4	
Copper alloy (80-150HB)	JC5003	250	5,000	2,500	4,000	2,000	3,200	1,600	2,650	1,325
			0.5		0.7		0.8		1.0	
Aluminum alloy (30-100HB)	JC5003	350	7,000	3,500	5,600	2,800	4,500	2,250	3,700	1,850
			0.8		1.0		1.2		1.6	

N: Spindle speed, F: Feed speed

" High Feed Mirror Radius "

HRM Recommended cutting conditions for High Feed Mirror Radius

Materials	Grades	Tool dia.(mm)														
		ø 8					ø 10					ø 12				
		L (mm)	Ae (mm)	Ap (mm)	N (min^{-1})	V_F (mm/min)	L (mm)	Ae (mm)	Ap (mm)	N (min^{-1})	V_F (mm/min)	L (mm)	Ae (mm)	Ap (mm)	N (min^{-1})	V_F (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8015	40	2.8	0.40	7,500	6,750	50	4.2	0.40	6,000	6,000	60	5.6	0.40	5,000	5,000
		60	2.8	0.25	7,500	6,750	75	4.2	0.25	6,000	6,000	90	5.6	0.25	5,000	5,000
		80	2.8	0.20	7,500	6,750	100	4.2	0.20	6,000	6,000	120	5.6	0.20	5,000	5,000
Mold steel (1.2311, P20) 30-43HRC	JC8015	40	2.8	0.40	7,100	6,400	50	4.2	0.40	5,700	5,700	60	5.6	0.40	4,700	4,700
		60	2.8	0.25	7,100	6,400	75	4.2	0.25	5,700	5,700	90	5.6	0.25	4,700	4,700
		80	2.8	0.20	7,100	6,400	100	4.2	0.20	5,700	5,700	120	5.6	0.20	4,700	4,700
Die steel (1.2344,1.2379) Below 255HB	JC8015	40	2.8	0.40	7,100	6,400	50	4.2	0.40	5,700	5,700	60	5.6	0.40	4,700	4,700
		60	2.8	0.25	7,100	6,400	75	4.2	0.25	5,700	5,700	90	5.6	0.25	4,700	4,700
		80	2.8	0.20	7,100	6,400	100	4.2	0.20	5,700	5,700	120	5.6	0.20	4,700	4,700
Stainless steel Below 250HB	JC8015	40	2.8	0.40	6,700	6,000	50	4.2	0.40	5,400	5,400	60	5.6	0.40	4,500	4,500
		60	2.8	0.25	6,700	6,000	75	4.2	0.25	5,400	5,400	90	5.6	0.25	4,500	4,500
		80	2.8	0.20	6,700	6,000	100	4.2	0.20	5,400	5,400	120	5.6	0.20	4,500	4,500
Hardened die steel (1.2344,1.2379) 40-50HRC	JC8015	40	2.8	0.20	6,000	4,800	50	4.2	0.20	4,700	4,700	60	5.6	0.20	4,000	4,000
		60	2.8	0.15	6,000	4,800	75	4.2	0.15	4,700	4,700	90	5.6	0.15	4,000	4,000
		80	2.8	0.10	6,000	4,800	100	4.2	0.10	4,700	4,700	120	5.6	0.10	4,000	4,000
Grey & Nodular cast iron (GG,GGG) Below 300HB	JC8015	40	2.8	0.40	6,400	5,700	50	4.2	0.40	5,100	5,100	60	5.6	0.40	4,200	4,200
		60	2.8	0.25	6,400	5,700	75	4.2	0.25	5,100	5,100	90	5.6	0.25	4,200	4,200
		80	2.8	0.20	6,400	5,700	100	4.2	0.20	5,100	5,100	120	5.6	0.20	4,200	4,200

L: Overhung length, Ae : Pick feed, Ap: Depth of cut, N: Spindle speed, V_F: Feed speed.

NOTE

1) The figure to be adjusted according to the machine rigidity or work rigidity. The figure is for BT40 or BT50.

2) In case of chatter occurring, recommend to reduce the depth of cut Ap or Spindle speed and keep feed per tooth.

3) If machine does not have enough power, recommend to reduce the depth of cut Ap or Spindle speed and Feed speed.

4) Use air blow.

5) In case of 50-55HRc, recommend to reduce 30% above Ap, N and F. (In the case of hardened die steel)

" High Feed Mirror Radius "

HRM Recommended cutting conditions for High Feed Mirror Radius

Materials	Grades	Tool dia.(mm)														
		ø 16					ø 20									
		L (mm)	Ae (mm)	Ap (mm)	N (min-1)	VF (mm/min)	L (mm)	Ae (mm)	Ap (mm)	N (min-1)	VF (mm/min)	L (mm)	Ae (mm)	Ap (mm)	N (min-1)	VF (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8015	80	7.0	0.60	3,800	3,800	100	9.8	0.60	3,000	3,000					
		120	7.0	0.40	3,800	3,800	150	9.8	0.40	3,000	3,000					
		160	7.0	0.30	3,800	3,800	200	9.8	0.30	3,000	3,000					
Mold steel (1.2311, P20) 30-43HRC	JC8015	80	7.0	0.60	3,500	3,500	100	9.8	0.60	2,800	2,800					
		120	7.0	0.40	3,500	3,500	150	9.8	0.40	2,800	2,800					
		160	7.0	0.30	3,500	3,500	200	9.8	0.30	2,800	2,800					
Die steel (1.2344,1.2379) Below 255HB	JC8015	80	7.0	0.60	3,500	3,500	100	9.8	0.60	2,800	2,800					
		120	7.0	0.40	3,500	3,500	150	9.8	0.40	2,800	2,800					
		160	7.0	0.30	3,500	3,500	200	9.8	0.30	2,800	2,800					
Stainless steel Below 250HB	JC8015	80	7.0	0.60	3,400	3,400	100	9.8	0.60	2,700	2,700					
		120	7.0	0.40	3,400	3,400	150	9.8	0.40	2,700	2,700					
		160	7.0	0.30	3,400	3,400	200	9.8	0.30	2,700	2,700					
Hardened die steel (1.2344,1.2379) 40-50HRC	JC8015	80	7.0	0.25	3,000	3,000	100	9.8	0.25	2,400	2,400					
		120	7.0	0.28	3,000	3,000	150	9.8	0.28	2,400	2,400					
		160	7.0	0.20	3,000	3,000	200	9.8	0.20	2,400	2,400					
Grey & Nodular cast iron (GG,GGG) Below 300HB	JC8015	80	7.0	0.60	3,200	3,200	100	9.8	0.60	2,500	2,500					
		120	7.0	0.40	3,200	3,200	150	9.8	0.40	2,500	2,500					
		160	7.0	0.30	3,200	3,200	200	9.8	0.30	2,500	2,500					

L: Overhung length, Ae : Pick feed, Ap: Depth of cut, N: Spindle speed, VF: Feed speed.

NOTE

1) The figure to be adjusted according to the machine rigidity or work rigidity. The figure is for BT40 or BT50.

2) In case of chatter occurring, recommend to reduce the depth of cut Ap or Spindle speed and keep feed per tooth.

3) If machine does not have enough power, recommend to reduce the depth of cut Ap or Spindle speed and Feed speed.

4) Use air blow.

5) In case of 50-55HRc, recommend to reduce 30% above Ap, N and F. (In the case of hardened die steel)