

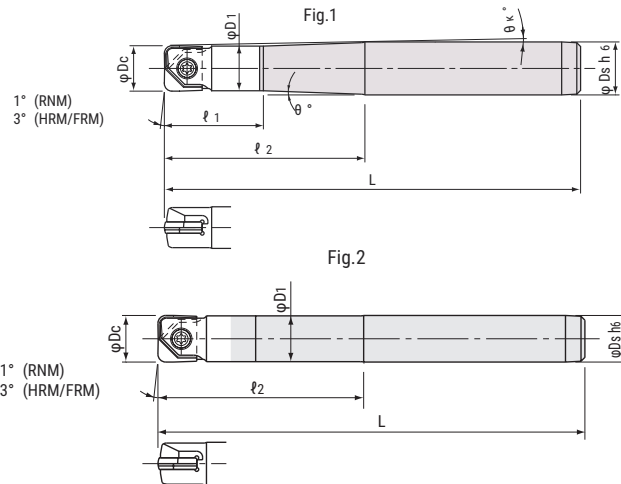
**MIRROR RADIUS** **RNM Type**

# MIRROR Radius

## High Precision Indexable Radius End Mill



● Corner radius accuracy below  $\pm 0.010\text{mm}$



Cat.No.	Stock	Dimensions (mm)							Parts		Inserts	Fig.	
		$\varphi D_c$	$\ell_1$	$\ell_2$	L	$\varphi D_1$	$\theta^\circ$	$\theta_k$	$\varphi D_s$	Screws			Wrench
RNMS-060015U-S06C	●	6	-	15	60	5.7	-	-	6	FSW-2005H	A-06	RNM-060...; HRM-060...; FRM-060...	2
RNMM-060030U-S06C	●			30	80								
RNMS-080020U-S08C	●	8	-	20	70	7.6	-	-	8	FSW-2506H	A-07	RNM-080...; HRM-080/090...; FRM-080...	1
RNMM-080040U-S08C	●			40	90								
RNMM-080053T-S12C	●			20	53	110			7.8	2°	2°12'	12	
RNML-080075S-S08C	●				75	140			8				
RNMS-100025U-S10C	●	10	-	25	75	9.5	-	-	10	FSW-3007H	A-08	RNM-100...; HRM-100/110...; FRM-100...	2
RNMM-100050U-S10C	●			50	100								
RNMM-100050S-S10C	●			22.5	53	110			9.8	1°	1°7'	12	
RNMM-100053T-S12C	●				75	140			10				
RNMS-120030U-S12C	●	12	-	30	80	11.5	-	-	12	FSW-3509H	A-10	RNM-120/130...; HRM-120/130...; FRM-120...	2
RNMM-120060U-S12C	●			60	110								
RNMM-120053S-S12C	●			53	110	11.8							
RNML-120095S-S12C	●			95	160								
RNMS-160035U-S16C	●	16	-	35	90	15.5	-	-	16	FSW-4013H	A-15	RNM-160/170...; HRM-160/170...; FRM-160/170...	2
RNMM-160070S-S16C	●			70	140								
RNMM-160090S-S16C	●			90	160	15.8							
RNML-160120S-S16C	●			120	210								
RNML-160150S-S16C	●			150	220								

Screw	Torque (N.m)
FSW-2005H	0.5
FSW-2506H	0.9
FSW-3007H	1.2
FSW-3509H	2.0
FSW-4013H	3.0

**MIRROR RADIUS** **RNM Type**

# MIRROR Radius

## High Precision Indexable Radius End Mill

**C-Body**



● Corner radius accuracy **below ±0.010mm**

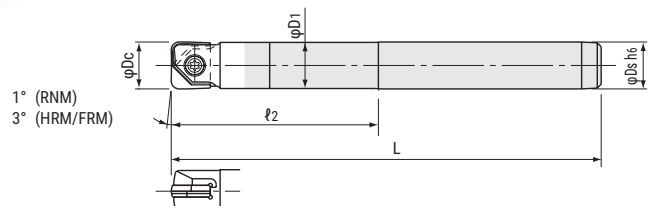


Fig 2

Cat.No.	Stock	Dimensions (mm)					Parts		Inserts	Fig.
		φDc	ℓ2	L	φD1	φDs	Screws	Wrench		
RNMS-200040U-S20C	●	20	40	105	19.8	20	FSW-5016H	A-20W	RNM-200/210...; HRM-200/220...; FRM-200/210...	2
RNMM-200075S-S20C	●		75	141						
RNMM-200105S-S20C	●		105	180						
RNML-200150S-S20C	●		150	220						
RNML-200170S-S20C	●		170	250						
RNMM-250090S-S25C	●	25	90	166	24.8	25	FSW-6020	A-30	RNM-250/260...; FRM-250...	2
RNMM-250140S-S25C	●		140	220						
RNML-250190S-S25C	●		190	260						
RNMM-300106S-S32C	●	30	106	186	29.8	32	FSW-8025S	A-30	RNM-300...; FRM-300...	2
RNMM-320106S-S32C	●	32			31.8					

Screw	Torque (N.m)
FSW-5016H	4.0
FSW-6020	5.0
FSW-8025S	6.0

# MIRROR RADIUS

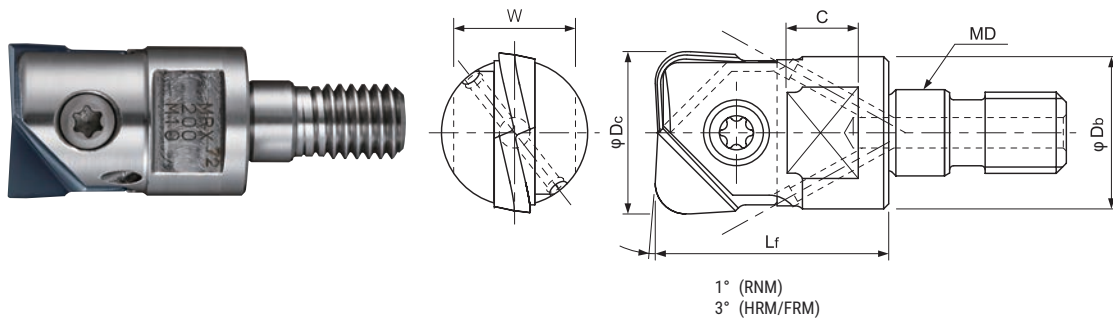
# MRX Type

- Modular Head Type
- High Precision Indexable Radius End Mill

Through coolant hole



- RNM / Corner radius accuracy **below ±0.010mm**
- HRM / Corner radius accuracy **±0.015 mm**
- FRM / Corner radius accuracy **±0.010 mm**
- O.D. run out / MRX + MSN carbide shank **below ±0.015mm**



Cat.No.	Stock	Dimensions (mm)					Parts		Inserts	
		φDc	Lf	φDb	MD	C	W	Screws		Wrench
MRX-100-M6	●	10	18	9.7	M6	6.5	8	FSW-3007H	A-08	RNM-100...; HRM-100/110...; FRM-100...
MRX-120-M6	●	12	20	11.5	M6			FSW-3509H	A-10	RNM-120/130...; HRM-120/130...; FRM-120...
MRX-160-M8	●	16	23	15	M8	8	12	FSW-4013H	A-15	RNM-160/170...; HRM-160/170...; FRM-160/170...
MRX-200-M10	●	20	30	18.5	M10			14	FSW-5016H	A-20W
MRX-250-M12	●	25	35	24	M12	10	17	FSW-6020	A-30	RNM-250/260...; FRM-250...
MRX-300-M16	●	30	43	29	M16	12.5	22	FSW-8025S	A-30	RNM-300...; FRM-300...
MRX-320-M16	●	32		30	M16					RNM-320...; FRM-320...

Screw	Torque (N.m)
FSW-3007H	1.2
FSW-3509H	2.0
FSW-4013H	3.0
FSW-5016H	4.0
FSW-6020	5.0
FSW-8025S	6.0

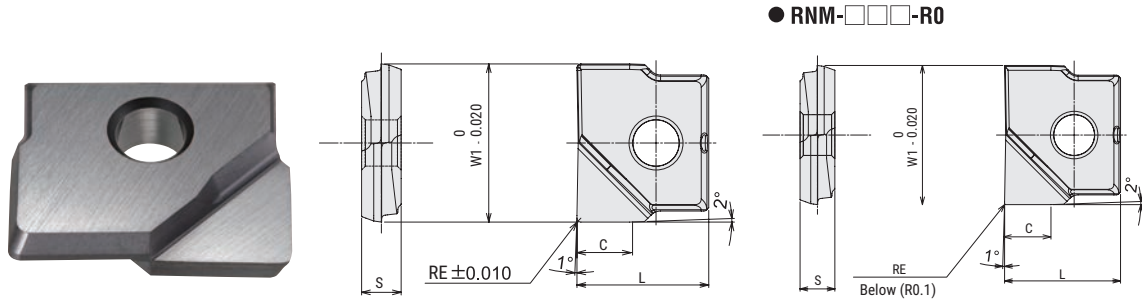
## ■ Spanner

	Cat.No.	MD	Torque	width across flat	Thickness	Length
	DS-08	M6	8.0 N.m	12	4	85
	DS-12	M8	16 N.m	12	4	93

**MIRROR RADIUS** **RNM/MRX Type**

● **RNM Type - Neutral geometry** (for finishing applications)

Corner radius accuracy  $\pm 0.010$  mm



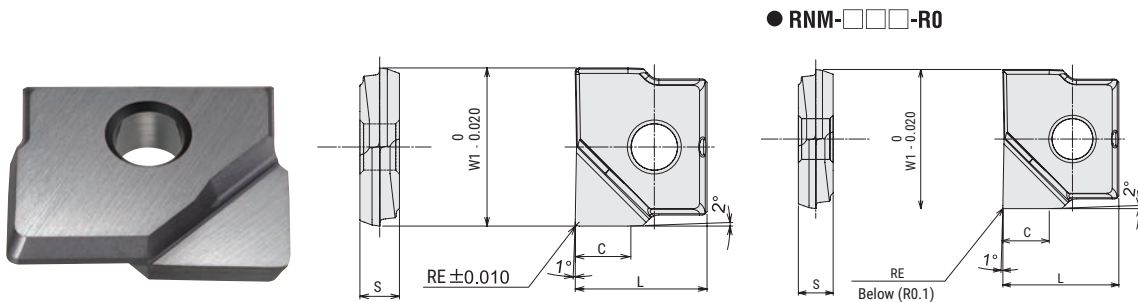
● RNM-□□□-R0

Cat.No	PVD coating		Diamond coating	Uncoated	Dimensions (mm)				
	DH103 (Z05)	JC8015 (Z10~20)	JC10000	KT9 (K10)	RE	L	W1	S	C
RNM-060-R03	●	●			0.3	5	6	2	2
RNM-060-R05	●	●			0.5				
RNM-060-R10	●	●			1				
RNM-080-R03	●	●		●	0.3	7	8	2.4	2.7
RNM-080-R05	●	●	●	●	0.5				
RNM-080-R10	●	●	●	●	1				
RNM-100-R0		●			※	8.5	10	2.6	3.3
RNM-100-R03	●	●		●	0.3				
RNM-100-R05	●	●	●	●	0.5				
RNM-100-R10	●	●	●	●	1				
RNM-100-R15		●		●	1.5				
RNM-100-R20	●	●		●	2				
RNM-120-R0		●			※	10	12	3	4
RNM-120-R03	●	●		●	0.3				
RNM-120-R05	●	●	●	●	0.5				
RNM-120-R10	●	●	●	●	1				
RNM-120-R15	●	●		●	1.5				
RNM-120-R20	●	●		●	2				
RNM-130-R03		●			0.3	10	13	3	4
RNM-130-R05		●			0.5				
RNM-130-R10		●			1				
RNM-130-R20		●			2				
RNM-160-R0		●			※	12	16	4	5.3
RNM-160-R03	●	●		●	0.3				
RNM-160-R05	●	●		●	0.5				
RNM-160-R10	●	●		●	1				
RNM-160-R15	●	●		●	1.5				
RNM-160-R20	●	●		●	2				
RNM-170-R03		●			0.3	12	17	4	5.3
RNM-170-R05		●			0.5				
RNM-170-R10		●			1				
RNM-170-R20		●			2				
RNM-200-R0		●			※	15	20	5	6.7
RNM-200-R03	●	●		●	0.3				
RNM-200-R05	●	●		●	0.5				
RNM-200-R10	●	●		●	1				

**MIRROR RADIUS** **RNM/MRX Type**

■ **RNM Type - Neutral geometry** (for finishing applications)

Corner radius accuracy  $\pm 0.010$  mm

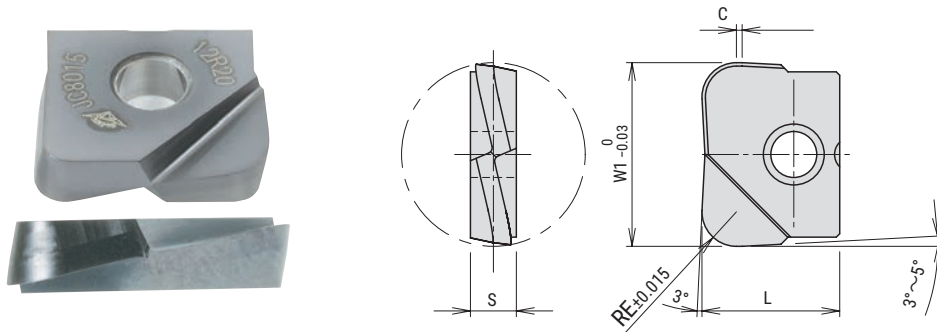


Cat.No	PVD coating		Diamond coating	Uncoated	Dimensions (mm)				
	DH103 (Z05)	JC8015 (Z10~20)	JC10000	KT9 (K10)	RE	L	W1	S	C
RNM-200-R15	●	●		●	1.5	6.7	20	15	5
RNM-200-R20	●	●		●	2				
RNM-200-R30		●			3				
RNM-210-R03		●			0.3	6.7	21	15	5
RNM-210-R05		●			0.5				
RNM-210-R10		●			1				
RNM-210-R20		●			2				
RNM-250-R0		●			※	8.3	25	18.5	6
RNM-250-R03	●	●			0.3				
RNM-250-R05	●	●			0.5				
RNM-250-R10	●	●			1				
RNM-250-R15	●	●			1.5				
RNM-250-R20	●	●			2				
RNM-250-R30		●			3				
RNM-260-R03		●			0.3	8.3	26	18.5	6
RNM-260-R05		●			0.5				
RNM-260-R10		●			1				
RNM-260-R20		●			2				
RNM-300-R03	●	●			0.3	10	30	22.5	7
RNM-300-R05	●	●			0.5				
RNM-300-R10	●	●			1				
RNM-300-R15		●			1.5				
RNM-300-R20	●	●			2				
RNM-300-R30		●			3				
RNM-320-R03	●	●			0.3	10.7	32	23.5	7
RNM-320-R05	●	●			0.5				
RNM-320-R10	●	●			1				
RNM-320-R15		●			1.5				
RNM-320-R20	●	●			2				
RNM-320-R30		●			3				

**MIRROR RADIUS** **RNM/MRX Type**

■ **HRM Type - High feed geometry** (from Semi-finishing to finishing)

Corner radius accuracy  
±0.015 mm

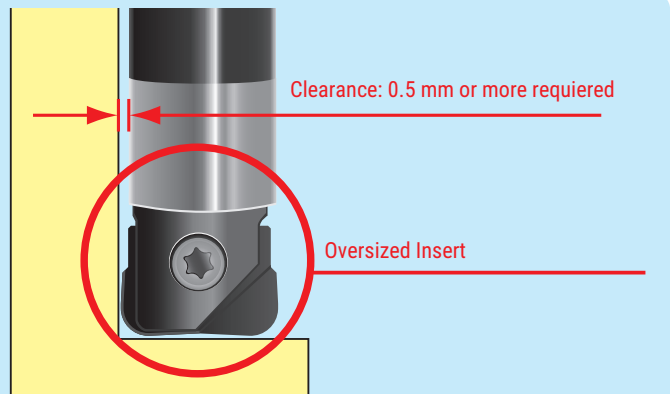


Cat.No.	PVD Coating	Dimensions(mm)				
	JC8015	RE	L	W1	S	C
HRM-060-R05	●	0.5	5	6	2	-
HRM-060-R10	●	1				
HRM-060-R15	●	1.5				
HRM-080-R20	●	2	7	8	2.4	0.3
HRM-090-R20	●			9		
HRM-100-R20	●		8.5	10	2.6	
HRM-110-R20	●			11		
HRM-120-R20	●		10	12	3	
HRM-130-R20	●			13		
HRM-160-R20	●	3	12	16	4	0.5
HRM-160-R30	●			17		
HRM-170-R30	●		2	15	20	
HRM-200-R20	●					
HRM-200-R30	●					
HRM-220-R30	●	3	22			

**Mirror Radius Oversized Insert**

Recommended to use oversized insert ※ for increasing side clearance to prevent the damage of shank by sticking chips.

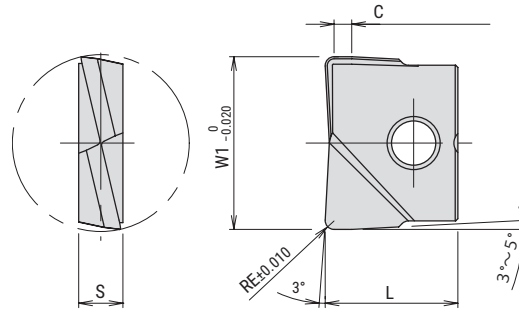
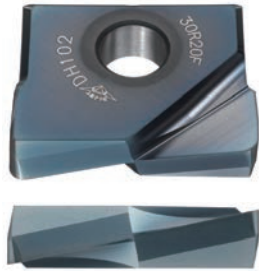
(※) **HRM-090-R20, HRM-110-R20, HRM-130-R20, HRM-170-R30, HRM-220-R30**



**MIRROR RADIUS** **RNM/MRX Type**

■ **FRM Type - High feed geometry** (from Semi-finishing to finishing)

Corner radius accuracy  $\pm 0.010$  mm



Cat.No.	PVD Coating		Dimensions(mm)					
	DH102	JC8015	RE	L	W1	S	C	
FRM-060-R03	●		0.3	5	6	2	0.8	
FRM-060-R05	●	●	0.5					
FRM-060-R10	●	●	1					
FRM-080-R03	●		0.3	7	8	2.4	1.2	
FRM-080-R05	●	●	0.5					
FRM-080-R10	●	●	1					
FRM-100-R03	●		0.3	8.5	10	2.6	1.5	
FRM-100-R05	●	●	0.5					
FRM-100-R10	●	●	1					
FRM-100-R20	●		2					
FRM-120-R03	●		0.3	10	12	3		2
FRM-120-R05	●	●	0.5					
FRM-120-R10	●	●	1					
FRM-120-R20	●	●	2					
FRM-120-R30	●		3					
FRM-160-R03	●		0.3	12	16	4		
FRM-160-R05	●	●	0.5					
FRM-160-R10	●	●	1					
FRM-160-R15	●		1.5					
FRM-160-R20	●	●	2					
FRM-160-R30	●		3					
FRM-170-R10	●	●	1		17			
FRM-200-R03	●		0.3	15	20	5	2	
FRM-200-R05	●	●	0.5					
FRM-200-R10	●	●	1					
FRM-200-R15	●		1.5					
FRM-200-R20	●	●	2					
FRM-200-R30	●		3					
FRM-210-R10	●	●	1		21			

Cat.No.	PVD Coating		Dimensions(mm)					
	DH102	JC8015	RE	L	W1	S	C	
FRM-250-R03	●		0.3	18.5	25	6	2.5	
FRM-250-R05	●		0.5					
FRM-250-R10	●	●	1					
FRM-250-R20	●	●	2					
FRM-250-R30	●		3					
FRM-300-R03	●		0.3	22.5	30	7	3	
FRM-300-R05	●		0.5					
FRM-300-R10	●	●	1					
FRM-300-R20	●	●	2					
FRM-300-R30	●		3					
FRM-320-R03	●		0.3	23.5	32	3		2
FRM-320-R05	●		0.5					
FRM-320-R10	●	●	1					
FRM-320-R20	●	●	2					
FRM-320-R30	●		3					

**MIRROR RADIUS**

**RNM/MRX Type**

■ **Grade selection guide**

Material	Cat.No	Grade	RNM				HRM	FRM	
			DH103	JC8015	JC10000	KT9	JC8015	DH102	JC8015
Carbon steel (S50C, S55C) below 250HB	RNM HRM FRM	JC8015		◎			◎		◎
Cast steel (GM190, ICD5) below 285HB	RNM HRM FRM	JC8015		◎			◎		◎
Tool & die steel (SKD61, SKD11) below 255HB	RNM HRM FRM	JC8015		◎			◎		◎
Mold steel (HPM7, PX5, P20) 30-36 HRC	RNM HRM FRM	DH103 JC8015	○	◎			◎		◎
Mold steel (NAK80, HPM1, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	○	◎			◎		◎
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	HRM FRM	DH102 JC8015		○			○	◎	○
Hardened die steel (SKD11, SLD, DC11) 55-62HRC	FRM	DH102						◎	
HSS (SKH, HAP) 63-70HRC	FRM	DH102	○					◎	
Grey cast iron (FC250) 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	◎	○			○	◎	○
Nodular cast iron (FCD700) 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	◎	○			○	◎	○
Austenitic stainless steel (SUS304, 316, 317) 17Cr	RNM HRM FRM	JC8015	○	◎			◎	○	◎
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	RNM HRM FRM	JC8015	○	◎			◎	○	◎
Aluminium alloy (A5052)	RNM	KT9				◎			
Aluminium alloy (A7075)	RNM	KT9				◎			
Aluminium alloy Si below13%	RNM	KT9				◎			
Copper alloy (C1100)	RNM	KT9				◎			
Graphite	RNM	JC10000			◎				
Titanium alloy (Ti-6Al-4V) 35-43HRC	HRM FRM	JC8015					◎		◎
Heat resistant alloy (INCO718) 35-43HRC	HRM FRM	JC8015					◎		◎

◎:First choice ○:Second choice ☆:Wet cutting ★:High speed cutting



**MIRROR RADIUS****RNM/MRX Type**

## ■ Recommended cutting conditions

## ● Side finishing

Overhang length ℓ/Dc	n (min <sup>-1</sup> )	Vf (mm/min)
~3Dc	100%	100%
3Dc~5Dc	70%	70%
5Dc~10Dc	50%	50%

Material	Cat.No.	Grade	Tool dia.(mm)											
			6				8				10			
			ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	RNM HRM FRM	JC8015	0.2	0.1	15,920	3,980	0.3	0.1	11940	2990	0.3	0.1	9,550	2,870
Cast steel (GM190, ICD5) below 285HB	RNM HRM FRM	JC8015	0.2	0.1	15,920	3,980	0.3	0.1	11940	2990	0.3	0.1	9,550	2,870
Tool & die steel (SKD61, SKD11) below 255HB	RNM HRM FRM	JC8015	0.2	0.1	15,920	3,980	0.3	0.1	11940	2990	0.3	0.1	9,550	2,870
Mold steel (HPM7, PX5, P20) 30-36 HRC	RNM HRM FRM	DH103 JC8015	0.2	0.1	15,920	3,980	0.3	0.1	11940	2990	0.3	0.1	9,550	2,870
Mold steel (NAK80, HPM1, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.2	0.1	14,850	3,710	0.2	0.1	11140	2790	0.3	0.1	8,910	2,670
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	HRM FRM	DH102 JC8015	0.2	0.1	13,260	1,330	0.2	0.1	9950	1000	0.3	0.1	7,960	800
Hardened die steel (SKD11, SLD, DC11) 55-62HRC	FRM	DH102	0.2	0.1	10,610	1,060	0.2	0.1	7960	800	0.3	0.1	6,370	640
HSS (SKH, HAP) 63-70HRC	FRM	DH102	0.1	0.1	7,960	320	0.1	0.1	5970	240	0.1	0.1	4,770	290
Grey cast iron (FC250) 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	0.1	18,570	6,500	0.3	0.1	13930	4880	0.3	0.15	11,140	3,900
Nodular cast iron (FCD700) 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	0.1	18,570	6,500	0.3	0.1	13930	4880	0.3	0.15	11,140	3,900
Austenitic stainless steel (SUS304, 316, 317) 17Cr	RNM HRM FRM	JC8015	0.2	0.1	14,850	4,460	0.3	0.1	11140	3340	0.3	0.1	8,910	2,670
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	RNM HRM FRM	JC8015	0.2	0.1	14,850	4,460	0.3	0.1	11140	3340	0.3	0.1	8,910	2,670
Aluminium alloy (A5052) 160-260HB	RNM	KT9	0.3	0.2	18,570	7,430	0.4	0.2	13930	5570	0.5	0.2	11,140	4,460
Aluminium alloy (A7075) 160-260HB	RNM	KT9	0.3	0.2	18,570	7,430	0.4	0.2	13930	5570	0.5	0.2	11,140	4,460
Aluminium alloy Si below13%	RNM	KT9	0.3	0.2	18,570	7,430	0.4	0.2	13930	5570	0.5	0.2	11,140	4,460
Copper alloy (C1100)	RNM	KT9	0.2	0.15	13,260	5,300	0.25	0.15	9950	3980	0.3	0.15	7,960	3,180
Graphite	RNM	JC10000	0.3	0.2	18,570	7,430	0.4	0.2	13930	5570	0.5	0.2	11,140	4,460
Titanium alloy (Ti-6Al-4V) 35-43HRC	HRM FRM	JC8015	0.2	0.1	5,310	1,060	0.2	0.1	3980	800	0.25	0.1	3,180	760
Heat resistant alloy (INCO718) 35-43HRC	HRM FRM	JC8015	0.2	0.1	4,240	850	0.2	0.1	3180	640	0.25	0.1	2,550	610

- Note
1. Please adjust cutting conditions according to machine rigidity or work rigidity.
  2. These cutting conditions represent stable machining at length 3 x Dc. please adjust cutting conditions according to overhang length.
  3. In case of chatter occurring, recommended to reduce ap or feed.
  4. Use air blow.

**MIRROR RADIUS****RNM/MRX Type**

## ■ Recommended cutting conditions

## ● Side finishing

Overhang length ℓ/Dc	n (min <sup>-1</sup> )	Vf (mm/min)
~3Dc	100%	100%
3Dc~5Dc	70%	70%
5Dc~10Dc	50%	50%

Material	Cat.No.	Grade	Tool dia.(mm)											
			12/13				16/17				20/21			
			ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	RNM HRM FRM	JC8015	0.3	0.1	7,960	2,390	0.4	0.1	5,970	2,390	0.5	0.1	4,770	1,910
Cast steel (GM190, ICD5) below 285HB	RNM HRM FRM	JC8015	0.3	0.1	7,960	2,390	0.4	0.1	5,970	2,390	0.5	0.1	4,770	1,910
Tool & die steel (SKD61, SKD11) below 255HB	RNM HRM FRM	JC8015	0.3	0.1	7,960	2,390	0.4	0.1	5,970	2,390	0.5	0.1	4,770	1,910
Mold steel (HPM7, PX5, P20) 30-36 HRC	RNM HRM FRM	DH103 JC8015	0.3	0.1	7,960	2,390	0.4	0.1	5,970	2,390	0.5	0.1	4,770	1,910
Mold steel (NAK80, HPM1, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.3	0.1	7,430	2,230	0.4	0.1	5,570	1,670	0.5	0.1	4,460	1,340
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	HRM FRM	DH102 JC8015	0.3	0.1	6,630	660	0.4	0.1	4,970	750	0.5	0.1	3,980	600
Hardened die steel (SKD11, SL, DC11) 55-62HRC	FRM	DH102	0.3	0.1	5,310	530	0.4	0.1	3,980	600	0.5	0.1	3,180	480
HSS (SKH, HAP) 63-70HRC	FRM	DH102	0.1	0.1	3,980	320	0.2	0.1	2,980	300	0.2	0.1	2,390	240
Grey cast iron (FC250) 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.3	0.2	9,280	3,250	0.4	0.2	6,960	3,480	0.5	0.2	5,570	3,340
Nodular cast iron (FCD700) 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.3	0.2	9,280	3,250	0.4	0.2	6,960	3,480	0.5	0.2	5,570	3,340
Austenitic stainless steel (SUS304, 316, 317) 17Cr	RNM HRM FRM	JC8015	0.3	0.1	7,430	2,230	0.4	0.1	5,570	2,230	0.5	0.1	4,460	1,780
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	RNM HRM FRM	JC8015	0.3	0.1	7,430	2,230	0.4	0.1	5,570	2,230	0.5	0.1	4,460	1,780
Aluminium alloy (A5052) 160-260HB	RNM	KT9	0.6	0.2	9,280	3,710	0.8	0.2	6,960	3,500	1	0.2	5,570	2,800
Aluminium alloy (A7075) 160-260HB	RNM	KT9	0.6	0.2	9,280	3,710	0.8	0.2	6,960	3,500	1	0.2	5,570	2,800
Aluminium alloy Si below13%	RNM	KT9	0.6	0.2	9,280	3,710	0.8	0.2	6,960	3,500	1	0.2	5,570	2,800
Copper alloy (C1100)	RNM	KT9	0.4	0.15	6,630	2,650	0.5	0.15	4,970	2,500	0.7	0.15	3,980	2,000
Graphite	RNM	JC10000	0.6	0.2	9,280	3,710	0.8	0.2	6,960	3,500	1	0.2	5,570	2,800
Titanium alloy (Ti-6Al-4V) 35-43HRC	HRM FRM	JC8015	0.25	0.1	2,650	640	0.25	0.1	1,990	480	0.3	0.1	1,590	380
Heat resistant alloy (INCO718) 35-43HRC	HRM FRM	JC8015	0.25	0.1	2,120	510	0.25	0.1	1,590	380	0.3	0.1	1,270	300

## Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. These cutting conditions represent stable machining at length 3 x Dc. please adjust cutting conditions according to overhang length.
3. In case of chatter occurring, recommended to reduce ap or feed.
4. Use air blow.

**MIRROR RADIUS****RNM/MRX Type**

## ■ Recommended cutting conditions

## ● Side finishing

Overhang length ℓ/Dc	n (min <sup>-1</sup> )	Vf (mm/min)
~3Dc	100%	100%
3Dc~5Dc	70%	70%
5Dc~10Dc	50%	50%

Material	Cat.No.	Grade	Tool dia.(mm)											
			25/26				30				32			
			ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	RNM HRM FRM	JC8015	0.8	0.1	3,820	1,530	1	0.1	3,180	1,270	1.2	0.1	2,980	1,190
Cast steel (GM190, ICD5) below 285HB	RNM HRM FRM	JC8015	0.8	0.1	3,820	1,530	1	0.1	3,180	1,270	1.2	0.1	2,980	1,190
Tool & die steel (SKD61, SKD11) below 255HB	RNM HRM FRM	JC8015	0.8	0.1	3,820	1,530	1	0.1	3,180	1,270	1.2	0.1	2,980	1,190
Mold steel (HPM7, PX5, P20) 30-36 HRC	RNM HRM FRM	DH103 JC8015	0.8	0.1	3,820	1,530	1	0.1	3,180	1,270	1.2	0.1	2,980	1,190
Mold steel (NAK80, HPM1, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.8	0.1	3,570	1,070	1	0.1	2,970	890	1.2	0.1	2,790	840
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	HRM FRM	DH102 JC8015	0.6	0.1	3,180	480	0.8	0.1	2,650	400	1	0.1	2,490	370
Hardened die steel (SKD11, SL, DC11) 55-62HRC	FRM	DH102	0.6	0.1	2,550	380	0.8	0.1	2,120	320	1	0.1	1,990	300
HSS (SKH, HAP) 63-70HRC	FRM	DH102	0.3	0.1	1,910	190	0.4	0.1	1,590	160	0.5	0.1	1,490	150
Grey cast iron (FC250) 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.8	0.2	4,460	2,680	1	0.2	3,710	2,230	1.2	0.2	3,480	2,090
Nodular cast iron (FCD700) 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.8	0.2	4,460	2,680	1	0.2	3,710	2,230	1.2	0.2	3,480	2,090
Austenitic stainless steel (SUS304, 316, 317) 17Cr	RNM HRM FRM	JC8015	0.8	0.1	3,570	1,430	1	0.1	2,970	1,190	1	0.1	2,790	1,120
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	RNM HRM FRM	JC8015	0.8	0.1	3,570	1,430	1	0.1	2,970	1,190	1.2	0.1	2,790	1,120
Aluminium alloy (A5052) 160-260HB	RNM	KT9	1.2	0.2	4,460	2,230	1.6	0.2	3,710	1,860	1.6	0.2	3,480	1,740
Aluminium alloy (A7075) 160-260HB	RNM	KT9	1.2	0.2	4,460	2,230	1.6	0.2	3,710	1,860	1.6	0.2	3,480	1,740
Aluminium alloy Si below13%	RNM	KT9	1.2	0.2	4,460	2,230	1.6	0.2	3,710	1,860	1.6	0.2	3,480	1,740
Copper alloy (C1100)	RNM	KT9	0.8	0.15	3,180	1,590	1	0.15	2,650	1,330	1	0.15	2,490	1,250
Graphite	RNM	JC10000	1.2	0.2	4,460	2,230	1.6	0.2	3,710	1,860	1.6	0.2	3,480	1,740
Titanium alloy (Ti-6Al-4V) 35-43HRC	HRM FRM	JC8015	0.35	0.1	1,270	320	0.4	0.1	1,060	270	0.4	0.1	990	250
Heat resistant alloy (INCO718) 35-43HRC	HRM FRM	JC8015	0.35	0.1	1,020	260	0.4	0.1	850	210	0.4	0.1	800	200

## Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. These cutting conditions represent stable machining at length 3 x Dc. please adjust cutting conditions according to overhang length.
3. In case of chatter occurring, recommended to reduce ap or feed.
4. Use air blow.

**MIRROR RADIUS****RNM/MRX Type**

- Recommended cutting conditions
- Bottom finishing

Overhang length ℓ/Dc	n (min <sup>-1</sup> )	Vf (mm/min)
~3Dc	100%	100%
3Dc~5Dc	70%	70%
5Dc~10Dc	50%	50%

Material	Cat.No.	Grade	Tool dia.(mm)											
			6				8				10			
			ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	RNM HRM FRM	JC8015	0.1	1.0(~3)	13,790	3,450	0.15	1.2(~4)	10,350	3,110	0.15	1.2(~5)	8,280	2,480
Cast steel (GM190, ICD5) below 285HB	RNM HRM FRM	JC8015	0.1	1.0(~3)	13,790	3,450	0.15	1.2(~4)	10,350	3,110	0.15	1.2(~5)	8,280	2,480
Tool & die steel (SKD61, SKD11) below 255HB	RNM HRM FRM	JC8015	0.1	1.0(~3)	13,790	3,450	0.15	1.2(~4)	10,350	3,110	0.15	1.2(~5)	8,280	2,480
Mold steel (HPM7, PX5, P20) 30-36 HRC	RNM HRM FRM	DH103 JC8015	0.1	1.0(~3)	13,790	3,450	0.15	1.2(~4)	10,350	3,110	0.15	1.2(~5)	8,280	2,480
Mold steel (NAK80, HPM1, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.1	1.0(~3)	12,730	3,180	0.15	1.2(~4)	9,550	2,870	0.15	1.2(~5)	7,640	2,290
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	HRM FRM	DH102 JC8015	0.05	1.0(~3)	10,080	1,010	0.06	1.2(~4)	7,560	760	0.08	1.2(~5)	6,050	610
Hardened die steel (SKD11, SLD, DC11) 55-62HRC	FRM	DH102	0.05	1.0(~3)	6,900	690	0.06	1.2(~4)	5,170	520	0.08	1.2(~5)	4,140	410
HSS (SKH, HAP) 63-70HRC	FRM	DH102	0.03	1.0(~2)	5,310	210	0.04	1.2(~3)	3,980	160	0.05	1.2(~4)	3,180	190
Grey cast iron (FC250) 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.1	1.0(~3)	15,920	4,780	0.15	1.2(~4)	11,940	4,180	0.15	1.2(~5)	9,550	3,340
Nodular cast iron (FCD700) 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.1	1.0(~3)	15,920	4,780	0.15	1.2(~4)	11,940	4,180	0.15	1.2(~5)	9,550	3,340
Austenitic stainless steel (SUS304, 316, 317) 17Cr	RNM HRM FRM	JC8015	0.1	1.0(~3)	12,730	3,180	0.15	1.2(~4)	9,550	2,870	0.15	1.2(~5)	7,640	2,290
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	RNM HRM FRM	JC8015	0.1	1.0(~3)	12,730	3,180	0.15	1.2(~4)	9,550	2,870	0.15	1.2(~5)	7,640	2,290
Aluminium alloy (A5052) 160-260HB	RNM	KT9	0.2	1.0(~3)	15,920	6,370	0.25	1.2(~4)	11,940	4,780	0.25	1.2(~5)	9,550	3,820
Aluminium alloy (A7075) 160-260HB	RNM	KT9	0.2	1.0(~3)	15,920	6,370	0.25	1.2(~4)	11,940	4,780	0.25	1.2(~5)	9,550	3,820
Aluminium alloy Si below 13%	RNM	KT9	0.2	1.0(~3)	15,920	6,370	0.25	1.2(~4)	11,940	4,780	0.25	1.2(~5)	9,550	3,820
Copper alloy (C1100)	RNM	KT9	0.15	1.0(~3)	10,610	3,180	0.2	1.2(~4)	7,960	2,390	0.2	1.2(~5)	6,370	1,910
Graphite	RNM	JC10000	0.2	1.0(~3)	15,920	6,370	0.25	1.2(~4)	11,940	4,780	0.25	1.2(~5)	9,550	3,820
Titanium alloy (Ti-6Al-4V) 35-43HRC	HRM FRM	JC8015	0.1	1.0(~3)	2,920	580	0.15	1.2(~4)	2,190	440	0.15	1.2(~5)	1,750	350
Heat resistant alloy (INCO718) 35-43HRC	HRM FRM	JC8015	0.1	1.0(~3)	2,920	580	0.15	1.2(~5)	2,190	440	0.15	1.2(~5)	1,750	350

## Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. These cutting conditions represent stable machining at length 3 x Dc. please adjust cutting conditions according to overhang length.
3. In case of chatter occurring, recommended to reduce ap or feed.
4. Use air blow.

**MIRROR RADIUS****RNM/MRX Type**

## ■ Recommended cutting conditions

## ● Bottom finishing

Overhang length ℓ/Dc	n (min <sup>-1</sup> )	Vf (mm/min)
~3Dc	100%	100%
3Dc~5Dc	70%	70%
5Dc~10Dc	50%	50%

Material	Cat.No.	Grade	Tool dia.(mm)											
			12/13				16/17				20/21			
			ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	RNM HRM FRM	JC8015	0.15	1.5(~5)	6,900	2,070	0.15	2.0(~9)	5,170	2,070	0.2	2.5(~13)	4,140	1,660
Cast steel (GM190, ICD5) below 285HB	RNM HRM FRM	JC8015	0.15	1.5(~5)	6,900	2,070	0.15	2.0(~9)	5,170	2,070	0.2	2.5(~13)	4,140	1,660
Tool & die steel (SKD61, SKD11) below 255HB	RNM HRM FRM	JC8015	0.15	1.5(~5)	6,900	2,070	0.15	2.0(~9)	5,170	2,070	0.2	2.5(~13)	4,140	1,660
Mold steel (HPM7, PX5, P20) 30-36 HRC	RNM HRM FRM	DH103 JC8015	0.15	1.5(~5)	6,900	2,070	0.15	2.0(~9)	5,170	2,070	0.2	2.5(~13)	4,140	1,660
Mold steel (NAK80, HPM1, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.15	1.5(~5)	6,370	1,910	0.15	2.0(~9)	4,770	1,430	0.2	2.5(~13)	3,820	1,150
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	HRM FRM	DH102 JC8015	0.1	1.5(~5)	5,040	600	0.1	2.0(~9)	3,780	570	0.15	2.5(~13)	3,020	450
Hardened die steel (SKD11, SLD, DC11) 55-62HRC	FRM	DH102	0.1	1.5(~5)	3,450	410	0.1	2.0(~9)	2,590	390	0.15	2.5(~13)	2,070	310
HSS (SKH, HAP) 63-70HRC	FRM	DH102	0.05	1.5(~5)	2,650	210	0.05	2.0(~6)	1,990	200	0.05	2.5(~8)	1,590	160
Grey cast iron (FC250) 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	1.5(~5)	7,960	3,180	0.2	2.0(~9)	5,970	2,390	0.2	2.5(~13)	4,770	1,910
Nodular cast iron (FCD700) 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	1.5(~5)	7,960	3,180	0.2	2.0(~9)	5,970	2,390	0.2	2.5(~13)	4,770	1,910
Austenitic stainless steel (SUS304, 316, 317) 17Cr	RNM HRM FRM	JC8015	0.15	1.5(~5)	6,370	1,910	0.15	2.0(~9)	4,770	1,910	0.15	2.5(~13)	3,820	1,530
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	RNM HRM FRM	JC8015	0.15	1.5(~5)	6,370	1,910	0.15	2.0(~9)	4,770	1,910	0.15	2.5(~13)	3,820	1,530
Aluminium alloy (A5052) 160-260HB	RNM	KT9	0.25	1.5(~5)	7,960	3,180	0.25	2.0(~9)	5,970	3,580	0.3	2.5(~13)	4,770	2,860
Aluminium alloy (A7075) 160-260HB	RNM	KT9	0.25	1.5(~5)	7,960	3,180	0.25	2.0(~9)	5,970	3,580	0.3	2.5(~13)	4,770	2,860
Aluminium alloy Si below13%	RNM	KT9	0.25	1.5(~5)	7,960	3,180	0.25	2.0(~9)	5,970	3,580	0.3	2.5(~13)	4,770	2,860
Copper alloy (C1100)	RNM	KT9	0.2	1.5(~5)	5,310	1,590	0.2	2.0(~9)	3,980	1,190	0.25	2.5(~13)	3,180	950
Graphite	RNM	JC10000	0.25	1.5(~5)	7,960	3,180	0.25	2.0(~9)	5,970	3,580	0.3	2.5(~13)	4,770	2,860
Titanium alloy (Ti-6Al-4V) 35-43HRC	HRM FRM	JC8015	0.15	1.5(~5)	1,460	290	0.15	2.0(~9)	1,090	220	0.2	2.5(~13)	880	180
Heat resistant alloy (INCO718) 35-43HRC	HRM FRM	JC8015	0.15	1.5(~5)	1,460	290	0.15	2.0(~9)	1,090	220	0.2	2.5(~13)	880	180

## Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. These cutting conditions represent stable machining at length 3 x Dc. please adjust cutting conditions according to overhang length.
3. In case of chatter occurring, recommended to reduce ap or feed.
4. Use air blow.

# MIRROR RADIUS

# RNM/MRX Type

- Recommended cutting conditions
- Bottom finishing

Overhang length ℓ/Dc	n (min <sup>-1</sup> )	Vf (mm/min)
~3Dc	100%	100%
3Dc~5Dc	70%	70%
5Dc~10Dc	50%	50%

Material	Cat.No.	Grade	Tool dia.(mm)											
			25/26				30				32			
			ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)	ap (mm)	ae (mm)	n (min <sup>-1</sup> )	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	RNM HRM FRM	JC8015	0.2	4.0(~18)	3,310	1,320	0.2	4.2(~23)	2,760	1,100	0.2	4.2(~25)	2,590	1,040
Cast steel (GM190, ICD5) below 285HB	RNM HRM FRM	JC8015	0.2	4.0(~18)	3,310	1,320	0.2	4.2(~23)	2,760	1,100	0.2	4.2(~25)	2,590	1,040
Tool & die steel (SKD61, SKD11) below 255HB	RNM HRM FRM	JC8015	0.2	4.0(~18)	3,310	1,320	0.2	4.2(~23)	2,760	1,100	0.2	4.2(~25)	2,590	1,040
Mold steel (HPM7, PX5, P20) 30-36 HRC	RNM HRM FRM	DH103 JC8015	0.2	4.0(~18)	3,310	1,320	0.2	4.2(~23)	2,760	1,100	0.2	4.2(~25)	2,590	1,040
Mold steel (NAK80, HPM1, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.2	4.0(~18)	3,060	920	0.2	4.2(~23)	2,550	770	0.2	4.2(~25)	2,390	720
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	HRM FRM	DH102 JC8015	0.15	4.0(~18)	2,420	360	0.15	4.2(~23)	2,020	300	0.15	4.2(~25)	1,890	280
Hardened die steel (SKD11, SLD, DC11) 55-62HRC	FRM	DH102	0.15	4.0(~18)	1,660	250	0.15	4.2(~23)	1,380	210	0.15	4.2(~25)	1,290	190
HSS (SKH, HAP) 63-70HRC	FRM	DH102	0.05	4.0(~10)	1,270	130	0.05	4.2(~12)	1,060	110	0.05	4.2(~13)	990	100
Grey cast iron (FC250) 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	4.0(~18)	3,820	1,910	0.2	4.2(~23)	3,180	1,590	0.2	4.2(~25)	2,980	1,490
Nodular cast iron (FCD700) 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	4.0(~18)	3,820	1,910	0.2	4.2(~23)	3,180	1,590	0.2	4.2(~25)	2,980	1,490
Austenitic stainless steel (SUS304, 316, 317) 17Cr	RNM HRM FRM	JC8015	0.15	4.0(~18)	3,060	1,220	0.15	4.2(~23)	2,550	1,020	0.15	4.2(~25)	2,390	960
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	RNM HRM FRM	JC8015	0.15	4.0(~18)	3,060	1,220	0.15	4.2(~23)	2,550	1,020	0.15	4.2(~25)	2,390	960
Aluminium alloy (A5052) 160-260HB	RNM	KT9	0.3	4.0(~18)	3,820	2,290	0.3	4.2(~23)	3,180	1,910	0.3	4.2(~25)	2,980	1,790
Aluminium alloy (A7075) 160-260HB	RNM	KT9	0.3	4.0(~18)	3,820	2,290	0.3	4.2(~23)	3,180	1,910	0.3	4.2(~25)	2,980	1,790
Aluminium alloy Si below13%	RNM	KT9	0.3	4.0(~18)	3,820	2,290	0.3	4.2(~23)	3,180	1,910	0.3	4.2(~25)	2,980	1,790
Copper alloy (C1100)	RNM	KT9	0.25	4.0(~18)	2,550	770	0.25	4.2(~23)	2,120	640	0.25	4.2(~25)	1,990	600
Graphite	RNM	JC10000	0.3	4.0(~18)	3,820	2,290	0.3	4.2(~23)	3,180	1,910	0.3	4.2(~25)	2,980	1,790
Titanium alloy (Ti-6Al-4V) 35-43HRC	HRM FRM	JC8015	0.2	4.0(~18)	700	140	0.2	4.2(~23)	580	120	0.2	4.2(~25)	550	110
Heat resistant alloy (INCO718) 35-43HRC	HRM FRM	JC8015	0.2	4.0(~18)	700	140	0.2	4.2(~23)	580	120	0.2	4.2(~25)	550	110

Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. These cutting conditions represent stable machining at length 3 x Dc. please adjust cutting conditions according to overhang length.
3. In case of chatter occurring, recommended to reduce ap or feed.
4. Use air blow.

**MIRROR RADIUS****RNM/MRX Type**

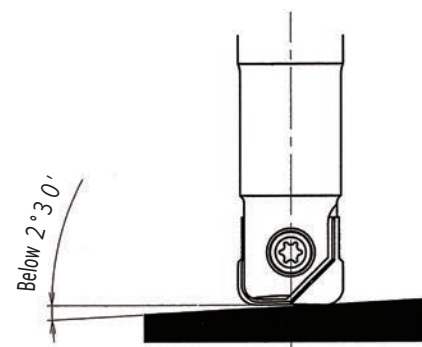
## ■ Recommended cutting conditions

## ● HRM type - High Feed / Semi finishing

Material	Grade	Tool dia.(mm)									
		φ6×R1.5					φ8×R2/φ9×R2				
		ℓ (mm)	a <sub>e</sub> (mm)	a <sub>p</sub> (mm)	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)	ℓ (mm)	a <sub>e</sub> (mm)	a <sub>p</sub> (mm)	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8015	15	2.1	0.20	9,000	8,000	20	2.8	0.40	7,500	8,200
		30	2.1	0.15	9,000	7,200	40	2.8	0.40	7,500	6,750
		-	-	-	-	-	60	2.8	0.25	7,500	6,750
		-	-	-	-	-	80	2.8	0.20	7,500	6,750
Mold steel (HPM7, PX5, NAK80, P20) 30-43HRC	JC8015	15	2.1	0.20	8,500	7,600	20	2.8	0.40	7,100	7,800
		30	2.1	0.15	8,500	6,800	40	2.8	0.40	7,100	6,400
		-	-	-	-	-	60	2.8	0.25	7,100	6,400
		-	-	-	-	-	80	2.8	0.20	7,100	6,400
Tool & die steel (SKD61, SKD11) below 255HB	JC8015	15	2.1	0.20	8,500	7,600	20	2.8	0.40	7,100	7,800
		30	2.1	0.15	8,500	6,800	40	2.8	0.40	7,100	6,400
		-	-	-	-	-	60	2.8	0.25	7,100	6,400
		-	-	-	-	-	80	2.8	0.20	7,100	6,400
Stainless steel (SUS304) below 250HB	JC8015	15	2.1	0.20	8,000	6,400	20	2.8	0.40	6,700	7,300
		30	2.1	0.15	8,000	5,600	40	2.8	0.40	6,700	6,000
		-	-	-	-	-	60	2.8	0.25	6,700	6,000
		-	-	-	-	-	80	2.8	0.20	6,700	6,000
Hardened die steel (SKD61, DAC, DHA) 40-50HRC	JC8015	15	2.1	0.15	6,900	5,500	20	2.8	0.20	6,000	6,600
		30	2.1	0.10	6,900	4,800	40	2.8	0.20	6,000	4,800
		-	-	-	-	-	60	2.8	0.15	6,000	4,800
		-	-	-	-	-	80	2.8	0.10	6,000	4,800
Grey & Nodular cast iron (FC, FCD) below 300HB	JC8015	15	2.1	0.20	7,400	6,600	20	2.8	0.40	6,400	7,600
		30	2.1	0.15	7,400	5,900	40	2.8	0.40	6,400	5,700
		-	-	-	-	-	60	2.8	0.25	6,400	5,700
		-	-	-	-	-	80	2.8	0.20	6,400	5,700
ap adjustment by corner radius ap × ratio	Corner Radius	R0.5	ap×0.65								
		R1	ap×0.80								
		R1.5	ap×1.0								
Reduce ap according to above table with keeping Vf											

## Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce ap or Vf.
3. Recommended to reduce the parameters when using on low horse power machine.
4. Use air blow.
5. Reduce ap, n & Vf by 30% in case of cutting material 50-55HRC.
6. Reduce Vf for better surface finish.
7. Use angle 2°30' or below in case of ramping (see right figure).
8. In case of slotting with over 5xDc, reduce Vf or ap appropriately.



## MIRROR RADIUS

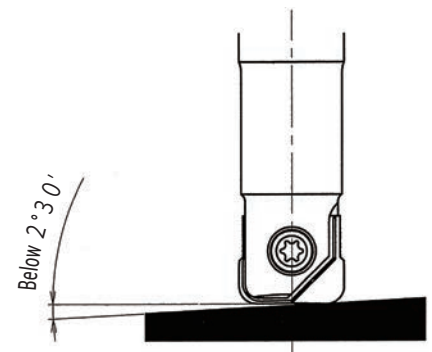
RNM/MRX Type

- Recommended cutting conditions
- HRM type - High Feed / Semi finishing

Material	Grade	Tool dia.(mm)									
		φ10×R2/φ11×R2					φ12×R2/φ13×R2				
		φ (mm)	a <sub>e</sub> (mm)	a <sub>p</sub> (mm)	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)	φ (mm)	a <sub>e</sub> (mm)	a <sub>p</sub> (mm)	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8015	25	4.2	0.40	6,000	7,200	30	5.6	0.50	5,000	6,000
		50	4.2	0.40	6,000	6,000	60	5.6	0.40	5,000	5,000
		75	4.2	0.25	6,000	6,000	90	5.6	0.25	5,000	5,000
		100	4.2	0.20	6,000	6,000	120	5.6	0.20	5,000	5,000
Mold steel (HPM7, PX5, NAK80, P20) 30-43HRC	JC8015	25	4.2	0.40	5,700	6,800	30	5.6	0.40	4,700	5,600
		50	4.2	0.40	5,700	5,700	60	5.6	0.40	4,700	4,700
		75	4.2	0.25	5,700	5,700	90	5.6	0.25	4,700	4,700
		100	4.2	0.20	5,700	5,700	120	5.6	0.20	4,700	4,700
Tool & die steel (SKD61, SKD11) below 255HB	JC8015	25	4.2	0.40	5,700	6,800	30	5.6	0.40	4,700	5,600
		50	4.2	0.40	5,700	5,700	60	5.6	0.40	4,700	4,700
		75	4.2	0.25	5,700	5,700	90	5.6	0.25	4,700	4,700
		100	4.2	0.20	5,700	5,700	120	5.6	0.20	4,700	4,700
Stainless steel (SUS304) below 250HB	JC8015	25	4.2	0.40	5,400	6,400	30	5.6	0.40	4,500	5,400
		50	4.2	0.40	5,400	5,400	60	5.6	0.40	4,500	4,500
		75	4.2	0.25	5,400	5,400	90	5.6	0.25	4,500	4,500
		100	4.2	0.20	5,400	5,400	120	5.6	0.20	4,500	4,500
Hardened die steel (SKD61, DAC, DHA) 40-50HRC	JC8015	25	4.2	0.20	4,700	5,600	30	5.6	0.20	4,000	4,800
		50	4.2	0.20	4,700	4,700	60	5.6	0.20	4,000	4,000
		75	4.2	0.15	4,700	4,700	90	5.6	0.15	4,000	4,000
		100	4.2	0.10	4,700	4,700	120	5.6	0.10	4,000	4,000
Grey & Nodular cast iron (FC, FCD) below 300HB	JC8015	25	4.2	0.40	5,100	6,100	30	5.6	0.40	4,200	5,000
		50	4.2	0.40	5,100	5,100	60	5.6	0.40	4,200	4,200
		75	4.2	0.25	5,100	5,100	90	5.6	0.25	4,200	4,200
		100	4.2	0.20	5,100	5,100	120	5.6	0.20	4,200	4,200

**Note**

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce a<sub>p</sub> or V<sub>f</sub>.
3. Recommended to reduce the parameters when using on low horse power machine.
4. Use air blow.
5. Reduce a<sub>p</sub>, n & V<sub>f</sub> by 30% in case of cutting material 50-55HRC.
6. Reduce V<sub>f</sub> for better surface finish.
7. Use angle 2°30' or below in case of ramping (see right figure).
8. In case of slotting with over 5xD<sub>c</sub>, reduce V<sub>f</sub> or a<sub>p</sub> appropriately.



★ **Insert Mounting Information**

1. Make sure the insert seat on body is carefully cleaned.
2. Make sure insert itself is clean, especially the hole and face location.
3. Change insert screw when threads starts to wear.
4. Do not over tighten screw. See table for torque specifications.

Tool dia. (mm)	Torque
φD <sub>c</sub>	N·m
6	0.5
8	0.9
10	1.2
12	2.0
16	3.0
20	4.0



**MIRROR RADIUS****RNM/MRX Type**

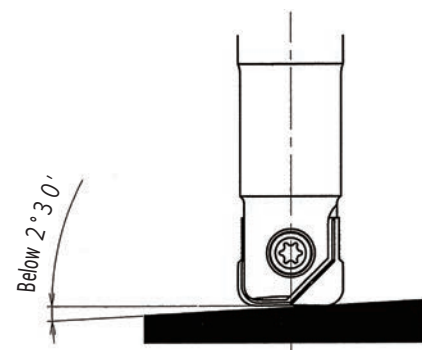
## ■ Recommended cutting conditions

## ● HRM type - High Feed / Semi finishing

Material	Grade	Tool dia.(mm)									
		φ16×R3/φ17×R3					φ20×R3/φ22×R3				
		ℓ (mm)	a <sub>e</sub> (mm)	a <sub>p</sub> (mm)	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)	ℓ (mm)	a <sub>e</sub> (mm)	a <sub>p</sub> (mm)	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)
Carbon steel (S50C, S55C) below 250HB	JC8015	35	7.0	0.60	3,800	4,500	40	9.8	0.60	3,000	3,600
		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 (HPM7, PX5, NAK80, P20) 30-43HRC	JC8015	35	7.0	0.60	3,500	4,200	40	9.8	0.60	2,800	3,300
		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
Tool & die steel (SKD61, SKD11) below 255HB	JC8015	35	7.0	0.60	3,500	4,200	40	9.8	0.60	2,800	3,300
		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 (SUS304) below 250HB	JC8015	35	7.0	0.60	3,400	4,000	40	9.8	0.60	2,700	3,200
		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 (SKD61, DAC, DHA) 40-50HRC	JC8015	35	7.0	0.30	3,000	3,600	40	9.8	0.30	2,400	2,800
		80	7.0	0.30	3,000	3,000	100	9.8	0.30	2,400	2,400
		120	7.0	0.25	3,000	3,000	150	9.8	0.25	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 (FC, FCD) below 300HB	JC8015	35	7.0	0.60	3,200	3,800	40	9.8	0.60	2,500	3,000
		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
ap adjustment by corner radius ap × ratio	Corner Radius	R2	ap×0.75				R2	ap×0.75			
		R3	ap×1.0				R3	ap×1.0			
Reduce ap according to above table with keeping Vf											

## Note

1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. In case of chatter occurring, recommended to reduce ap or Vf.
3. Recommended to reduce the parameters when using on low horse power machine.
4. Use air blow.
5. Reduce ap, n & Vf by 30% in case of cutting material 50-55HRC.
6. Reduce Vf for better surface finish.
7. Use angle 2°30' or below in case of ramping (see right figure).
8. In case of slotting with over 5xDc, reduce Vf or ap appropriately.



## Mirror Radius

MRX<sub>TYPE</sub>

## RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

## MRX type with FRM insert + MSN Carbide Shank Holder

Work Materials	Insert Grades	Type of machining	Cutting speed Vc (m/min)	Tool dia. (mm)			
				φ 10		φ 12	
				n (min <sup>-1</sup> )	Vf (mm/min)	n (min <sup>-1</sup> )	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015		300	9,550	2,860	7,960	2,380
			ap(mm)	0.25		0.30	
			ae(mm)	0.10		0.12	
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015		300	9,550	2,860	7,960	2,380
			ap(mm)	0.25		0.30	
			ae(mm)	0.10		0.12	
Stainless steel SUS304 Below 250HB	JC8015		280	8,910	2,670	7,420	2,220
			ap(mm)	0.25		0.30	
			ae(mm)	0.10		0.12	
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 DH102		300	9,550	2,860	7,960	2,380
			ap(mm)	0.25		0.30	
			ae(mm)	0.10		0.12	
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102		280	8,910	2,670	7,420	2,220
			ap(mm)	0.25		0.30	
			ae(mm)	0.10		0.12	
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102		250	7,960	800	6,630	800
			ap(mm)	0.25		0.30	
			ae(mm)	0.10		0.12	
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102		200	6,360	640	5,300	640
			ap(mm)	0.25		0.30	
			ae(mm)	0.10		0.12	
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 DH102		350	11,140	3,900	9,280	3,710
			ap(mm)	0.25		0.30	
			ae(mm)	0.15		0.20	

ap: Axial depth of cut, ae: Radial depth of cut, n: Spindle speed, Vf: Feed speed

## NOTE

- 1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
- 2) In case chatter occurs, recommend to reduce depth of cut or feed speed.
- 3) In case of overhung length over 3 x Dc, cutting speed and feed speed to be reduced according to the right table.
- 4) Use air blow to flush the chips out.

Overhung length L/Dc	Vc (m/min)	Vf (mm/min)
~3Dc 3D cor less	100%	100%
3Dc~5Dc Over 3Dc, up to 5Dc	70%	70%
5Dc~10Dc Over 5Dc, up to 10Dc	50%	50%

## Mirror Radius

MRX<sub>TYPE</sub>

## RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

## MRX type with FRM insert + MSN Carbide Shank Holder

Work Materials	Insert Grades	Type of machining	Cutting speed Vc (m/min)	Tool dia. (mm)			
				φ 16		φ 20	
				n (min <sup>-1</sup> )	Vf (mm/min)	n (min <sup>-1</sup> )	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015		300	5,970	2,390	4,770	1,910
			ap(mm)	0.40		0.50	
			ae(mm)	0.16		0.20	
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015		300	5,970	2,390	4,770	1,910
			ap(mm)	0.40		0.50	
			ae(mm)	0.16		0.20	
Stainless steel SUS304 Below 250HB	JC8015		280	5,570	2,230	4,560	1,820
			ap(mm)	0.40		0.50	
			ae(mm)	0.16		0.20	
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 DH102		300	5,970	2,390	4,770	1,910
			ap(mm)	0.40		0.50	
			ae(mm)	0.16		0.20	
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102		280	5,570	1,670	4,560	1,370
			ap(mm)	0.40		0.50	
			ae(mm)	0.16		0.20	
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102		250	4,970	750	3,980	600
			ap(mm)	0.40		0.50	
			ae(mm)	0.16		0.20	
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102		200	3,980	600	3,180	480
			ap(mm)	0.40		0.50	
			ae(mm)	0.16		0.20	
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 DH102		350	6,960	3,480	5,570	3,340
			ap(mm)	0.40		0.50	
			ae(mm)	0.20		0.25	

ap: Axial depth of cut, ae: Radial depth of cut, n: Spindle speed, Vf: Feed speed

## NOTE

- 1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
- 2) In case chatter occurs, recommend to reduce depth of cut or feed speed.
- 3) In case of overhung length over 3 x Dc, cutting speed and feed speed to be reduced according to the right table.
- 4) Use air blow to flush the chips out.

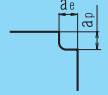
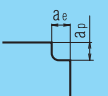
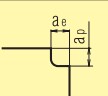
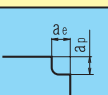
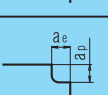
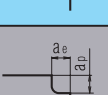
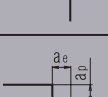
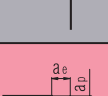
Overhung length L/Dc	Vc (m/min)	Vf (mm/min)
~3Dc 3D cor less	100%	100%
3Dc~5Dc Over 3Dc, up to 5Dc	70%	70%
5Dc~10Dc Over 5Dc, up to 10Dc	50%	50%

## Mirror Radius

MRX<sub>TYPE</sub>

## RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

## MRX type with FRM insert + MSN Carbide Shank Holder

Work Materials	Insert Grades	Type of machining	Cutting speed V <sub>c</sub> (m/min)	Tool dia. (mm)							
				φ21		φ25		φ30		φ32	
				n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)	n (min <sup>-1</sup> )	V <sub>f</sub> (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8015		300	4,550	1,820	3,820	1,530	3,180	1,270	2,980	1,190
			a <sub>p</sub> (mm)	0.50		0.80		1.0		1.2	
			a <sub>e</sub> (mm)	0.10		0.10		0.10		0.10	
Die steel (1.2344, 1.2379) Below 255HB	JC8015		300	4,550	1,820	3,820	1,530	3,180	1,270	2,980	1,190
			a <sub>p</sub> (mm)	0.50		0.80		1.0		1.2	
			a <sub>e</sub> (mm)	0.10		0.10		0.10		0.10	
Stainless steel Below 250HB	JC8015		280	4,240	1,700	3,560	1,420	2,970	1,190	2,780	1,110
			a <sub>p</sub> (mm)	0.50		0.80		1.0		1.2	
			a <sub>e</sub> (mm)	0.10		0.10		0.10		0.10	
Mold steel (1.2311, P20) 30-36HRC	JC8015 DH102		300	4,550	1,820	3,820	1,530	3,180	1,270	2,980	1,190
			a <sub>p</sub> (mm)	0.50		0.80		1.0		1.2	
			a <sub>e</sub> (mm)	0.10		0.10		0.10		0.10	
Mold steel (1.2311, P21) 38-43HRC	DH102		280	4,240	1,270	3,560	1,070	2,970	890	2,780	830
			a <sub>p</sub> (mm)	0.50		0.80		1.0		1.2	
			a <sub>e</sub> (mm)	0.10		0.10		0.10		0.10	
Hardened die steel (1.2344, 1.2379) 42-52HRC	DH102		250	3,790	570	3,180	480	2,650	400	2,480	370
			a <sub>p</sub> (mm)	0.50		0.80		1.0		1.2	
			a <sub>e</sub> (mm)	0.10		0.10		0.10		0.10	
Hardened die steel (1.2344, 1.2379) 55-62HRC	DH102		200	3,000	450	2,540	380	2,120	320	1,990	300
			a <sub>p</sub> (mm)	0.50		0.80		1.0		1.2	
			a <sub>e</sub> (mm)	0.10		0.10		0.10		0.10	
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8015 DH102		350	5,300	3,180	4,450	2,670	3,710	2,230	3,480	2,090
			a <sub>p</sub> (mm)	0.50		0.80		1.0		1.2	
			a <sub>e</sub> (mm)	0.10		0.10		0.10		0.10	

a<sub>p</sub>: Axial depth of cut, a<sub>e</sub>: Radial depth of cut, n: Spindle speed, V<sub>f</sub>: Feed speed

## NOTE

- 1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
- 2) In case chatter occurs, recommend to reduce depth of cut or feed speed.
- 3) In case of overhung length over 3 x D<sub>c</sub>, cutting speed and feed speed to be reduced according to the right table.
- 4) Use air blow to flush the chips out.

ℓ / D <sub>c</sub>	V <sub>c</sub> (m/min)	V <sub>f</sub> (mm/min)
3D <sub>c</sub> or less	100%	100%
Over 3D <sub>c</sub> , up to 5D <sub>c</sub>	70%	70%
Over 5D <sub>c</sub> , up to 10D <sub>c</sub>	50%	50%

## Mirror Radius

MRX<sub>TYPE</sub>

## RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

## MRX type with FRM insert + MSN Carbide Shank Holder

Work Materials	Insert Grades	Type of machining	Cutting speed Vc (m/min)	Tool dia. (mm)							
				φ 10		φ 12		φ 16		φ 20	
				n (min <sup>-1</sup> )	Vf (mm/min)	n (min <sup>-1</sup> )	Vf (mm/min)	n (min <sup>-1</sup> )	Vf (mm/min)	n (min <sup>-1</sup> )	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015		260	8,280	2,480	6,900	2,070	5,170	2,070	4,140	1,660
			ap(mm)	0.15		0.20		0.20		0.20	
			ae(mm)	1.2		1.5		2.0		2.5	
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015		260	8,280	2,480	6,900	2,070	5,170	2,070	4,140	1,660
			ap(mm)	0.15		0.20		0.20		0.20	
			ae(mm)	1.2		1.5		2.0		2.5	
Stainless steel SUS304 Below 250HB	JC8015		240	7,640	2,290	6,360	1,900	4,770	1,910	3,810	1,520
			ap(mm)	0.15		0.20		0.20		0.20	
			ae(mm)	1.2		1.5		2.0		2.5	
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 DH102		260	8,280	2,480	6,900	2,060	5,170	2,070	4,140	1,660
			ap(mm)	0.15		0.20		0.20		0.20	
			ae(mm)	1.2		1.5		2.0		2.5	
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102		240	7,640	2,290	6,360	1,900	4,770	1,430	3,810	1,140
			ap(mm)	0.15		0.20		0.20		0.20	
			ae(mm)	1.2		1.5		2.0		2.5	
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102		190	6,050	610	5,040	600	3,780	570	3,020	450
			ap(mm)	0.10		0.15		0.15		0.15	
			ae(mm)	0.90		1.1		1.4		1.8	
Hardened dies teel SKD11, SL D, DC11 (1.2344, 1.2379) 55-62HRC	DH102		130	4,140	410	3,450	410	2,590	390	2,070	310
			ap(mm)	0.10		0.15		0.15		0.15	
			ae(mm)	0.90		1.0		1.2		1.5	
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 DH102		300	9,450	3,310	7,960	3,180	5,970	2,390	4,770	1,910
			ap(mm)	0.15		0.20		0.20		0.20	
			ae(mm)	1.5		1.8		2.4		3.0	

ap: Depth of cut, ae: Pick feed, n: Spindle speed, Vf: Feed speed

## NOTE

- 1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
- 2) In case chatter occurs, recommend to reduce depth of cut or feed speed.
- 3) In case of overhung length hover 3 x Dc, cutting speed and feed speed to be reduced according to the right table.
- 4) Use air blow to flush the chips out.

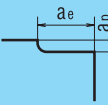
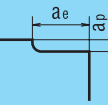
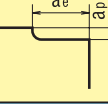
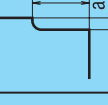
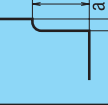
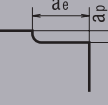
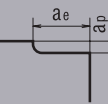
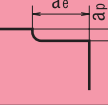
Overhung length L/Dc	Vc (m/min)	Vf (mm/min)
~3Dc 3Dc or less	100%	100%
3Dc~5Dc Over 3Dc, up to 5Dc	70%	70%
5Dc~10Dc Over 5Dc, up to 10Dc	50%	50%

## Mirror Radius

MRX<sub>TYPE</sub>

## RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

## MRX type with FRM insert + MSN Carbide Shank Holder

Work Materials	Insert Grades	Type of machining	Cutting speed Vc (m/min)	Tool dia. (mm)							
				φ21		φ25		φ30		φ32	
				n (min <sup>-1</sup> )	Vf (mm/min)	n (min <sup>-1</sup> )	Vf (mm/min)	n (min <sup>-1</sup> )	Vf (mm/min)	n (min <sup>-1</sup> )	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8015		260	3,940	1,570	3,310	1,320	2,750	1,100	2,580	1,030
			ap(mm)	0.20		0.20		0.20		0.20	
			ae(mm)	2.5		3.0		4.0		4.2	
Die steel (1.2344, 1.2379) Below 255HB	JC8015		260	3,940	1,570	3,310	1,320	2,750	1,100	2,580	1,030
			ap(mm)	0.20		0.20		0.20		0.20	
			ae(mm)	2.5		3.0		4.0		4.2	
Stainless steel Below 250HB	JC8015		240	3,640	1,450	3,050	1,220	2,540	1,020	2,380	950
			ap(mm)	0.20		0.20		0.20		0.20	
			ae(mm)	2.5		3.0		4.0		4.2	
Mold steel (1.2311, P20) 30-36HRC	JC8015 DH102		260	3,940	1,570	3,310	1,320	2,750	1,100	2,580	1,030
			ap(mm)	0.20		0.20		0.20		0.20	
			ae(mm)	2.5		3.0		4.0		4.2	
Mold steel (1.2311, P21) 38-43HRC	DH102		240	3,640	1,090	3,050	910	2,540	760	2,380	710
			ap(mm)	0.20		0.20		0.20		0.20	
			ae(mm)	2.5		3.0		4.0		4.2	
Hardened die steel (1.2344, 1.2379) 42-52HRC	DH102		190	2,880	430	2,420	360	2,010	300	1,890	280
			ap(mm)	0.15		0.15		0.15		0.15	
			ae(mm)	1.8		2.2		2.7		2.8	
Hardened die steel (1.2344, 1.2379) 55-62HRC	DH102		130	1,970	290	1,650	250	1,380	200	1,290	190
			ap(mm)	0.15		0.15		0.15		0.15	
			ae(mm)	1.5		1.8		2.2		2.3	
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8015 DH102		300	4,550	1,820	3,820	1,900	3,180	1,590	2,980	1,490
			ap(mm)	0.20		0.20		0.20		0.20	
			ae(mm)	3.0		3.0		4.0		4.2	

ap: Axial depth of cut, ae: Radial depth of cut, n: Spindle speed, Vf: Feed speed

## NOTE

- 1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
- 2) In case chatter occurs, recommend to reduce depth of cut or feed speed.
- 3) In case of overhung length over 3 x Dc, cutting speed and feed speed to be reduced according to the right table.
- 4) Use air blow to flush the chips out.

ℓ / Dc	Vc (m/min)	Vf (mm/min)
3Dc or less	100%	100%
Over 3Dc, up to 5Dc	70%	70%
Over 5Dc, up to 10Dc	50%	50%