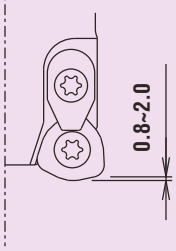
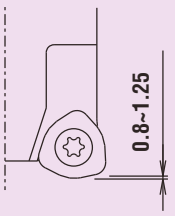
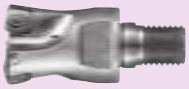
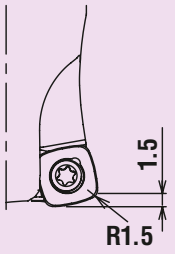
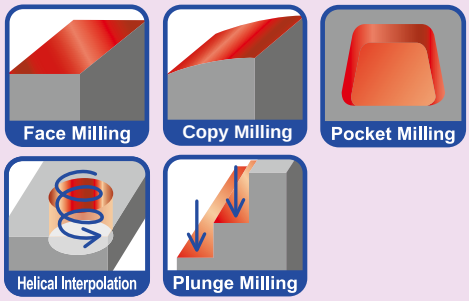
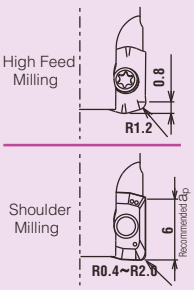
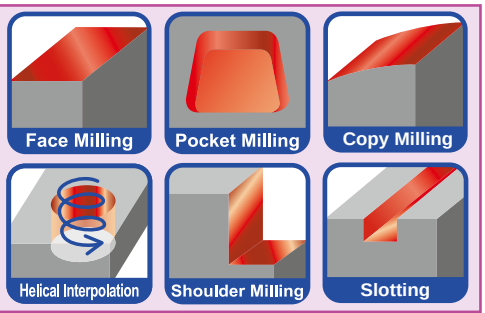
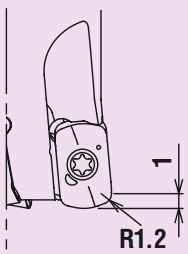
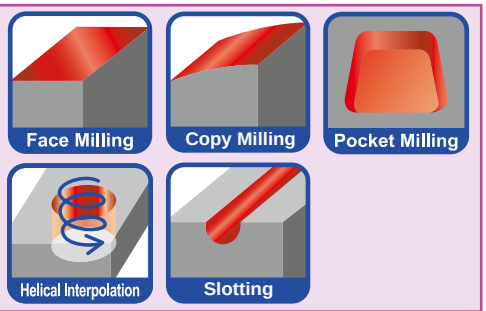
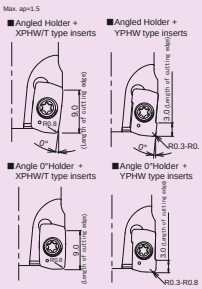
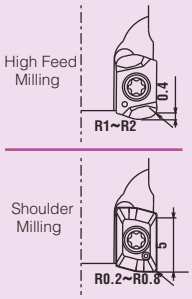
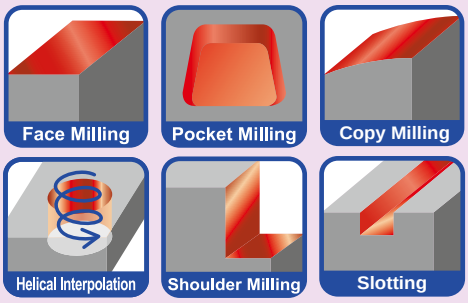
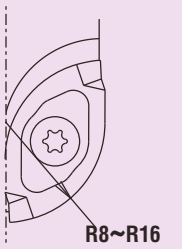
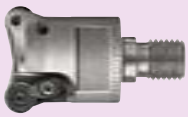
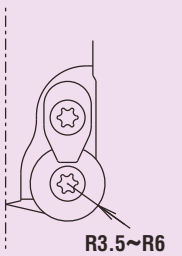
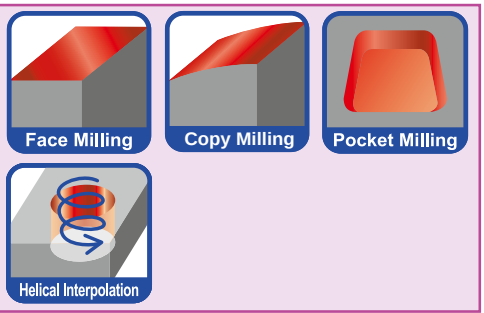
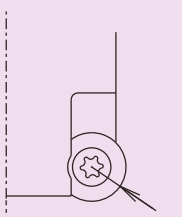
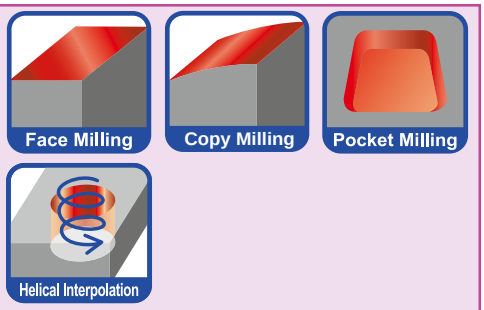
Tooling by DIJET®

Modular Head Series

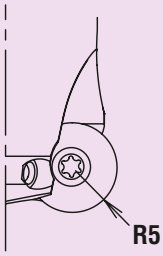
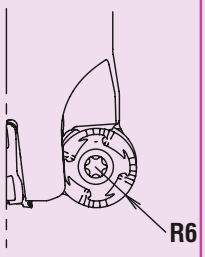
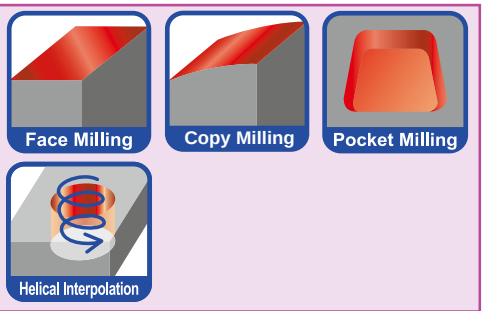
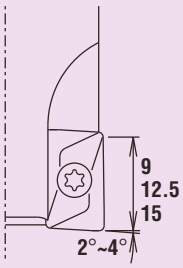
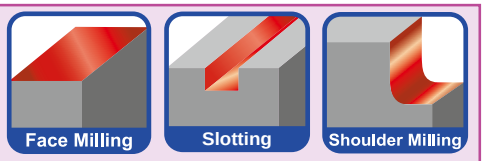
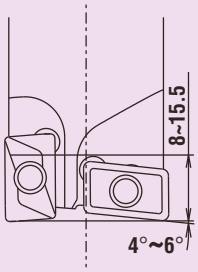
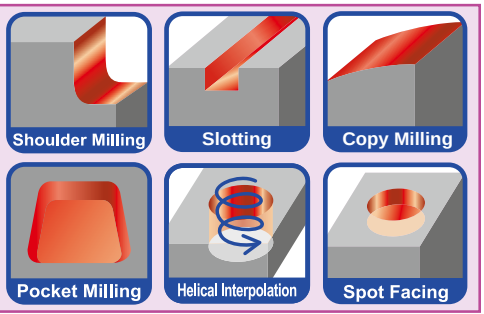
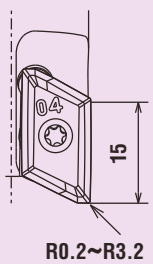
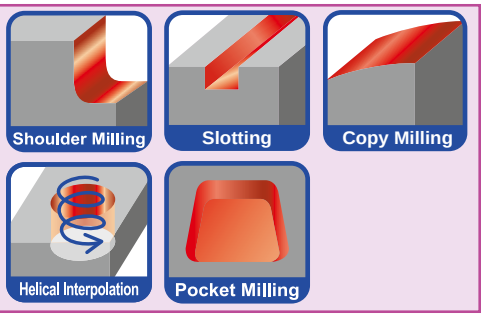
Modular Head Series

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
High Feed Copy Milling	High Feed Diemaster Standard type MSH Type B012	G-Body  φ16~φ35		
High Feed Copy Milling	High Feed Diemaster Fine pitch type MSH Type B013	G-Body  φ20~φ40		
High Feed & Efficient Copy Milling	SKS GII MSG Type B024	G-Body  φ25~φ42		
High Feed Copy Milling	QM MAX MQX Type B030	G-Body  φ16~φ42		
High Feed & Efficient Copy Milling	QM Max G II MXG Type B080	G-Body  φ16~φ42		

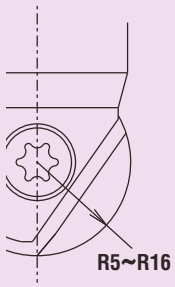
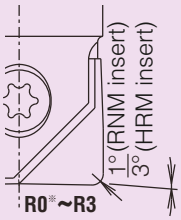
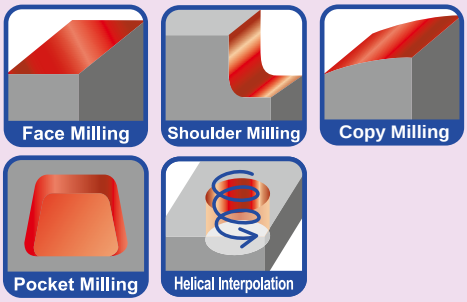
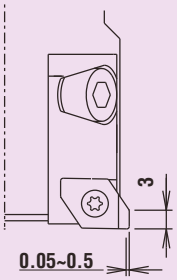
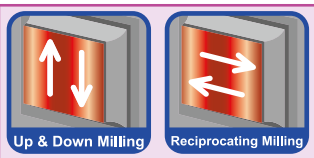
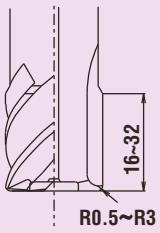
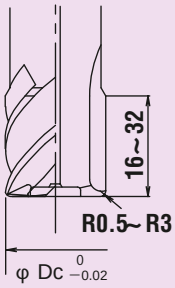
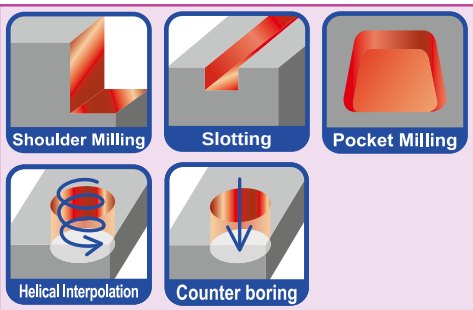
Modular Head Series

Type	Tool	Type and Range	Entering Angle/Max .ap	Applications
High Efficient tilted wall finishing	QM MAX MQT Type B086	G-Body  φ16~φ35		
High Feed Copy Milling	QM MILL MPM Type B090	G-Body  φ10~φ32		
Copy Roughing	Swing Ball MSW Type B107	G-Body  φ16~φ32		
Copy Milling oncommon &difficult to cut materials	Super Diemaster Standard type SDH Type B111	G-Body  φ15~φ40		
Copy Milling oncommon &difficult to cut materials	Super Diemaster Fine pitch type SDH Type B112	G-Body  φ20~φ42		

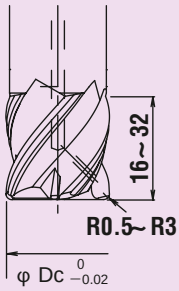
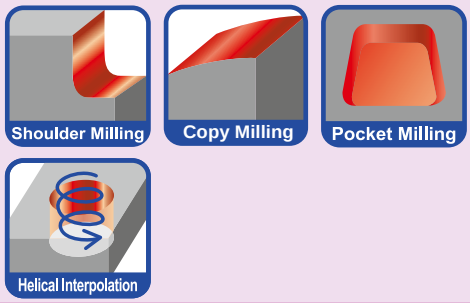
Modular Head Series

Type	Tool	Type and Range	Entering Angle/Max .ap	Applications
Roughing for Turbine Blade	Blade Chipper MTD Type B127	 φ25~φ32		
For hard-to-cut Material	Extrem Diemate MTX Type B132	G-Body  φ32~φ40		
Shoulder Milling	Side Chipper MIC Type B135	 φ16~φ40		
Multi-Functional Milling	Super End Chipper MEC Type B141	 φ16~φ32		
Aerospace Tooling	Aero Chipper MAL Type B147	G-Body  φ20~φ40		

Modular Head Series

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
Copy Milling	Mirror Ball MBX Type B153	 φ10~φ32		
Shoulder Finishing & Copy Milling	Mirror Radius MRX Type B163	 φ10~φ32	 ※ R0: corner radius below 0.1mm.	
Vertical Wall Finishing	Back& Forth Cutter MPF Type B179	 φ30~φ40		
Solid Carbide Modular Head with Multi Cutting Edge	S-Head SMSA Type B182	 φ16~φ32		
For Aluminium Alloy	S-Head SMAL Type B187	 φ18~φ28		

Modular Head Series

Type	Tool	Type and Range	Entering Angle/Max .ap	Applications
Anti-Vibration Type	S-Head SMSR Type B191	 φ16~φ32		
High Productivity	Solid Carbide Shank Holder MSN Type B193 – B195	 	φ10~φ32 : End Mill Shank type φ9.8~φ32 : Straight Arbor type	

Tuff Modular Head System

Roughing | Finishing | Multi Function Milling | Up& Down Milling | Chamfering | HighEfficiency × Intensive ToolManagement = CostReduction

■ FEATURES

1. High efficient machining is possible with the combination of MSN carbide shank holder and Modular head compared with conventional steel shank tools and almost 2 to 3 times higher efficiency in all the aspects is possible. This is due to controlled vibrations of MSN carbide shank holder + Modular head. Machining time is drasticaly reduced due to higher cutting parameters and cost reduction is achieved by increased tool life and reduction in machine hour rate.
2. Intensive tool management is possible from roughing to finishing by the combination of 19 kinds of heads
3. Carbide shank can be used repeatedly only by exchanging a head even if the head is damaged. Also the head can be easily exchanged because of the screw mounting mechanism.

G-Body

Special surface-hardening treatment on thermal heat resistant high speed steel gives high hardness over 65HRC and secure insert pocket and holder against thermal deformation. This G-body is anti-vibration & highly tough. This results into increased tool life by 30% or more compared with general cutter body/tool. It is difficult to get damaged even under severe cutting conditions. Also rust-proof and anti-welding effect is much improved.

☆☆☆

Tuff Modular Head System

Performance comparison test MSN carbide shank VS Steel shank

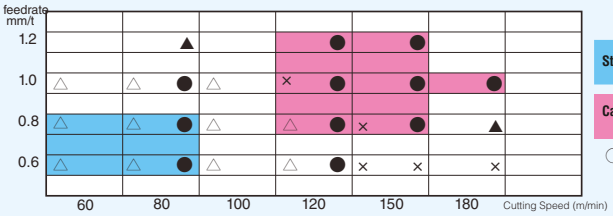
■ CUTTINGCONDITIONS

- Tool: Steelshank: SKS-2020-130-S20
  Carbide shank MSN-M10-140-S20C + MSH-2020-M10
- InsertNo.: WDMW050316ZTR (JC5040)
- Workmaterial: S55C
- Hardness: 201HB

	Lowspeed	Highspeed
Cuttingspeed	Vc=80m/min	Vc=150m/min
Spindlespeed	n= 1,270min-1	n= 2,390min-1
Feedspeed	Vf= 2,000mm/min	Vf= 4,800mm/min
Feedperrevolution	f= 1.6mm/rev	f= 2.0mm/rev

- Depthofcut: ap=0.3mm
- Pickfeed: ae=12mm
- Coolant: Air blow
- Machine: Vertical MC
- Overhunglength: 190mm
- Downcutting

■ CUTTINGREGION'SCOMPARISON



Steelshankbody : SKS-2020-130-S20S20 (○,△,×)

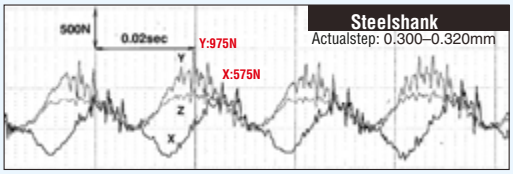
Carbideshankbody : MSN-M10-140-S20C+MSH-2020-M10(●,▲,×)

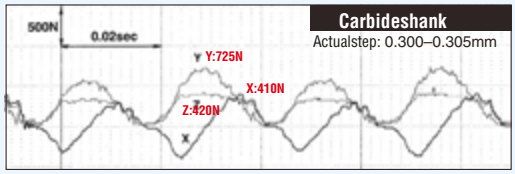
○,● : No chatter △,▲ : Small chatter × : Bigchatter

Improved efficiency by 3 times!

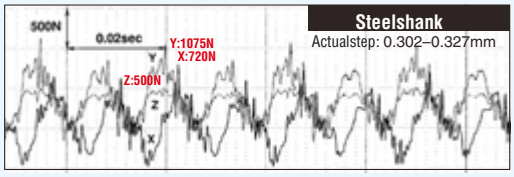
■ VIBRATIONS COMPARISON

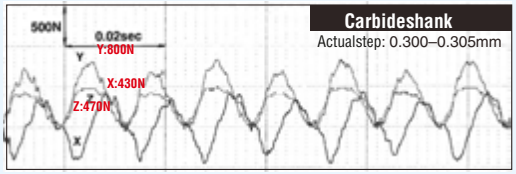
Low cutting speed (Vc=80m/min)



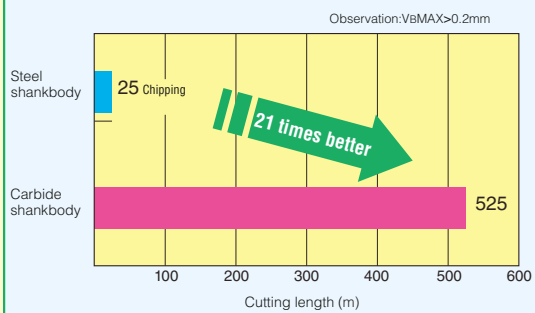


High cutting speed (Vc=150m/min)

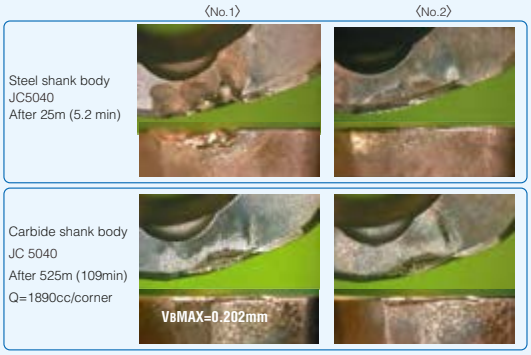




■ TOOL LIFE COMPARISON



■ CONDITION OF THE INSERTS AFTER ABOVE TESTS



■ OBSERVATIONS

- Tool life was highly improved with MSN carbide shank.
- No chatter in low speed and high speed conditions.

Tuff Modular Head System

Instructions for Tuff Modular Head System

⚠ Mounting Modular head and MSN/MGN shank holder

Tightening procedure

1 Cleaning

Remove dirt and chips with air blow from the connecting thread and face of modular head and MSN/MGN shank holder.

2 Initial Tightening

Tighten by hand until the head and the shank holder faces touch.

3 Final Tightening

Tighten slowly with torque control spanner wrench or special spanner wrench for S-Head and confirm that there is no gap.

⚠ Attention: Final tightening without initial tightening can cause connecting thread damage.

⚠ NOTE

1. Use the spanner wrenches that designed specifically for S-Head or torque control type.
2. Please gently apply pressure on wrench.
3. Please confirm that there is no gap between MSN/MGN shank holder and Modular head.

Torque control spanner wrench

Spanner wrench for S-Head (DS type)

■ Except for S-Head

Thread	Tightening torque	Spannersize for S-Head
M6	8.0N·m	8
M8	16N·m	10,12
M10	16N·m	14,15
M12	20N·m	17
M16	25N·m	22,26

※Modular heads are supplied without spanner wrench.

■ S-Head

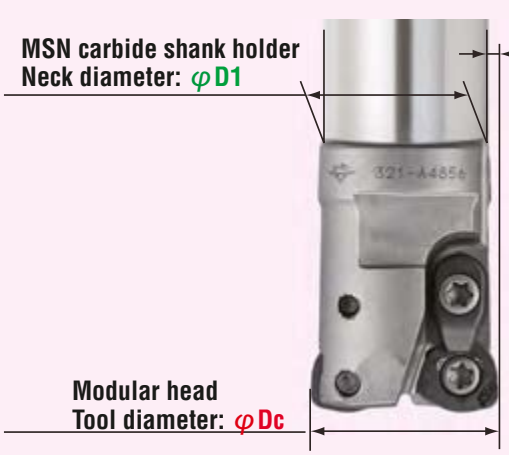
Thread	Tightening torque	Spannersize for S-Head	Cat No.of spanner wrench for S-Head
M8	10~11N·m	14	DS-14
M10	10~16N·m	17	DS-17
M12	15~20N·m	22	DS-22
M16	20~25N·m	27	DS-27

Tuff Modular Head System

Instructions for Tuff Modular Head System

⚠ Selection of "MSN Carbide shank holder"

In case of using modular head over φ16mm, please select
MSN carbide shank whose diameter (φD1) is 1mm or more smaller thanmodular head (φDc).
A wrong selection causes damage to the carbide shank.



In case of finishing operation (like Mirror Ball, Mirror Radius etc.), the damage risk of the carbide shank is low. Clearance more than 0.5mm is not necessary.

⚠ Caution for the mounting on shrink-fit holder.

When you use acarbide shank and a modular head onthe shrink-fit holder, please shrink-fit the only carbide shank without mounting a modular head. Please mount amodular head after shrink-fit operation.

Note: In case of shrink fit MSN shank+Modular Head together, it will be difficult to loose due to heat desipation.

Insert setup installation points of double clamping mechanism type

1 Clean the insert seat by brush or air blow before installing the insert, and remove the chips and dust completely. In that time, please confirm whether there is neither the deformation nor burr at insert seat.

2 Clean the insert it self.

3 Please spread the attached Moly coat on the clamp screw.

4 Fix the insert to insert seat and confirm. Tighten the clamp screw with torque wrench with specified torque as follows.

Recommended torque for clamp screw

Wrench size	Recommended torque
T15	3.6N•m
T20	6.0N•m

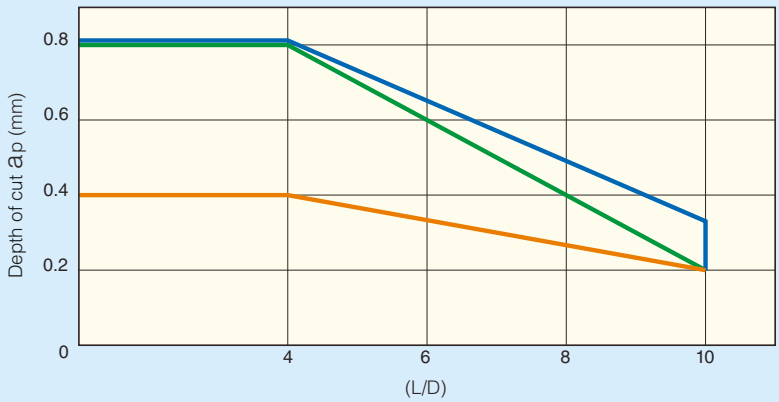
5 Confirm the insert is completely fixed, then tighten the screw for clamp set. (The insert can be removed ifthe clamp set loosens even if it doesn't completely detach)

6 ⚠ **Make sure to fix the insert completely by tightening the clamp screw again.**

Tuff Modular Head System

Guidelines to select the DIJET high feed cutters

The relation between ap and L/D



Tool:
High feed cutter (modular head type)
+ MSN carbide shank holder

Workmaterial: Carbon steel

▼ Point

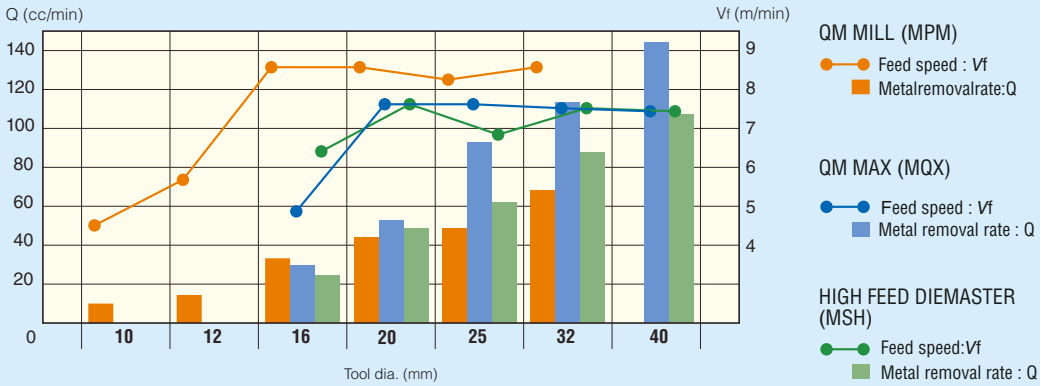
ap (Depth of cut : mm)

- In case of L/D=4 or below, QM MAX (MQX) or HIGH FEED DIEMASTER (MSH) are able to cut deeply at ap=0.8mm.
- In case of QM MILL (MPM), even L/D is higher, there is no change in ap.

Machine

- In case machine does not have enough power or unrigid for higher L/D, were commend to use QM MILL (MPM).

Metal removal rate



▼ Point

Metal removal rate

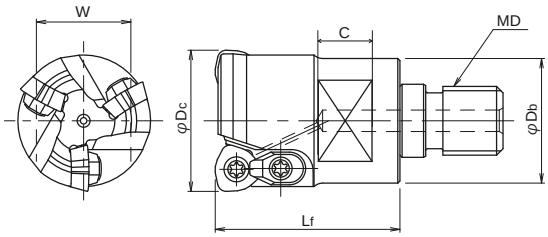
- In case of tool dia. φ16 or below, we recommend to use QM MILL (MPM).
- In case of tool dia. φ16-φ40, we recommend to use QM MAX (MQX).

Machine

- In case of machining by small machine (BT40 or below), we recommend to use QM MILL (MPM).
- In case of moderate speed machine (Vf≦10m/min), we recommend to use QM MAX (MQX).
- In case of low speed machine (Vf≦6m/min), we recommend to use HIGH FEED DIEMASTER (MSH).

High Feed Diemaster MSH TYPE

G-Body | Standard Type | Through Coolant Hole



■ BODY

Cat No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Inserts	Parts: Clamp Screw	Clamp Set	Wrench
MSH-2016-M8	●	2	16	23	15	M8	8	12	WO※※04...	TSW-2556H	–	A-08SD
MSH-2017-M8	●	2	17									
MSH-2020-M10	●	2	20	30	19	M10	9	14	WD※※05...	DSW-306H	–	A-10
MSH-2021-M10	●	2	21									
MSH-2025-M12	●	2	25	35	23.6	M12	10	17	WD※※06...	CSW-408H	DCM-18	A-15
MSH-2026-M12	●	2	26									
MSH-2032-M16	●	2	32	43	29	M16	12.5	22	WD※※08...	DSW-4510H	DCM-17	A-20SD
MSH-3032-M16	●	3	32						WD※※06...	CSW-408H	DCM-18	A-15
MSH-2033-M16	●	2	33						WD※※08...	DSW-4510H	DCM-17	A-20SD
MSH-3033-M16	●	3	33						WD※※06...	CSW-408H	DCM-18	A-15
MSH-2035-M16	□	2	35						WD※※08...	DSW-4510H	DCM-17	A-20SD
MSH-3035-M16	●	3	35						WD※※06...	CSW-408H	DCM-18	A-15

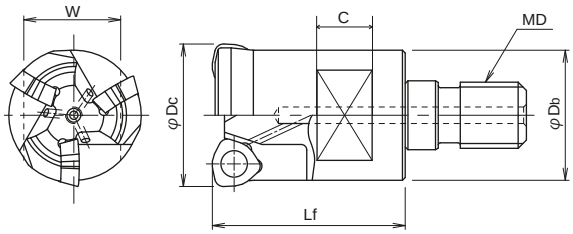
Note) 1. Please refer page B015-B021 for recommended cutting conditions.
2. All cutters are supplied without inserts.
3. Please refer page B009 for recommended tightening torque.
4. In case of using double clamping mechanism type, please refer page B010 "Insert setup installation points of double clamping mechanism type"

Arbor B193

Clamp Screw	Recommended Torque (N•m)
TSW-2556H	0.9
DSW-306H	1.8
CSW-408H	3.6
DSW-4510H	6.0

High Feed Diemaster MSH TYPE

G-Body Fine Pitch Type Through Coolant Hole



■ BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
											
MSH-3020-M10	●	3	**20**	30	19	M10	9	14			
MSH-3021-M10	●	3	**21**	30	19	M10	9	14	WO※※04...	TSW-2556H	A-08SD
MSH-3025-M12	●	3	**25**	35	23.6	M12	10	17			
MSH-3026-M12	●	3	**26**	35	23.6	M12	10	17	WD※※05...	DSW-306H	A-10
MSH-4032-M16	□	4	**32**	43	29	M16	12	22			
MSH-5040-M16	●	5	**40**	43	32	M16	14	26			

Note) 1. Please refer page B015-B021 for recommended cutting conditions.
2. All cutters are supplied with out inserts.
3. Please refer page B009 for recommended tightening torque.

Arbor B193

Clamp Screw	Recommended Torque (N•m)
TSW-2556H	0.9
DSW-306H	1.8

● Standard stock items □: Stock in Japan ○: Soon to be deleted

High Feed Diemaster MSH TYPE

■ INSERT WITHOUT CHIPBREAKER

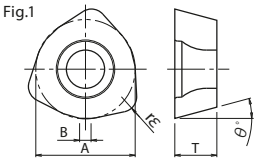
Fig.1


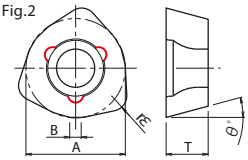
Fig.2


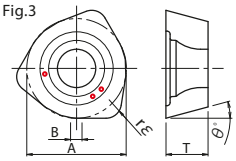
Fig.3


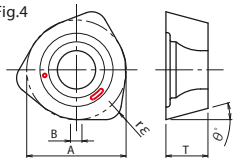
Fig.4


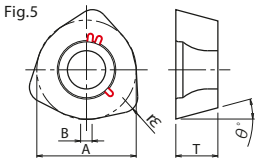
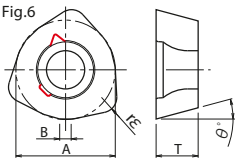
Fig.5


Fig.6


Cat. No.	Tole-rance	Dimensions (mm)					PVD coated				
		A	T	B	rε	θ°	JC7560	JC8015	JC8050	JC8118	JC5040
WOMW04T215ZER		6.5	2.8	0.8	1.5	13	●Fig.1	●Fig.1	●Fig.1	●	●Fig.2
WDMW050316ZER		8	3.2	1	1.6	15			●Fig.4		
WDMW050316ZTR		8	3.2	1	1.6	15	●Fig.1	●Fig.1	●Fig.1	●	●Fig.2
WDMW06T320ZER	M	10	3.97	1.2	2	15	●	●	●Fig.4		●
WDMW06T320ZTR		10	3.97	1.2	2	15	●Fig.1	●Fig.1	●Fig.1	●	●Fig.2
WDMW080520ZER		13	5.5	1.5	2	15			●Fig.4		
WDMW080520ZTR		13	5.5	1.5	2	15	●Fig.5	●Fig.5	●Fig.5	●	●Fig.6

10 inserts per case

■ INSERT WITH CHIPBREAKER

PVD coated

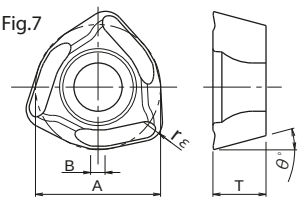
Fig.7


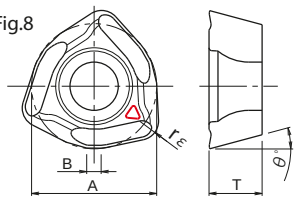
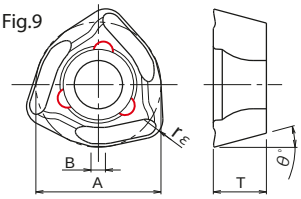
Fig.8


Fig.9


Cat. No.	Tole-rance	Dimensions (mm)					PVD coated			
		A	T	B	rε	θ°	JC7560	JC8015	JC8050	JC8118
WOMT04T215ZER		6.5	2.8	0.8	1.5	13	●Fig.9	●Fig.7	●Fig.9	●
WDMT050316ZER	M	8	3.2	1	1.6	15	●Fig.8	●Fig.7	●Fig.8	●
WDMT06T320ZER		10	3.97	1.2	2	15	●Fig.8	●Fig.7	●Fig.8	●
WDMT080520ZER		13	5.5	1.5	2	15	●Fig.8	●Fig.7	●Fig.8	●

10 inserts per case

● Standard stock items □: Stock in Japan ◎ : Soon to be stocked ○: Soon to be deleted

High Feed Diemaster MSH TYPE

■ RECOMMENDED CUTTING CONDITIONS

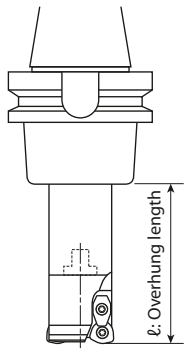
● MSH type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia.(mm)							
		16/17				20/21/22			
		No.of teeth 2N				No.of teeth 2N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbonsteel S50C,S55C (C50,C55) Below250HB	JC7560 (JC5040) (JC8050)	70	0.4	3,580	6,440	70	0.6	2,850	5,700
		120	0.3	3,180	5,090	120	0.5	2,600	5,200
		160	0.2	2,980	4,760	190	0.3	2,400	4,800
Mold steel HPM7, PX5, NAK80, P20 (1.2311,P20) 30-43HRC	JC8118 JC5118 (JC7560) (Below 36HRC)	70	0.4	3,180	5,720	70	0.5	2,850	5,700
		120	0.3	3,180	5,090	120	0.4	2,600	5,200
		160	0.2	2,980	4,760	190	0.3	2,400	4,800
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC5040) (JC8050)	70	0.4	3,180	5,720	70	0.5	2,850	5,700
		120	0.3	3,180	5,090	120	0.4	2,600	5,200
		160	0.2	2,980	4,760	190	0.3	2,400	4,800
Stainless steel SUS304 Below 250HB	JC7560 (JC5118) (JC8050) (JC8118)	70	0.3	3,180	5,720	70	0.5	2,500	5,000
		120	0.3	2,980	4,760	120	0.4	2,400	4,800
		160	0.2	2,980	4,760	190	0.3	2,400	4,800
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8118 JC5118 JC8015	70	0.2	2,380	2,610	70	0.4	1,300	1,600
		120	0.2	2,380	2,380	120	0.3	1,200	1,400
		160	–	–	–	190	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 JC5118 JC8015 (JC7560)	70	0.5	2,980	6,550	70	0.6	2,400	5,800
		120	0.4	2,980	5,960	120	0.5	2,400	5,300
		160	0.3	2,500	5,000	190	0.4	2,000	4,800

ℓ: Overhung length, ap: 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce 30% above ap, n, Vf.
6) In case of unfavourable conditions, insert grade JC8050 is recommended.



High Feed Diemaster MSH TYPE

■ RECOMMENDED CUTTING CONDITIONS

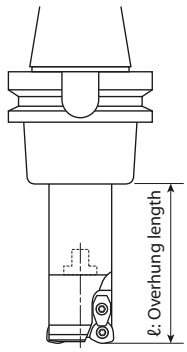
● MSH type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)							
		20/21/22				25/26			
		No. of teeth 3N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC5040) (JC8050)	70	0.5	2,850	7,700	90	0.7	2,300	5,500
		120	0.4	2,600	7,000	140	0.5	2,300	5,100
		190	0.3	2,400	6,500	210	0.3	1,900	3,800
Mold steel HPM7, PX5, NAK80, P20 (1.2311,P20) 30-43HRC	JC8118 JC5118 (JC7560) (Below 36HRC)	70	0.5	2,850	7,700	90	0.7	2,300	5,500
		120	0.4	2,600	7,000	140	0.5	2,300	5,100
		190	0.3	2,400	6,500	210	0.3	1,900	3,800
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC5040) (JC8050)	70	0.5	2,850	7,700	90	0.7	2,300	5,500
		120	0.4	2,600	7,000	140	0.5	2,300	5,100
		190	0.3	2,400	6,500	210	0.3	1,900	3,800
Stainless steel SUS304 Below 250HB	JC7560 (JC5118) (JC8050) JC8118	70	0.5	2,500	6,800	90	0.7	2,000	4,400
		120	0.4	2,400	6,500	140	0.5	2,000	4,000
		190	0.3	2,400	6,500	210	0.3	1,900	3,800
Hardened die steel SKD61, DAC, DHA (1.2344,1.2379) 40-50HRC	JC8118 JC5118 JC8015	70	0.3	1,300	2,300	90	0.6	1,100	1,500
		120	0.3	1,200	2,000	140	0.4	1,000	1,400
		190	–	–	–	210	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 JC5118 JC8015 (JC7560)	70	0.6	2,400	8,000	90	1	1,900	4,500
		120	0.5	2,400	7,200	140	0.8	1,900	4,300
		190	0.4	2,000	6,000	210	0.5	1,600	3,800

ℓ: Overhung length, ap: 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce 30% above ap, n, Vf.
6) In case of unfavourable conditions, insert grade JC8050 is recommended.



High Feed Diemaster MSH TYPE

■ RECOMMENDED CUTTING CONDITIONS

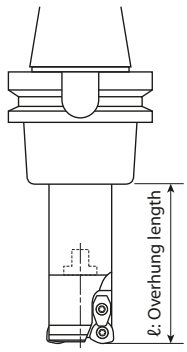
● MSH type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 25/26 No.of teeth 3N			
		ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC5040) (JC8050)	90	0.6	2,300	6,900
		140	0.5	2,300	6,900
		210	0.3	1,900	5,700
Mold steel HPM7, PX5, NAK80, P20 (1.2311,P20) 30-43HRC	JC8118 JC5118 (JC7560) (Below 36HRC)	90	0.6	2,300	6,900
		140	0.5	2,300	6,900
		210	0.3	1,900	5,700
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC5040) (JC8050)	90	0.6	2,300	6,900
		140	0.5	2,300	6,900
		210	0.3	1,900	5,700
Stainless steel SUS304 Below 250HB	JC7560 (JC5118) (JC8050) (JC8118)	90	0.6	2,000	6,000
		140	0.5	2,000	6,000
		210	0.3	1,900	5,700
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8118 JC5118 JC8015	90	0.5	1,100	2,000
		140	0.3	1,000	1,800
		210	–	–	–
Grey&Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 JC5118 JC8015 (JC7560)	90	0.8	1,900	6,900
		140	0.6	1,900	6,300
		210	0.5	1,600	5,300

ℓ: Overhung length, ap: 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce 30% above ap, n, Vf.
6) In case of unfavourable conditions, insert grade JC8050 is recommended.



High Feed Diemaster MSH TYPE

■ RECOMMENDED CUTTING CONDITIONS

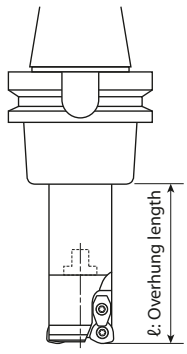
● MSH type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 32/33/35 No.of teeth 2N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC5040) (JC8050)	100	0.8	1,800	4,600
		150	0.6	1,800	4,300
		210	0.4	1,500	3,900
Mold steel HPM7, PX5, NAK80, P20 (1.2311,P20) 30-43HRC	JC8118 JC5118 (JC7560) (Below 36HRC)	100	0.8	1,800	4,600
		150	0.6	1,800	4,300
		210	0.4	1,500	3,900
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC5040) (JC8050)	100	0.8	1,800	4,600
		150	0.6	1,800	4,300
		210	0.4	1,500	3,900
Stainless steel SUS304 Below 250HB	JC7560 (JC5118) (JC8050) (JC8118)	100	0.8	1,600	3,800
		150	0.6	1,600	3,500
		210	0.4	1,500	3,000
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8118 JC5118 JC8015	100	0.8	800	1,600
		150	0.6	700	1,400
		210	0.3	600	1,200
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 JC5118 JC8015 (JC7560)	100	1.2	1,500	4,200
		150	1	1,500	3,900
		210	0.6	1,250	3,000

ℓ: Overhung length, ap: 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce 30% above ap, n, Vf.
6) In case of unfavourable conditions, insert grade JC8050 is recommended.



High Feed Diemaster MSHTYPE

■ RECOMMENDED CUTTING CONDITIONS

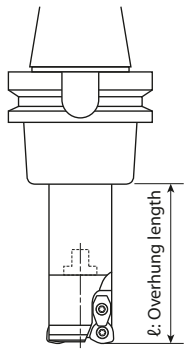
● MSH type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)											
		32				32/33/35				40			
		No.of teeth 4N				No. of teeth 3N				No. of teeth 5N			
		ℓ (mm)	a_p (mm)	n (min⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min⁻¹)	V_f (mm/min)
Carbon steel S50C,S55C (C50,C55) Below250HB	JC7560 (JC5040) (JC8050)	100	0.6	1,900	7,600	100	0.7	1,800	6,000	100	0.6	1,500	7,500
		150	0.5	1,800	7,200	150	0.5	1,800	5,400	150	0.5	1,400	7,000
		210	0.3	1,500	6,000	210	0.3	1,500	4,500	210	0.3	1,200	6,000
Mold steel HPM7, PX5, NAK80, P20 (1.2311,P20) 30-43HRC	JC8118 JC5118 (JC7560) (Below 36HRC)	100	0.6	1,900	7,600	100	0.7	1,800	6,000	100	0.6	1,500	7,500
		150	0.5	1,800	7,200	150	0.5	1,800	5,400	150	0.5	1,400	7,000
		210	0.3	1,500	6,000	210	0.3	1,500	4,500	210	0.3	1,200	6,000
Die steel SKD61,SKD11 (1.2344,1.2379) Below255HB	JC7560 (JC5040) (JC8050)	100	0.6	1,900	7,600	100	0.7	1,800	6,000	100	0.6	1,500	7,500
		150	0.5	1,800	7,200	150	0.5	1,800	5,400	150	0.5	1,400	7,000
		210	0.3	1,500	6,000	210	0.3	1,500	4,500	210	0.3	1,200	6,000
Stainless steel SUS304 Below250HB	JC7560 (JC5118) (JC8050) (JC8118)	100	0.6	1,700	6,800	100	0.7	1,600	5,200	100	0.6	1,350	6,800
		150	0.5	1,600	6,400	150	0.5	1,600	4,800	150	0.5	1,300	6,500
		210	0.3	1,500	6,000	210	0.3	1,500	4,500	210	0.3	1,200	6,000
Hardened die steel SKD61,DAC,DHA (1.2344,1.2379) 40-50HRC	JC8118 JC5118 JC8015	100	0.5	800	1,900	100	0.6	800	2,200	100	0.5	640	1,900
		150	0.4	700	1,700	150	0.4	700	1,900	150	0.4	560	1,700
		210	0.2	600	1,500	210	0.2	600	1,500	210	0.2	480	1,450
Grey & Nodular castiron FC,FCD(GG,GGG) Below300HB	JC8118 JC5118 JC8015 (JC7560)	100	0.8	1,500	7,200	100	1	1,500	5,200	100	0.8	1,200	7,200
		150	0.6	1,500	6,600	150	0.8	1,500	5,000	150	0.6	1,200	6,600
		210	0.5	1,250	5,500	210	0.5	1,250	4,000	210	0.5	1,000	5,500

ℓ: Overhung length, a_p: Depth of cut, n: Spindle speed, V_f: Feedspeed

■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce 30% above ap, n, Vf.
6) In case of unfavourable conditions, insert grade JC8050 is recommended.



High Feed Diemaster MSH TYPE

■ Guidelines for selection of the Inserts

Work Materials	Carbonsteel S50C, S55C (C50, C55) Below 250HB			Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC			Mold steel NAK80, HPM1 (1.2311, P20) 38-43 HRC		Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB		
Cat. No. \ Grades	JC5040	JC8050	JC7560	JC8118	JC8050	JC7560	JC8118	JC8015	JC5040	JC8050	JC7560
WOMW04T215ZER	○	○	◎	◎	●	○	◎	◎	○	○	◎
WOMT04T215ZER		☆	☆	☆	☆		☆	☆		☆	☆
WDMW050316ZTR	○	○	◎	○	●	○	○	○	○	○	◎
WDMW050316ZER		●		◎			◎			●	
WDMT050316ZER		☆	☆	☆	☆	☆	☆	☆		☆	☆
WDMW06T320ZTR	○	○	◎	○	●	○	○	○	○	○	◎
WDMW06T320ZER		●		◎			◎			●	
WDMT06T320ZER		☆	☆	☆	☆	☆	☆	☆		☆	☆
WDMW080520ZTR	○	○	◎	○	●	○	○	○	○	○	◎
WDMW080520ZER		●		◎			◎			●	
WDMT080520ZER		☆	☆	☆	☆	☆	☆	☆		☆	☆

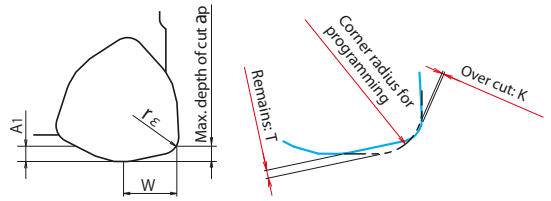
Work Materials	Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB			Nodularcastiron FCD500, FCD700 (GGG50, GGG70) Below 300HB		Stainless steel SUS304 Below 250HB		
Cat. No. \ Grades	JC8118	JC8015	JC7560	JC8118	JC8015	JC8050	JC7560	JC8118
WOMW04T215ZER	◎	○	○	◎	○	●		○
WOMT04T215ZER	☆	☆	☆	☆	☆	○	◎	
WDMW050316ZTR	●	○	○	●	○			
WDMW050316ZER	◎			◎		●		○
WDMT050316ZER	☆	☆	☆	☆	☆	○	◎	
WDMW06T320ZTR	●	○	○	●	○			
WDMW06T320ZER	◎			◎		●		○
WDMT06T320ZER	☆	☆	☆	☆	☆	○	◎	
WDMW080520ZTR	●	○	○	●	○			
WDMW080520ZER	◎			◎		●		○
WDMT080520ZER	☆	☆	☆	☆	☆	○	◎	

Work Materials	Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	
Cat.No. \ Grades	JC8118	JC8015
WOMW04T215ZER	◎	○
WOMT04T215ZER	×	×
WDMW050316ZTR	●	○
WDMW050316ZER	◎	
WDMT050316ZER	×	×
WDMW06T320ZTR	●	○
WDMW06T320ZER	◎	
WDMT06T320ZER	×	×
WDMW080520ZTR	●	○
WDMW080520ZER	◎	
WDMT080520ZER	×	×

•WD (O) MW Type: Without chip breaker •WD (O) MT Type: With chip breaker
◎: First Choice, Good Condition ○: Moderate Condition ●: Unfavorable Condition ☆: Light Cutting ×:Nogood

High Feed Diemaster MSHTYPE

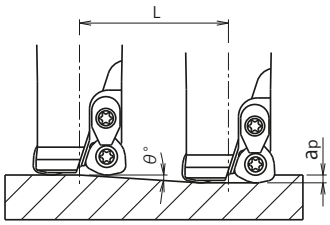
■ Definition of corner radius for programming



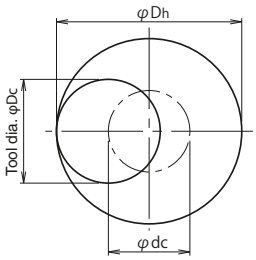
	Corner radius for programming	T	K	rε	W	ap	
04 Type	R1.5 (Recommended)	0.29	0	1.5	2.7	0.8	0.8
	R2	0.19	0.04				
05 Type	R2 (Recommended)	0.35	0	1.6	3.6	1.25	1.2
	R2.5	0.25	0.12				
06 Type	R2.5 (Recommended)	0.44	0	2.0	4.5	1.5	1.5
	R3	0.34	0.1				
08 Type	R3 (Recommended)	0.63	0	2.0	6.0	2.0	2.0
	R3.5	0.54	0.14				
	R4	0.45	0.32				

■ Instructions for profile milling

● Ramping



● Helical interpolation



● Calculation of tool passdia.

$$\varphi dc = \varphi Dh - \varphi Dc$$

Tool pass dia. Bore dia. Tool dia.

● Depth of cut perone circle should not exceed max. depth of cut ap.

● Down cutting is recommended. Tool pass rotation should be counter-clockwise.

● In case of ramping and helical interpolation, apply 70% or less feed speed from standard cutting condition table.
● In case of drilling, apply 50% or less Z axis feed speed from standard cutting condition table.
● Long continous chips may come out in case of drilling, confirm the safe cutting conditions.

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max.depth ofcut ap (mm)	Ramping		Helical interpolation		Max. drilling depth (mm)
				Max. ramping angle θ°	Total cutting length L (mm) atmax.ap	Min. bore dia. Dh min (mm)	Max.bore dia. Dh max (mm)	
MSH-2016	16	10.5	0.8	2°30′	20.6	25	29	0.3
MSH-2017	17	11.5	0.8	2°	25.7	27	31	0.3
MSH-2020	20	12.7	1.2	3°	22.9	30	37	0.5
MSH-3020	20	14.5	0.8	3°	22.9	30	37	0.3
MSH-2021	21	13.7	1.2	2°30′	27.5	32	39	0.5
MSH-3021	21	15.5	0.8	2°30′	27.5	32	39	0.3
MSH-2022	22	14.7	1.2	2°	34.4	34	41	0.5
MSH-3022	22	16.5	0.8	2°	34.4	34	41	0.3
MSH-2025	25	15.9	1.5	4°	21.5	33	46	1
MSH-3025	25	17.7	1.2	2°	34.4	40	47	0.5
MSH-2026	26	16.9	1.5	3°30′	24.5	35	48	1
MSH-3026	26	18.7	1.2	1°54′	36.2	42	49	0.5
MSH-2032	32	20	2	4°	28.6	41	60	1.5
MSH-3032	32	22.8	1.5	2°15′	38.1	47	60	1
MSH-4032	32	24.7	1.2	1°18′	52.9	54	61	0.5
MSH-2033	33	21	2	3°30′	32.7	43	62	1.5
MSH-3033	33	23.8	1.5	2°6′	40.9	49	62	1
MSH-2035	35	23	2	3°	38.2	47	66	1.5
MSH-3035	35	25.8	1.5	2°	43	53	66	1
MSH-5040	40	32.7	1.2	1°	68.7	70	77	0.5

SKS G II — MSG TYPE

Feature of product

"SKS-G II" SKG / MSG type, innovative high feed cutter achieved extremely excellent chip removal rate!

Features 1

Applicable to deep cutting of mold material or high feed machine aircraft parts that made of titanium alloy & stainless steel.

Features 2

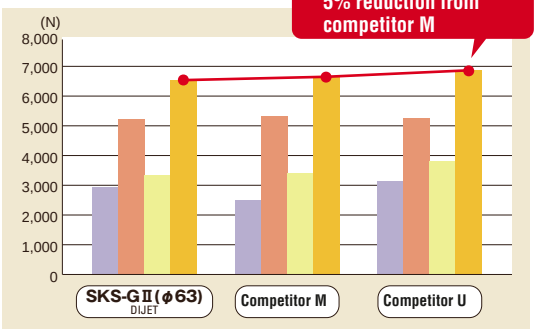
Adopted low cutting force & economical 4 corners positive insert, achieved stable high feed machining.

Features 3

Large ap machining is possible.
(Max. ap=1.5mm in case of using insert 10-type

Cutting performance

● Cutting force comparison



Material P21
● ø 63mm
Tool dia.
Insert No.
SPNW100415ZTR (JC8118)
● Cutting conditions:
Vc=80m/min, fz=1.5mm/t,
ap=1.5mm, ae=40mm,
Dry, Down cut

SKS G II — MSG TYPE

Features 4

3 insert grades “JC8118”, “JC8050” & “JC7550” can be widely applied from general & mold steel to hard-to-cut materials such as high hardened die steel, titanium alloy & stainless steel

JC 8118
For mold steel more than 38HRC &high hardened die steel less than 50HRC.

JC 8050
For general & mold steel less than 36HRC.

JC 7550
For titanium alloy & stainless steel.

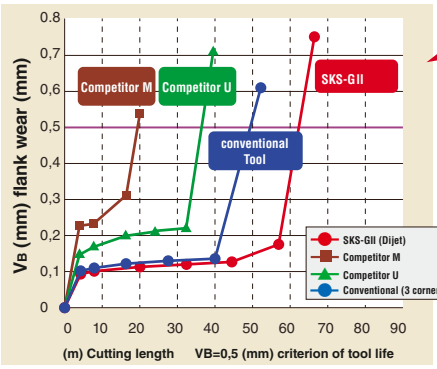
Application

ISO	P					M					K				S				H		
	P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30	S01	S10	S20	S30	H01	H10	H20
Applicable range		JC8118										JC8118								JC8118	
				JC8050																	
									JC7550								JC7550				

Features 5

Large chip pocket achieved excellent chip removal.

Tool life comparison



SKS-GII achieved 3.2 times longer tool life compared with competitor M, 1.8 times longer compared with competitor U, and 1.2 times longer compared with conventional tool.

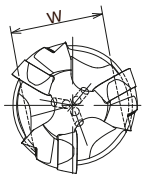
(32HRC)
Material: P20
- ø 63mm
  Tool dia.
  Insert No.
  SPNW100415ZTR (JC8118)
- Cutting conditions
  Vc=150m/min, fz=1mm/t,
  ap=1.5mm, ae=37.5mm,
  Air blow,
  Down cut,
  Test by one insert

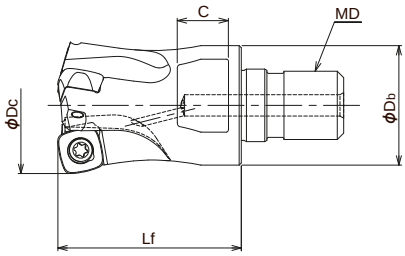
SKS GII — MSG TYPE

■ Modular head type (Insert 10-type)

Through Coolant Hole

G-Body





■ BODY

Cat. No.	Stock	No. of flutes	Dimensions(mm) φDc	Lf	φ	Db	MD	C	W	Applicable Inserts	Parts: Clamp Screw	Parts: Wrench
MSG-2025-10-M12	●	2	25	35	23	M12	11	19		SPNW10※※ SPET10※※ SPMT10※※	TSW-3509H	A-15
MSG-3032-10-M16	●	3	32	43	28	M16	12	22				
MSG-4040-10-M16	●	4	40	43	32	M16	14	26				
MSG-4042-10-M16	●	4	42	43	32	M16	14	26				

Note) 1. All cutters are supplied without inserts.
2. In case of using MSG-4040/4042-10-M16, recommend combining with MSN carbide shank straight arbor type.
3. Please refer page 009 for recommended tightening torque.

Arbor B193

Clamp Screw	Recommended torque (N•m)
TSW-3509H	3.0

■ Insert 10-type

Fig.1 SPNW100415ZTR

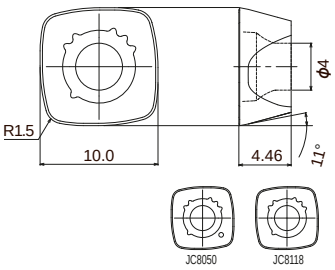


Fig.2 SPET100415ZPER-SM

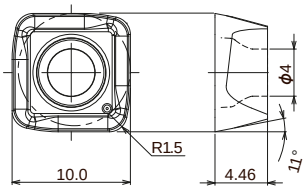
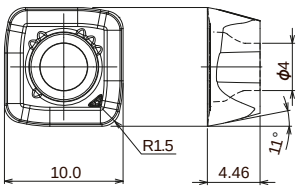


Fig.3 SPMT100415ZPER-SM



Cat. No.	Tolerance	PVD coated JC7550	JC8050	JC8118	Fig.
SPNW100415ZTR	N		●	●	1
SPET100415ZPER-SM	E	●			2
SPMT100415ZPER-SM	M	●			3
SPMT100415ZPTR-PM	M			●	3

● Standard stock items
10 inserts per case.

SKS GII — MSG TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MSG type (insert 10-type) + MSN Carbide Shank Holder

Work Materials	Grades	Tool dia. (mm)														
		25					32					40/42				
		No.of teeth 2N					No.of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel (C50,C55) Below 250HB	JC8050 (JC8118) SPNW10 Type	~75	1	~9	2,290	6,870	~100	1	~14	1,790	8,060	~100	1	~24	1,430	8,580
		125	0.8	~9	2,290	6,870	150	0.8	~14	1,790	8,060	150	0.8	~24	1,430	8,580
		175	0.6	~9	2,290	6,410	210	0.6	~14	1,790	7,520	210	0.6	~24	1,430	8,010
Die steel (1.2344,1.2379) Below 255HB	JC8050 (JC8118) SPNW10 Type	~75	1	~9	1,910	5,730	~100	1	~14	1,490	6,710	~100	1	~24	1,190	7,140
		125	0.8	~9	1,910	5,730	150	0.8	~14	1,490	6,710	150	0.8	~24	1,190	7,140
		175	0.6	~9	1,910	5,350	210	0.6	~14	1,490	6,260	210	0.6	~24	1,190	6,660
Mold steel (1.2311, P20) 30-36 HRC	JC8050 (JC8118) SPNW10 Type	~75	1	~9	1,910	5,730	~100	1	~14	1,490	6,710	~100	1	~24	1,190	7,140
		125	0.8	~9	1,910	5,730	150	0.8	~14	1,490	6,710	150	0.8	~24	1,190	7,140
		175	0.6	~9	1,910	5,350	210	0.6	~14	1,490	6,260	210	0.6	~24	1,190	6,660
Mold steel (1.2311,P21) 38-43HRC	JC8118 (JC8050) SPNW10 Type	~75	1	~9	1,400	3,640	~100	1	~14	1,090	4,250	~100	1	~24	880	4,580
		125	0.8	~9	1,400	3,640	150	0.8	~14	1,090	4,250	150	0.8	~24	880	4,580
		175	0.6	~9	1,400	3,360	210	0.6	~14	1,090	3,920	210	0.6	~24	880	4,220
Hardened die steel (1.2344,1.2379) 42-52HRC	JC8118 SPNW10 Type	~75	0.6	~9	1,270	3,050	~100	0.6	~14	990	3,560	~100	0.6	~24	800	3,840
		125	0.4	~9	1,270	3,050	150	0.4	~14	990	3,560	150	0.4	~24	800	3,840
		175	0.3	~9	1,270	2,540	210	0.3	~14	990	2,970	210	0.3	~24	800	3,200
Grey & Nodular cast iron (GG,GGG) Below 300HB	JC8118 SPNW10 Type	~75	1.2	~9	2,290	6,870	~100	1.2	~14	1,790	8,060	~100	1.2	~24	1,430	8,580
		125	1	~9	2,290	6,870	150	1	~14	1,790	8,060	150	1	~24	1,430	8,580
		175	0.8	~9	2,290	6,870	210	0.8	~14	1,790	8,060	210	0.8	~24	1,430	8,580
Stainless steel Below 250HB	JC7550 SPET10 SPMT10 Type	~75	1	~9	1,910	3,820	~100	1	~14	1,490	4,470	~100	1	~24	1,190	4,760
		125	0.8	~9	1,910	3,820	150	0.8	~14	1,490	4,470	150	0.8	~24	1,190	4,760
		175	0.6	~9	1,660	2,990	210	0.6	~14	1,290	3,480	210	0.6	~24	1,030	3,710
Titanium alloy	JC7550 SPET10 SPMT10 Type	~75	1	~9	760	910	~100	1	~14	600	1,080	~100	1	~24	480	1,150
		125	0.8	~9	760	910	150	0.8	~14	600	1,080	150	0.8	~24	480	1,150
		175	0.6	~9	760	760	210	0.6	~14	600	900	210	0.6	~24	480	960

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

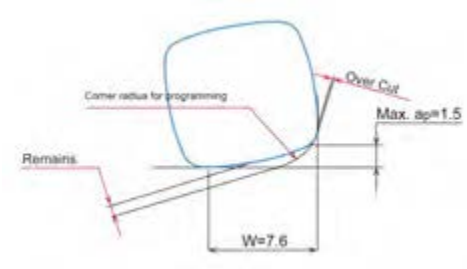
■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

SKS GII MSG TYPE

Definition of corner shape for programming

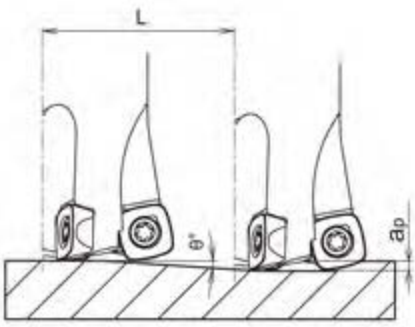
■ SPNW10 / SPE(M)T type inserts



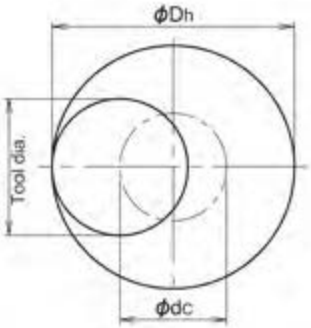
Corner R for programming	Over cut	Remains
R2.5	0	0.99
R3.0 (Standard)	0	0.84
R3.5	0.09	0.71
R4.0	0.23	0.59

■ Attention for profile milling

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

$\varphi dc = \varphi Dh - \varphi Dc$

Tool pass dia. Bore dia. Tool dia.

● Depth of cut per one circuit should not exceed max. depth of cut ap.

● Down cutting is recommended, so tool pass rotation should be counterclockwise.

◎ In case of ramping and helical interpolation, apply 70% or less feed speed from standard cutting condition table.

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max.depth ofcut ap (mm)	Ramping		Helical interpolation	
				Max. ramping angle θ°	Total cutting length L (mm) atmax.ap	Min. bore dia. Dh min (mm)	Max.bore dia. Dh max (mm)
MSG-2025-10	25	9.8	1.5	1°	95.5	36	48
MSG-3032-10	32	16.8	1.5	1°	95.5	50	62
MSG-4040-10	40	24.8	1.5	1°	95.5	66	78
MSG-4042-10	42	26.8	1.5	1°	95.5	70	82

QM MAX MQXTYPE

QM Quick&Mini MAX

G-Body

Low cutting force

Adopted unique 3D geometry insert with low cutting force (25% lower than coventional tool).
QM MAX achieved high efficient machining up to ap=1mm.
Maintain stable cutting force & power consumption after 1.7mm depth, in case of deep cavity milling.
⇒Excellent for vertical wall machining

Multi blades

Multi blades achieves Q=144cc/min.

Vibration free

"QM MAX" MQX type can be possible high efficient machining and longer tool life, due to control the vibration by the combination of MSN carbide shank holder.

Insert variation

High feed insert

EPMT100312ZER EPMT100312ZER

High feed insert for unfavorable condition

EPMW100312ZER EPMW100312ZTR EPMW100312ZTR

Shoulder milling insert

ZPMT1003…ZER

0.03mm or less cusp height gives true 90 degree with no mismatch

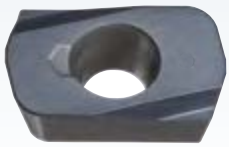
NEW Shoulder milling insert for aluminum alloy

ZPMT1003…ZER-NL

NEW Shoulder milling insert (From semi-finishing to finishing)

ZPMT100308ZER-PL

High hardened steel



EPHW100316ZTR

"MIRROR INSERT" for finishing side & bottom face/ contouring milling

YPHW1003…ZER-…

NEW CBN

YPHW100308ZTR-F1

High feed and shoulder milling can be processed with same body. Moreover, adopted "MIRROR INSERT" achieved high efficient finishing side & bottom face.

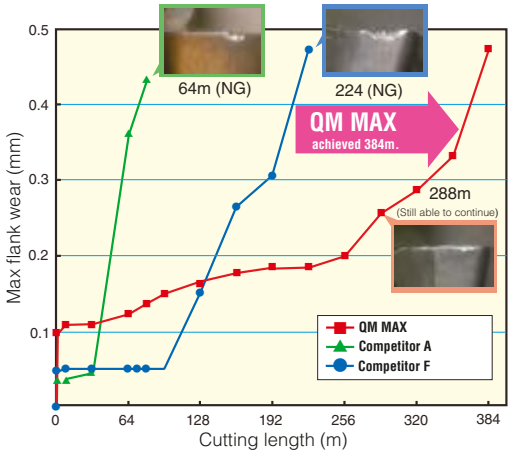
Adopted PVD coated grade "JC5118" possible to cut general steel, hardened material, titanium alloy and heat-resistant alloy, tough grade "JC8050" for interrupted cutting, and new PVD coated grade "JC7560" improved heat-fracture resistance & impact strength and tool life. And, available now uncoated grade "FZ15" for shoulder milling of aluminum alloy.
Moreover, "MIRROR INSERT" YPHW type and shoulder milling insert ZPMT-PL type adopted generic PVD coated grade "JC8015" that have a wide application, cermet "CX75", and new PVD coated grade "DH102" for high speed machining in high hardened material.
And available now CBN grade for "MIRROR INSERT" YPHW type.

QM MAX MQXTYPE

■ Cutting performance of QM MAX against competitor

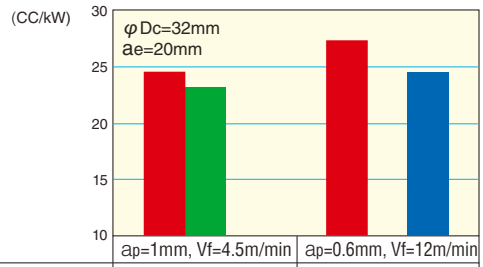
Tool life comparison

Material: NAK80, 40HRC
Insert No.: EPMT100312ZER (JC8050)
Cutting conditions:
Dc=32mm, Vc=120.6m/min (n=1,200min^{-1}),
f=3mm/rev (Vf=3, 600mm/min) (6N), ap=0.6mm, ae=19mm, Q=41cc/min
Overhunglength: ℓ=100mm, Shoulder milling, Downcut, Dry (Air blow)



Metal removal rate comparison

Metal removal rate/1kW on S50C



	ap=1mm, Vf=4.5m/min	ap=0.6mm, Vf=12m/min
QM MAX	**24.59**	**27.27**
Competitor A	23.08	
Competitor F		24.49

Metal removal rate Q / kW of QM MAX is 6%-10% more than the competitor's tool. And also, Power consumption of QM MAX is lower than competitors.

Power Saving Features

QM MAX **MQX**TYPE

NEW ZPMT-PL

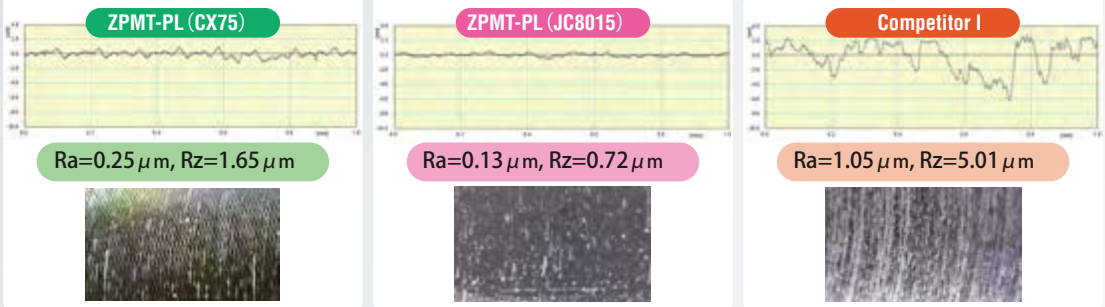
Series expansion, shoulder milling insert from semi-finishing to finishing side & bottom face for QM MAX MQX / QXP type.

Adopted 3 grades: PVD coated grade "JC8015" that showed stable performance in raw material up to 36HRC, cast iron, and stainless steel. / New PVD coated grade "DH102" suitable for high speed machining in high hardened material. / Cermet "CX75".

Cutting performance

Surface roughness (bottom)

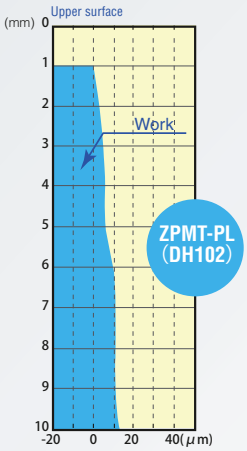
Material: C50 (raw material), Tool dia.: Ø25mm
Vc=160.2m/min, fz=0.12mm/t, ap=0.2mm, Overhung length: 60mm



2. Deflection (side wall) (Z pick=2mm)

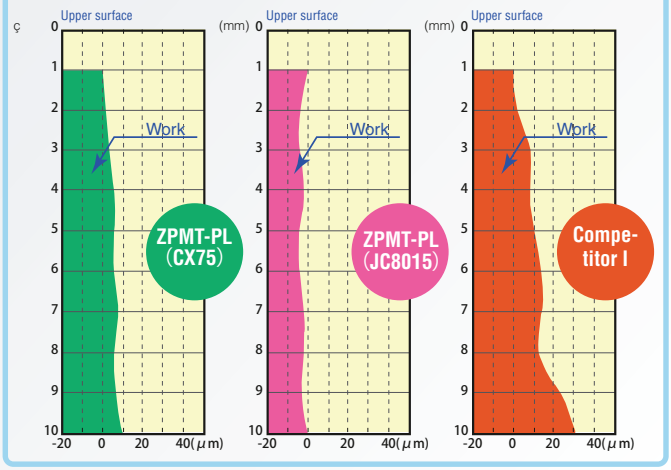
Material: SKD11 (60HRC)
1.2379 (60HRC)
Tool dia: Ø26 mm
Vc=180m/min,
fz=0.15mm/t,
ap=2×8=16mm,
ae=0.1mm

Overhung length: 65mm



3. Deflection (side wall) (Z pick=3mm)

Material: 50CC50 (raw material), Tool dia: Ø25mm Vc=282.7m/min,
fz=0.12mm/t, ap=3×4=12mm, ae=0.15mm
Overhung length: 60mm



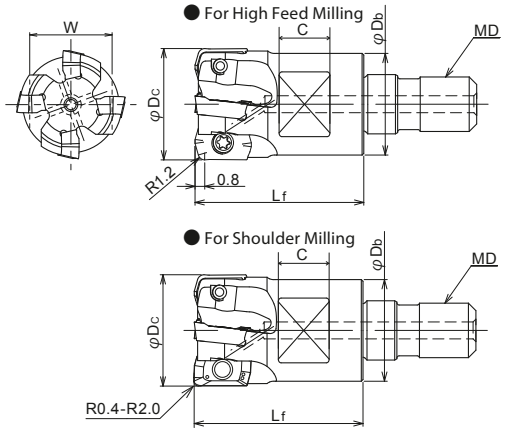
Application for choice of insert grade for ZPMT-PL type

Work-materials	Carbon steel (C50, C55) Below 250HB	Die steel (1.2344, 1.2379) Below 255HB	Mold steel (1.2311, P20) 30-36HRC	Mold steel (1.2311, P21) 38-43HRC	Hardened die steel (1.2344, 1.2379) 42-52HRC	Hardened die steel (1.2344, 1.2379) 55-62HRC	Grey & Nodular cast iron (GG, GGG) Below 300HB	Stainless steel Below 250HB	Titanium alloy
Grades	**CX75 (JC8015)**	**CX75 (JC8015)**	**JC8015 (DH102)**	**DH102 (JC8015)**	**DH102 (JC8015)**	**DH102**	**JC8015 (DH102)**	**JC8015 (DH102)**	**JC8015 (DH102)**

QM MAX — MQX TYPE

G-Body

Through Coolant Hole



■ BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
MQX-2016-M8	●	2	16	23	14	M8	8	12			
MQX-2017-M8	●	2	17	23	14	M8	8	12			
MQX-3020-M10	●	3	20	30	18	M10	9	14		TSW-2556H	
MQX-4020-M10	●	4	20	30	18	M10	9	14			
MQX-4021-M10	●	4	21	30	18	M10	9	14			
MQX-4025-M12	●	4	25	35	22.5	M12	10	17			
MQX-5025-M12	●	5	25	35	22.5	M12	10	17			
MQX-4026-M12	●	4	26	35	22.5	M12	10	17	EP**1003**Z*R		
MQX-5026-M12	●	5	26	35	22.5	M12	10	17	ZPMT1003**ZER		A-08
MQX-5030-M16	□	5	30	43	27	M16	12	22	YPHW1003**ZER-**		
MQX-5032-M16	●	5	32	43	29	M16	12	22		DSW-2563H	
MQX-6032-M16	●	6	32	43	29	M16	12	22			
MQX-5035-M16	●	5	35	43	29	M16	12	22			
MQX-6035-M16	●	6	35	43	29	M16	12	22			
MQX-6040-M16	●	6	40	43	32	M16	14	26			
MQX-7040-M16	●	7	40	43	32	M16	14	26			
MQX-6042-M16	●	6	42	43	32	M16	14	26			

Note) 1. Please refer page B033-B076 for recommended cutting conditions.
2. All cutters are supplied without inserts.
3. Please refer page B009 for recommended tightening torque.

Arbor B193

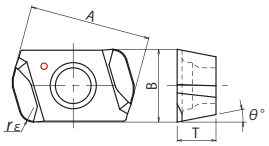
Clamp Screw	Recommended Torque (N•m)
TSW-2556H	0.9
DSW-2563H	0.9

QM MAX — MQX TYPE

MQX TYPE

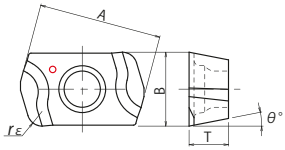
High feed insert
(EPMT100312ZER)

Cutting condition B033~B036



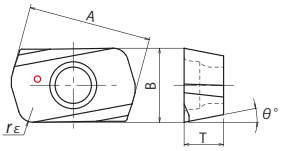
High feed insert for unfavorable condition
(EPMW100312ZER)

Cutting condition B033~B036



High feed insert for unfavorable condition
(EPMW100312ZTR)

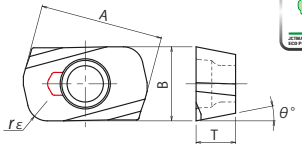
Cutting condition B033~B036



(JC7560)

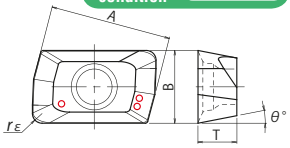
High hardened steel
(EPHW100316ZTR)

Cutting condition B037~B039



Shoulder milling insert
(EPMT1003ZER)**

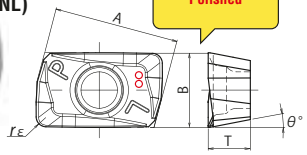
Cutting condition B040~B047



NEW **Shoulder milling insert for aluminum alloy**
(ZPMT1003ZER-NL)**

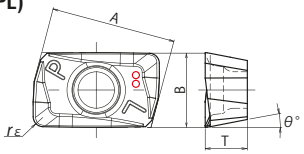
Cutting condition B074

Polished



NEW **Shoulder milling insert (From semi-finishing to finishing)**
(ZPMT100308ZER-PL)

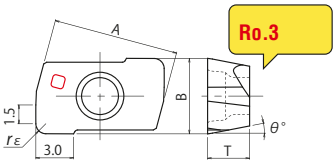
Cutting condition B066~B073



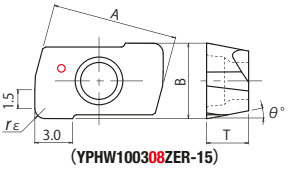
"MIRROR INSERT" for finishing side & bottom face
(YPHW1003ZER-15)**
(YPHW100308ZTR-F1)
(YPHW100308ZER-F)

Cutting condition B048~B058

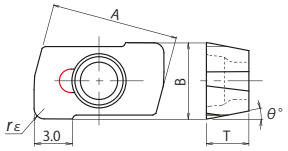
Ro.3



(YPHW100303ZER-15)



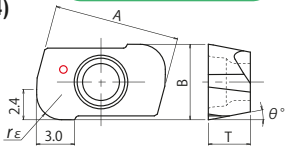
(YPHW100308ZER-15)



(YPHW100308ZER-F)

"MIRROR INSERT" for finishing side & bottom face / contouring milling
(YPHW100320ZER-24)

Cutting condition B059~B065



QM MAX MQX TYPE

Type	Cat. No.	Tole-rance	PVD coated JC5118	JC8118	DH102	JC7560	JC8015	JC8050	Uncoated FZ 15	FC 18	Cermet CX75	Dimensions (mm) A	T	B	r ε	θ°
High feed insert	**EPMT100312ZER**	M	○	●		●		●				10	3.2	6	1.2	11°
High feed insert for unfavourable condition	**EPMW100312ZER**	M	○	●				●				10	3.2	6	1.2	11°
	EPMW100312ZTR	M	○	●		●		●								
High hardened steel	**EPHW100316ZTR**	H		●	●							10	3.2	6	1.6	11°
Shouldermilling insert	**ZPMT100304ZER**	M	○					●				10	3.2	6	0.4	11°
	ZPMT100308ZER	M	○					●				10	3.2	6	0.8	11°
	ZPMT100320ZER	M	○					●				10	3.2	6	2.0	11°
Shoulder milling insert for aluminum alloy	NEW **ZPMT100304ZER-NL**	M								●		10	3.4	6	0.4	11°
	ZPMT100308ZER-NL	M							○	◎		10	3.4	6	0.8	11°
	NEW **ZPMT100320ZER-NL**	M								●		10	3.4	6	2.0	11°
Shoulder milling insert from semi-finishing to finishing	NEW **ZPMT100304ZER-PL**	M		●	●						●	10	3.4	6	0.4	11°
	ZPMT100308ZER-PL	M		●	●		○				●	10	3.4	6	0.8	11°
	NEW **ZPMT100320ZER-PL**	M		●	●						●	10	3.4	6	2.0	11°
"MIRROR INSERT" for finishing side & bottom face/ contouring milling	NEW **YPHW100303ZER-15**	H			●		●				●	10	3.35	6	0.3	11°
	YPHW100308ZER-15	H			●						●	10	3.35	6	0.8	11°
	YPHW100308ZER-F	H					●					10	3.35	6	0.8	11°
	YPHW100320ZER-24	H			●		●					10	3.35	6	2.0	11°

10 inserts per case.

Discrimination of grade for MQX / QXP insert

Each grade shows different mark around the hole for fool proof.

● Standard stock items ◎: soon to be stocked ○: Soon to be deleted

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS

● MQX type (EPMT/W type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No.of teeth 2N					No.of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50,C55) Below 250HB	JC7560 (JC8050) (JC5118) (JC8118)	~70	0.6	~10	3,600	4,900	~70	0.6	~14	2,850	5,800	~70	0.6	~14	2,850	7,700
		120	0.5	~10	3,600	4,500	120	0.5	~14	2,850	5,300	120	0.5	~14	2,850	7,000
		160	0.35	~10	3,000	4,200	190	0.35	~14	2,400	4,900	190	0.35	~14	2,400	6,500
Die steel SKD61, SKD11 (1.2344,1.2379) Below 255HB	JC7560 (JC8050) (JC5118) (JC8118)	~70	0.6	~10	3,600	4,900	~70	0.6	~14	2,850	5,800	~70	0.6	~14	2,850	7,700
		120	0.5	~10	3,600	4,500	120	0.5	~14	2,850	5,300	120	0.5	~14	2,850	7,000
		160	0.35	~10	3,000	4,200	190	0.35	~14	2,400	4,900	190	0.35	~14	2,400	6,500
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36 HRC	JC7560 (JC8050) (JC5118) (JC8118)	~70	0.6	~10	3,600	4,900	~70	0.6	~14	2,850	5,800	~70	0.6	~14	2,850	7,700
		120	0.5	~10	3,600	4,500	120	0.5	~14	2,850	5,300	120	0.5	~14	2,850	7,000
		160	0.35	~10	3,000	4,200	190	0.35	~14	2,400	4,900	190	0.35	~14	2,400	6,500
Mold steel NAK80, HPM1, P21 (1.2311,P21) 38-43HRC	JC8050 (JC5118) (JC8118)	~70	0.5	~10	1,900	2,600	~70	0.5	~14	1,500	3,050	~70	0.5	~14	1,500	4,050
		120	0.3	~10	1,900	2,400	120	0.3	~14	1,500	2,800	120	0.3	~14	1,500	3,700
		160	0.2	~10	1,600	2,200	190	0.2	~14	1,250	2,600	190	0.2	~14	1,250	3,400
Hardened die steel SKD61, DAC, DHA (1.2344,1.2379) 42-52HRC	JC8118 JC5118 (JC8050)	~70	0.4	~10	1,400	1,400	~70	0.4	~14	1,100	1,650	~70	0.4	~14	1,100	2,200
		120	0.3	~10	1,400	1,400	120	0.3	~14	1,100	1,650	120	0.3	~14	1,100	2,200
		160	–	–	–	–	190	–	–	–	–	190	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8118 C5118 EPMW type	~70	0.15	~10	600	180	~70	0.15	~14	500	230	~70	0.15	~14	500	300
		120	0.1	~10	600	180	120	0.1	~14	500	230	120	0.1	~14	500	300
		160	–	–	–	–	190	–	–	–	–	190	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG,GGG) Below 300HB	JC8118 JC5118 (JC7560)	~70	0.8	~10	3,000	5,000	~70	0.8	~14	2,400	6,000	~70	0.8	~14	2,400	8,000
		120	0.6	~10	3,000	4,500	120	0.6	~14	2,400	5,400	120	0.6	~14	2,400	7,200
		160	0.5	~10	2,200	3,750	190	0.5	~14	1,750	4,500	190	0.5	~14	1,750	6,000
Stainless steel SUS304 Below 250HB	JC7560 (JC8050)	~70	0.6	~10	3,100	4,200	~70	0.6	~14	2,500	5,100	~70	0.6	~14	2,500	6,800
		120	0.5	~10	3,000	4,000	120	0.5	~14	2,400	4,900	120	0.5	~14	2,400	6,500
		160	0.35	~10	3,000	4,000	190	0.35	~14	2,400	4,900	190	0.35	~14	2,400	6,500
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050) (JC8118)	~70	0.5	~10	1,200	960	~70	0.5	~14	950	1,140	~70	0.5	~14	950	1,500
		120	0.3	~10	1,200	960	120	0.3	~14	950	1,140	120	0.3	~14	950	1,500
		160	0.2	~10	1,200	960	190	0.2	~14	950	1,140	190	0.2	~14	950	1,500
Inconel (INCO718)	JC8118 JC5118 (JC8050) (JC7560)	~70	0.5	~10	630	380	~70	0.5	~14	500	450	~70	0.5	~14	500	600
		120	0.3	~10	630	380	120	0.3	~14	500	450	120	0.3	~14	500	600
		160	0.2	~10	630	380	190	0.2	~14	500	450	190	0.2	~14	500	600

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS

● MQX type (EPMT/W type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 25/26									
		No.o fteeth 4N					No.of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50,C55) Below 250HB	JC7560 (JC8050) (JC5118) (JC8118)	~90	0.8	~19	2,300	6,200	~90	0.8	~19	2,300	7,700
		140	0.6	~19	2,300	5,600	140	0.6	~19	2,300	7,000
		210	0.4	~19	1,900	5,200	210	0.4	~19	1,900	6,500
Die steel SKD61, SKD11 (1.2344,1.2379) Below 255HB	JC7560 (JC8050) (JC5118) (JC8118)	~90	0.8	~19	2,300	6,200	~90	0.8	~19	2,300	7,700
		140	0.6	~19	2,300	5,600	140	0.6	~19	2,300	7,000
		210	0.4	~19	1,900	5,200	210	0.4	~19	1,900	6,500
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 (JC8050) (JC5118) (JC8118)	~90	0.8	~19	2,300	6,200	~90	0.8	~19	2,300	7,700
		140	0.6	~19	2,300	5,600	140	0.6	~19	2,300	7,000
		210	0.4	~19	1,900	5,200	210	0.4	~19	1,900	6,500
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC5118) (JC8118)	~90	0.6	~19	1,200	3,250	~90	0.6	~19	1,200	4,050
		140	0.4	~19	1,200	3,000	140	0.4	~19	1,200	3,700
		210	0.3	~19	1,000	2,700	210	0.3	~19	1,000	3,400
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 JC5118 (JC8050)	~90	0.4	~19	900	1,800	~90	0.4	~19	900	2,250
		140	0.3	~19	900	1,800	140	0.3	~19	900	2,250
		210	—	—	—	—	210	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8118 JC5118 EPMW type	~90	0.15	~19	400	240	~90	0.15	~19	400	300
		140	0.1	~19	400	240	140	0.1	~19	400	300
		210	—	—	—	—	210	—	—	—	—
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 JC5118 (JC7560)	~90	0.8	~19	1,900	6,400	~90	0.8	~19	1,900	8,000
		140	0.6	~19	1,900	5,800	140	0.6	~19	1,900	7,200
		210	0.5	~19	1,600	4,800	210	0.5	~19	1,600	6,000
Stainless steel SUS304 Below 250HB	JC7560 (JC8050)	~90	0.8	~19	2,000	5,450	~90	0.8	~19	2,000	6,800
		140	0.6	~19	2,000	5,200	140	0.6	~19	2,000	6,500
		210	0.35	~19	1,900	4,950	210	0.35	~19	1,900	6,200
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050) (JC8118)	~90	0.5	~19	750	1,200	~90	0.5	~19	750	1,500
		140	0.3	~19	750	1,200	140	0.3	~19	750	1,500
		210	0.2	~19	750	1,200	210	0.2	~19	750	1,500
Inconel (INCO718)	JC5118 (JC8050) (JC7560) (JC8118)	~90	0.5	~19	400	480	~90	0.5	~19	400	600
		140	0.3	~19	400	480	140	0.3	~19	400	600
		210	0.2	~19	400	480	210	0.2	~19	400	600

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS

● MQX type (EPMT/W type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32/35					32/35				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50,C55) Below 250HB	JC7560 (JC8050) (JC5118) (JC8118)	~100	0.8	~25	1,900	6,350	~100	0.8	~25	1,900	7,600
		150	0.6	~25	1,800	6,000	150	0.6	~25	1,800	7,200
		210	0.4	~25	1,500	5,000	210	0.4	~25	1,500	6,000
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC8050) (JC5118) (JC8118)	~100	0.8	~25	1,900	6,350	~100	0.8	~25	1,900	7,600
		150	0.6	~25	1,800	6,000	150	0.6	~25	1,800	7,200
		210	0.4	~25	1,500	5,000	210	0.4	~25	1,500	6,000
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC5118) (JC8118)	~100	0.8	~25	1,900	6,350	~100	0.8	~25	1,900	7,600
		150	0.6	~25	1,800	6,000	150	0.6	~25	1,800	7,200
		210	0.4	~25	1,500	5,000	210	0.4	~25	1,500	6,000
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC5118) (JC8118)	~100	0.6	~25	950	3,200	~100	0.6	~25	950	3,800
		150	0.4	~25	950	3,200	150	0.4	~25	950	3,800
		210	0.3	~25	800	2,650	210	0.3	~25	800	3,200
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 JC5118 (JC8050)	~100	0.4	~25	700	1,750	~100	0.4	~25	700	2,100
		150	0.3	~25	700	1,750	150	0.3	~25	700	2,100
		210	—	—	—	—	210	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8118 JC5118 EPMW type	~100	0.15	~25	300	250	~100	0.15	~25	300	300
		150	0.1	~25	300	250	150	0.1	~25	300	300
		210	—	—	—	—	210	—	—	—	—
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 JC5118 (JC7560)	~100	1	~25	1,500	6,250	~100	1	~25	1,500	7,500
		150	0.8	~25	1,500	5,750	150	0.8	~25	1,500	6,900
		210	0.6	~25	1,250	4,850	210	0.6	~25	1,250	5,800
Stainless steel SUS304 Below 250HB	(JC7560) JC8050	~100	0.8	~25	1,700	5,700	~100	0.8	~25	1,700	6,800
		150	0.6	~25	1,600	5,350	150	0.6	~25	1,600	6,400
		210	0.35	~25	1,500	5,000	210	0.35	~25	1,500	6,000
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050) (JC8118)	~100	0.5	~25	600	1,250	~100	0.5	~25	600	1,500
		150	0.3	~25	600	1,250	150	0.3	~25	600	1,500
		210	0.2	~25	600	1,250	210	0.2	~25	600	1,500
Inconel (INCO718)	JC5118 (JC8050) (JC7560) (JC8118)	~100	0.5	~25	300	500	~100	0.5	~25	300	580
		150	0.3	~25	300	500	150	0.3	~25	300	580
		210	0.2	~25	300	500	210	0.2	~25	300	580

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

■ NOTE

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2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS

● MQX type (EPMT/W type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		40/42					40				
		No. of teeth 6N					No. oft eeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbonsteel S50C, S55C (C50,C55) Below 250HB	JC7560 (JC8050) (JC5118) (JC8118)	~100	0.8	~32	1,500	6,300	~100	0.8	~32	1,500	7,500
		150	0.6	~32	1,400	5,900	150	0.6	~32	1,400	7,000
		210	0.4	~32	1,200	5,000	210	0.4	~32	1,200	6,000
Die steel SKD61, SKD11 (1.2344,1.2379) Below 255HB	JC7560 (JC8050) (JC5118) (JC8118)	~100	0.8	~32	1,500	6,300	~100	0.8	~32	1,500	7,500
		150	0.6	~32	1,400	5,900	150	0.6	~32	1,400	7,000
		210	0.4	~32	1,200	5,000	210	0.4	~32	1,200	6,000
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 (JC8050) (JC5118) (JC8118)	~100	0.8	~32	1,500	6,300	~100	0.8	~32	1,500	7,500
		150	0.6	~32	1,400	5,900	150	0.6	~32	1,400	7,000
		210	0.4	~32	1,200	5,000	210	0.4	~32	1,200	6,000
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC5118) (JC8118)	~100	0.6	~32	750	3,000	~100	0.6	~32	750	3,500
		150	0.4	~32	750	3,000	150	0.4	~32	750	3,500
		210	0.3	~32	620	2,500	210	0.3	~32	620	2,900
Hardened die steel SKD61, DAC, DHA (1.2344,1.2379) 42-52HRC	JC8118 JC5118 (JC8050)	~100	0.4	~32	550	1,650	~100	0.4	~32	550	1,900
		150	0.3	~32	550	1,650	150	0.3	~32	550	1,900
		210	—	—	—	—	210	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8118 JC5118 EPMW type	~100	0.15	~32	250	240	~100	0.15	~32	250	280
		150	0.1	~32	250	240	150	0.1	~32	250	280
		210	—	—	—	—	210	—	—	—	—
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 JC5118 (JC7560)	~100	1	~32	1,200	6,150	~100	1	~32	1,200	7,200
		150	0.8	~32	1,200	5,650	150	0.8	~32	1,200	6,600
		210	0.6	~32	1,000	4,700	210	0.6	~32	1,000	5,500
Stainless steel SUS304 Below 250HB	JC7560 (JC8050)	~100	0.8	~32	1,350	5,850	~100	0.8	~32	1,350	6,800
		150	0.6	~32	1,300	5,550	150	0.6	~32	1,300	6,500
		210	0.35	~32	1,200	5,150	210	0.35	~32	1,200	6,000
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050) (JC8118)	~100	0.5	~32	480	1,150	~100	0.5	~32	480	1,350
		150	0.3	~32	480	1,150	150	0.3	~32	480	1,350
		210	0.2	~32	480	1,150	210	0.2	~32	480	1,350
Inconel (INCO718)	JC5118 (JC8050) (JC7560) (JC8118)	~100	0.5	~32	250	450	~100	0.5	~32	250	520
		150	0.3	~32	250	450	150	0.3	~32	250	520
		210	0.2	~32	250	450	210	0.2	~32	250	520

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS/ HIGH SPEED MACHINING

● MQX type (EPHW type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		16/17									
		No. of teeth 2N									
		ℓ (mm)	ap (mm)	ae (mm)	n(min-1)	Vf (mm/min)					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~70	0.30	~10	1,790	2,860					
		100	0.25	~10	1,610	2,060					
		130	0.20	~10	1,430	1,370					
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~70	0.20	~10	1,590	950					
		100	0.15	~10	1,430	770					
		130	0.10	~10	1,270	610					

Work Materials	Insert Grades	Tool dia.(mm)									
		20					20/21				
		No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~80	0.30	~14	1,430	3,430	~80	0.30	~14	1,430	3,060
		120	0.25	~14	1,290	2,480	120	0.25	~14	1,290	3,300
		160	0.20	~14	1,140	1,640	160	0.20	~14	1,140	2,190
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~80	0.20	~14	1,270	1,140	~80	0.20	~14	1,270	1,520
		120	0.15	~14	1,140	920	120	0.15	~14	1,140	1,230
		160	0.10	~14	1,020	730	160	0.10	~14	1,020	980

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

■ NOTE

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2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS/ HIGH SPEED MACHINING

● MQX type (EPHW type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 25/26 No. of teeth 4N					Tool dia. (mm) 25/26 No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	0.30	~18	1,150	3,680	~100	0.30	~18	1,150	4,600
		150	0.25	~18	1,040	2,660	150	0.25	~18	1,040	3,330
		200	0.25	~18	920	1,770	200	0.20	~18	920	2,210
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~100	0.20	~18	1,020	1,220	~100	0.20	~18	1,020	1,530
		150	0.15	~18	920	990	150	0.15	~18	920	1,240
		200	0.10	~18	820	790	200	0.10	~18	820	980

Work Materials	Insert Grades	Tool dia. (mm) 30/32/35 No.of teeth 5N					Tool dia. (mm) 32/35 No.of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~130	0.30	~24	900	3,600	~130	0.30	~24	900	4,320
		190	0.25	~24	810	2,590	100	0.25	~24	810	3,110
		250	0.20	~24	720	1,730	250	0.20	~24	720	2,070
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~130	0.20	~24	800	1,200	~130	0.20	~24	800	1,440
		190	0.15	~24	720	970	190	0.15	~24	720	1,160
		250	0.10	~24	640	770	250	0.10	~24	640	920

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■ NOTE

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2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS/ HIGH SPEED MACHINING

● MQX type (EPHW type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tooldia.(mm)									
		40/42					40				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344,1 .2379) 42-52HRC	JC8118	~130	0.30	~32	720	3,460	~130	0.30	~32	720	4,030
		190	0.25	~32	650	2,500	190	0.25	~32	650	2,910
		250	0.20	~32	580	1,670	250	0.20	~32	580	1,950
Hardened die steel SKD11, SLD,DC11 (1.2344, 1.2379) 55-62HRC	DH102	~130	0.20	~32	640	1,150	~130	0.20	~32	640	1,340
		190	0.15	~32	580	940	190	0.15	~32	580	1,100
		250	0.10	~32	510	740	250	0.10	~32	510	860

ℓ: Overhung length, a_p: Axial depth of cut, a_e: 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS

● MQX type (ZPMT type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia .(mm)														
		16/17					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50,C55) Below 250HB	JC5118 (JC8050)	~70	~6.0	~13.0	3,180	760	~70	~6.0	~16.0	2,550	920	~70	~6.0	~16.0	2,550	1,220
		120	~4.0	~4.0	2,860	630	120	~5.0	~8.0	2,300	760	120	~5.0	~8.0	2,300	1,010
		160	~3.0	~2.0	2,540	500	190	~4.0	~4.0	2,040	620	190	~4.0	~4.0	2,040	820
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~70	~6.0	~13.0	2,990	600	~70	~6.0	~16.0	2,390	720	~70	~6.0	~16.0	2,390	960
		120	~4.0	~4.0	2,690	480	120	~5.0	~8.0	2,150	580	120	~5.0	~8.0	2,150	770
		160	~3.0	~2.0	2,390	380	190	~4.0	~4.0	1,910	460	190	~4.0	~4.0	1,910	610
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 (JC5118)	~70	~6.0	~8.0	2,390	480	~70	~6.0	~16.0	1,910	570	~70	~6.0	~16.0	1,910	760
		120	~3.0	~3.0	2,150	390	120	~4.0	~8.0	1,720	460	120	~4.0	~8.0	1,720	620
		160	~2.0	~1.6	1,910	310	190	~3.0	~4.0	1,530	370	190	~3.0	~4.0	1,530	490
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~70	~7.0	~13.0	2,990	720	~70	~6.0	~18.0	2,390	860	~70	~6.0	~18.0	2,390	1,150
		120	~4.0	~4.0	2,690	590	120	~5.0	~10.0	2,150	710	120	~5.0	~10.0	2,150	950
		160	~3.0	~2.0	2,390	480	190	~4.0	~5.0	1,910	570	190	~4.0	~5.0	1,910	760
Stainless steel SUS304 Below 250HB	JC8050	~70	~6.0	~13.0	2,990	600	~70	~6.0	~16.0	2,390	720	~70	~6.0	~16.0	2,390	960
		120	~3.6	~3.6	2,690	480	120	~5.0	~8.0	2,150	580	120	~5.0	~8.0	2,150	770
		160	~2.5	~2.0	2,390	380	190	~4.0	~4.0	1,910	460	190	~4.0	~4.0	1,910	610

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS

● MQX type (ZPMT type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 25/26									
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	~90	~6.0	~20.0	2,040	980	~90	~6.0	~20.0	2,040	1,220
		140	~5.0	~10.0	1,840	810	140	~5.0	~10.0	1,840	1,010
		210	~4.0	~8.0	1,630	660	210	~4.0	~8.0	1,630	820
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~90	~6.0	~20.0	1,910	770	~90	~6.0	~20.0	1,910	960
		140	~5.0	~10.0	1,720	620	140	~5.0	~10.0	1,720	770
		210	~4.0	~8.0	1,530	490	210	~4.0	~8.0	1,530	610
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 (JC5118)	~90	~6.0	~20.0	1,530	610	~90	~6.0	~20.0	1,530	760
		140	~4.0	~10.0	1,380	500	140	~4.0	~10.0	1,380	620
		210	~3.0	~8.0	1,220	390	210	~3.0	~8.0	1,220	490
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~90	~6.0	~25.0	1,910	920	~90	~6.0	~25.0	1,910	1,150
		140	~5.0	~12.0	1,720	760	140	~5.0	~12.0	1,720	950
		210	~4.0	~9.0	1,530	610	210	~4.0	~9.0	1,530	760
Stainless steel SUS304 Below 250HB	JC8050	~90	~6.0	~20.0	1,910	770	~90	~6.0	~20.0	1,910	960
		140	~5.0	~10.0	1,720	620	140	~5.0	~10.0	1,720	770
		210	~4.0	~8.0	1,530	490	210	~4.0	~8.0	1,530	610

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS

● MQX type (ZPMT type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32/35					32/35				
		No.of teeth 5N					No.of teeth 6N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50,C55) Below 250HB	JC5118 (JC8050)	~100	~6.0	~22.0	1,590	950	~100	~6.0	~22.0	1,590	1,140
		150	~5.0	~15.0	1,430	780	150	~5.0	~15.0	1,430	940
		210	~4.0	~8.0	1,270	630	210	~4.0	~8.0	1,270	760
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~100	~6.0	~22.0	1,490	740	~100	~6.0	~22.0	1,490	890
		150	~5.0	~15.0	1,340	600	150	~5.0	~15.0	1,340	720
		210	~4.0	~8.0	1,190	480	210	~4.0	~8.0	1,190	570
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 (JC5118)	~100	~6.0	~22.0	1,190	590	~100	~6.0	~22.0	1,190	710
		150	~5.0	~15.0	1,070	480	150	~5.0	~15.0	1,070	580
		210	~4.0	~8.0	950	380	210	~4.0	~8.0	950	460
Grey & Nodular cast iron FC,FCD (GG,GGG) Below 300HB	JC5118	~100	~6.0	~24.0	1,490	890	~100	~6.0	~24.0	1,490	1,070
		150	~5.0	~16.0	1,340	730	150	~5.0	~16.0	1,340	880
		210	~4.0	~9.0	1,190	590	210	~4.0	~9.0	1,190	710
Stainless steel SUS304 Below 250HB	JC8050	~100	~6.0	~22.0	1,490	740	~100	~6.0	~22.0	1,490	890
		150	~5.0	~15.0	1,340	600	150	~5.0	~15.0	1,340	720
		210	~4.0	~8.0	1,190	480	210	~4.0	~8.0	1,190	570

ℓ: Overhung length, a_p: Axial depth of cut, a_e: 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS

● MQX type (ZPMT type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		40/42					40				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ap×ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	~100	~6.0	~28.0	1,270	920	~100	~6.0	~28.0	1,270	1,070
		150	~5.0	~20.0	1,140	750	150	~5.0	~20.0	1,140	880
		210	~4.0	~10.0	1,010	610	210	~4.0	~10.0	1,010	710
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~100	~6.0	~28.0	1,190	590	~100	~6.0	~28.0	1,190	690
		150	~5.0	~20.0	1,070	450	150	~5.0	~20.0	1,070	520
		210	~4.0	~10.0	950	320	210	~4.0	~10.0	950	370
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 (JC5118)	~100	~6.0	~28.0	950	570	~100	~6.0	~28.0	950	660
		150	~5.0	~20.0	860	460	150	~5.0	~20.0	860	530
		210	~4.0	~10.0	760	360	210	~4.0	~10.0	760	420
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~100	~6.0	~32.0	1,190	860	~100	~6.0	~32.0	1,190	1,000
		150	~5.0	~24.0	1,070	710	150	~5.0	~24.0	1,070	820
		210	~4.0	~12.0	950	570	210	~4.0	~12.0	950	670
Stainless steel SUS304 Below 250HB	JC8050	~100	~6.0	~28.0	1,190	590	~100	~6.0	~28.0	1,190	690
		150	~5.0	~20.0	1,070	450	150	~5.0	~20.0	1,070	520
		210	~4.0	~10.0	950	320	210	~4.0	~10.0	950	370

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS/LOW DEPTH OF CUT AND HIGH FEED

● MQX type (ZPMT 100320ZER insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	~70	0.4	~10	3,380	4,060	~70	0.4	~14	2,700	4,860	~70	0.4	~14	2,700	6,480
		120	0.3	~10	3,040	3,290	120	0.3	~14	2,430	3,940	120	0.3	~14	2,430	5,250
		160	0.25	~10	2,700	2,600	190	0.25	~14	2,160	3,110	190	0.25	~14	2,160	4,150
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~70	0.4	~10	3,180	3,820	~70	0.4	~14	2,550	4,590	~70	0.4	~14	2,550	6,120
		120	0.3	~10	2,860	3,090	120	0.3	~14	2,300	3,720	120	0.3	~14	2,300	4,960
		160	0.25	~10	2,540	2,440	190	0.25	~14	2,040	2,940	190	0.25	~14	2,040	3,920
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC5118)	~70	0.4	~10	3,180	3,820	~70	0.4	~14	2,550	4,590	~70	0.4	~14	2,550	6,120
		120	0.3	~10	2,860	3,090	120	0.3	~14	2,300	3,720	120	0.3	~14	2,300	4,960
		160	0.25	~10	2,540	2,440	190	0.25	~14	2,040	2,940	190	0.25	~14	2,040	3,920
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~70	0.4	~10	2,980	4,200	~70	0.4	~14	2,390	5,020	~70	0.4	~14	2,390	6,690
		120	0.35	~10	2,680	3,400	120	0.35	~14	2,150	4,070	120	0.35	~14	2,150	5,430
		160	0.3	~10	2,380	2,690	190	0.3	~14	1,910	3,210	190	0.3	~14	1,910	4,280
Stainless steel SUS304 Below 250HB	JC8050	~70	0.4	~10	3,380	4,060	~70	0.4	~14	2,700	4,860	~70	0.4	~14	2,700	6,480
		120	0.3	~10	3,040	3,290	120	0.3	~14	2,430	3,940	120	0.3	~14	2,430	5,250
		160	0.25	~10	2,700	2,600	190	0.25	~14	2,160	3,110	190	0.25	~14	2,160	4,150
Titanium alloy (Ti-6Al-4V)	JC5118 (JC8050)	~70	0.3	~10	1,200	960	~70	0.4	~14	950	1,140	~70	0.4	~14	950	1,520
		120	0.2	~10	1,200	960	120	0.3	~14	950	1,140	120	0.3	~14	950	1,520
		160	0.15	~10	1,200	960	190	0.25	~14	950	1,140	190	0.25	~14	950	1,520
Inconel (INCO718)	JC5118 (JC8050)	~70	0.3	~10	630	380	~70	0.4	~14	500	450	~70	0.4	~14	500	600
		120	0.2	~10	630	380	120	0.3	~14	500	450	120	0.3	~14	500	600
		160	0.15	~10	630	380	190	0.25	~14	500	450	190	0.25	~14	500	600

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS/LOW DEPTH OF CUT AND HIGH FEED

● MQX type (ZPMT 100320ZER insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 25/26									
		No.of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	~90	0.4	~19	2,160	5,180	~90	0.4	~19	2,160	6,480
		140	0.3	~19	1,940	4,200	140	0.3	~19	1,940	5,250
		210	0.25	~19	1,730	3,320	210	0.25	~19	1,730	4,150
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~90	0.4	~19	2,040	4,900	~90	0.4	~19	2,040	6,120
		140	0.3	~19	1,840	3,970	140	0.3	~19	1,840	4,960
		210	0.25	~19	1,630	3,140	210	0.25	~19	1,630	3,920
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC5118)	~90	0.4	~19	2,040	4,900	~90	0.4	~19	2,040	6,120
		140	0.3	~19	1,840	3,970	140	0.3	~19	1,840	4,960
		210	0.25	~19	1,630	3,140	210	0.25	~19	1,630	3,920
Grey & Nodular cast iron FC, FCD (GG, GGG) Below300HB	JC5118	~90	0.4	~19	1,910	5,350	~90	0.4	~19	1,910	5,730
		140	0.35	~19	1,720	4,330	140	0.35	~19	1,720	4,640
		210	0.3	~19	1,530	3,420	210	0.3	~19	1,530	3,670
Stainless steel SUS304 Below250HB	JC8050	~90	0.4	~19	2,160	5,180	~90	0.4	~19	2,160	6,480
		140	0.3	~19	1,940	4,200	140	0.3	~19	1,940	5,250
		210	0.25	~19	1,730	3,320	210	0.25	~19	1,730	4,150
Titanium alloy (Ti-6Al-4V)	JC5118 (JC8050)	~90	0.3	~19	750	1,200	~90	0.3	~19	750	1,500
		140	0.2	~19	750	1,200	140	0.2	~19	750	1,500
		210	0.15	~19	750	1,200	210	0.15	~19	750	1,500
Inconel (INCO718)	JC5118 (JC8050)	~90	0.3	~19	400	480	~90	0.3	~19	400	600
		140	0.2	~19	400	480	140	0.2	~19	400	600
		210	0.15	~19	400	480	210	0.15	~19	400	600

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS/LOW DEPTH OF CUT AND HIGH FEED

● MQX type (ZPMT 100320ZER insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32/35					32/35				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50,C55) Below 250HB	JC5118 (JC8050)	~100	0.4	~25	1,690	5,070	~100	0.4	~25	1,690	6,080
		150	0.35	~25	1,690	5,070	150	0.35	~25	1,690	6,080
		210	0.3	~25	1,520	4,110	210	0.3	~25	1,520	4,930
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~100	0.4	~25	1,590	4,770	~100	0.4	~25	1,590	5,720
		150	0.35	~25	1,590	4,770	150	0.35	~25	1,590	5,720
		210	0.3	~25	1,430	3,860	210	0.3	~25	1,430	4,640
Mold steel HPM7, PX5, P20 (1.2311,P20) 30-36HRC	JC8050 (JC5118)	~100	0.4	~25	1,590	4,770	~100	0.4	~25	1,590	5,720
		150	0.35	~25	1,590	4,770	150	0.35	~25	1,590	5,720
		210	0.3	~25	1,430	3,860	210	0.3	~25	1,430	4,640
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~100	0.4	~25	1,490	5,220	~100	0.4	~25	1,490	6,260
		150	0.35	~25	1,490	5,220	150	0.35	~25	1,490	6,260
		210	0.3	~25	1,340	4,230	210	0.3	~25	1,340	5,070
Stainless steel SUS304 Below 250HB	JC8050	~100	0.4	~25	1,690	5,070	~100	0.4	~25	1,690	6,080
		150	0.35	~25	1,690	5,070	150	0.35	~25	1,690	6,080
		210	0.3	~25	1,520	4,110	210	0.3	~25	1,520	4,930
Titanium alloy (Ti-6Al-4V)	JC5118 (JC8050)	~100	0.3	~25	600	1,250	~100	0.3	~25	600	1,500
		150	0.25	~25	600	1,250	150	0.2	~25	600	1,500
		210	0.2	~25	600	1,250	210	0.15	~25	600	1,500
Inconel (INCO718)	JC5118 (JC8050)	~100	0.3	~25	300	500	~100	0.3	~25	300	580
		150	0.25	~25	300	500	150	0.25	~25	300	580
		210	0.2	~25	300	500	210	0.2	~25	300	580

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS/LOW DEPTH OF CUT AND HIGH FEED

● MQX type (ZPMT 100320ZER insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Too Idia. (mm)									
		40/42					40				
		No. of teeth 6N					No. oft eeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n(min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	~100	0.4	~32	1,350	4,860	~100	0.4	~32	1,350	5,670
		150	0.35	~32	1,350	4,860	150	0.35	~32	1,350	5,670
		210	0.3	~32	1,220	3,940	210	0.3	~32	1,220	4,590
Die steel SKD61, SKD11 (1.2344,1.2379) Below 255HB	JC5118 (JC8050)	~100	0.4	~32	1,270	4,570	~100	0.4	~32	1,270	5,330
		150	0.35	~32	1,270	4,570	150	0.35	~32	1,270	5,330
		210	0.3	~32	1,140	3,700	210	0.3	~32	1,140	4,320
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC5118)	~100	0.4	~32	1,270	4,570	~100	0.4	~32	1,270	5,330
		150	0.35	~32	1,270	4,570	150	0.35	~32	1,270	5,330
		210	0.3	~32	1,140	3,700	210	0.3	~32	1,140	4,320
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~100	0.4	~32	1,190	5,000	~100	0.4	~32	1,190	5,830
		150	0.35	~32	1,190	5,000	150	0.35	~32	1,190	5,830
		210	0.3	~32	1,070	4,050	210	0.3	~32	1,070	4,720
Stainless steel SUS304 Below 250HB	JC8050	~100	0.4	~32	1,350	4,860	~100	0.4	~32	1,350	5,670
		150	0.35	~32	1,350	4,860	150	0.35	~32	1,350	5,670
		210	0.3	~32	1,220	3,940	210	0.3	~32	1,220	4,590
Titanium alloy (Ti-6Al-4V)	JC5118 (JC8050)	~100	0.3	~32	480	1,150	~100	0.3	~32	480	1,350
		150	0.25	~32	480	1,150	150	0.25	~32	480	1,350
		210	0.2	~32	480	1,150	210	0.2	~32	480	1,350
Inconel (INCO718)	JC5118 (JC8050)	~100	0.3	~32	250	450	~100	0.3	~32	250	520
		150	0.25	~32	250	450	150	0.25	~32	250	520
		210	0.2	~32	250	450	210	0.2	~32	250	520

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS/UP & DOWN FINISHING

● MQX type (YPHW-15/-F type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No.of teeth 2N					No.of teeth 3N					No.of teeth 4N				
		ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50,C55) Below 250HB	JC8015 (DH102)	~70	0.5	<0.2	8,950	2,680	~70	0.6	<0.2	7,160	3,220	~70	0.6	<0.2	7,160	4,290
		120	0.5	<0.2	6,960	1,390	120	0.6	<0.2	7,160	2,790	120	0.6	<0.2	7,160	3,720
		160	0.5	<0.2	6,960	1,110	190	0.6	<0.2	5,570	1,670	190	0.6	<0.2	5,570	2,230
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (JC6102) (DH102)	~70	0.5	<0.2	7,960	2,390	~70	0.6	<0.2	6,370	3,220	~70	0.6	<0.2	6,370	4,290
		120	0.5	<0.2	5,970	1,190	120	0.6	<0.2	6,370	2,480	120	0.6	<0.2	6,370	3,310
		160	0.5	<0.2	5,970	960	190	0.6	<0.2	4,770	1,430	190	0.6	<0.2	4,770	1,910
Mold steel HPM7, PX5, P20 (1.2311,P20) 30-36HRC	JC8015 (DH102)	~70	0.5	<0.2	6,960	1,670	~70	0.6	<0.2	5,570	2,000	~70	0.6	<0.2	5,570	2,670
		120	0.5	<0.2	4,970	840	120	0.6	<0.2	5,570	1,670	120	0.6	<0.2	5,570	2,230
		160	0.5	<0.2	4,970	700	190	0.6	<0.2	3,980	960	190	0.6	<0.2	3,980	1,280
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~70	0.5	<0.2	4,980	1,200	~70	0.6	<0.2	3,980	1,430	~70	0.6	<0.2	3,980	1,910
		120	0.5	<0.2	3,560	600	120	0.6	<0.2	3,980	1,190	120	0.6	<0.2	3,980	1,590
		160	0.5	<0.2	3,560	500	190	0.6	<0.2	2,840	690	190	0.6	<0.2	2,840	920
Hardened die steel SKD61, DAC, DHA (1.2344,1.2379) 42-52HRC	DH102 (JC8015)	~70	0.5	<0.15	3,380	680	~70	0.6	<0.15	2,710	810	~70	0.6	<0.15	2,710	1,080
		120	0.5	<0.15	2,400	340	120	0.6	<0.15	2,710	670	120	0.6	<0.15	2,710	890
		160	0.5	<0.15	2,400	280	190	0.6	<0.15	1,940	390	190	0.6	<0.15	1,940	520
Grey & Nodular cast iron FC, FCD (GG,GGG) Below 300HB	JC8015 (DH102)	~70	0.5	<0.2	10,900	4,360	~70	0.6	<0.2	8,750	5,250	~70	0.6	<0.2	8,750	7,000
		120	0.5	<0.2	8,950	2,680	120	0.6	<0.2	7,160	4,300	120	0.6	<0.2	7,160	5,730
		160	0.5	<0.2	8,950	2,150	190	0.6	<0.2	7,160	3,220	190	0.6	<0.2	7,160	4,290

ℓ: Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / UP & DOWN FINISHING

● MQX type (YPHW-15/-F type insert) ＋MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		25/26										30/32/35				
		No. of teeth 4N					No. of teeth 5N					No. of teeth 5N				
		ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 (DH102)	~90	0.7	<0.2	5,730	4,120	~90	0.7	<0.2	5,730	6,210	~100	0.8	<0.2	4,480	4,030
		140	0.7	<0.2	5,730	3,440	140	0.7	<0.2	5,730	4,300	150	0.8	<0.2	4,480	4,030
		210	0.7	<0.2	4,460	2,140	210	0.7	<0.2	4,460	2,860	210	0.8	<0.2	3,480	2,610
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~90	0.7	<0.2	5,090	3,660	~90	0.7	<0.2	5,090	4,580	~100	0.8	<0.2	3,980	3,580
		140	0.7	<0.2	5,090	3,050	140	0.7	<0.2	5,090	3,810	150	0.8	<0.2	3,980	3,580
		210	0.7	<0.2	3,820	1,830	210	0.7	<0.2	3,820	2,290	210	0.8	<0.2	2,980	1,740
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~90	0.7	<0.2	4,460	2,680	~90	0.7	<0.2	4,460	3,350	~100	0.8	<0.2	3,480	2,610
		140	0.7	<0.2	4,460	2,140	140	0.7	<0.2	4,460	2,680	150	0.8	<0.2	3,480	2,610
		210	0.7	<0.2	3,180	1,270	210	0.7	<0.2	3,180	1,590	210	0.8	<0.2	2,490	1,250
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~90	0.7	<0.2	3,180	1,530	~90	0.7	<0.2	3,180	1,910	~100	0.8	<0.2	2,490	1,500
		140	0.7	<0.2	3,180	1,220	140	0.7	<0.2	3,180	1,520	150	0.8	<0.2	2,490	1,500
		210	0.7	<0.2	2,270	730	210	0.7	<0.2	2,270	910	210	0.8	<0.2	1,780	720
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~90	0.7	<0.15	2,160	860	~90	0.7	<0.15	2,160	1,080	~100	0.8	<0.15	1,690	850
		140	0.7	<0.15	2,160	690	140	0.7	<0.15	2,160	860	150	0.8	<0.15	1,690	850
		210	0.7	<0.15	1,540	410	210	0.7	<0.15	1,540	510	210	0.8	<0.15	1,210	410
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~90	0.7	<0.2	7,000	5,600	~90	0.7	<0.2	7,000	7,000	~100	0.8	<0.2	5,470	5,470
		140	0.7	<0.2	5,730	4,580	140	0.7	<0.2	5,730	5,730	150	0.8	<0.2	4,480	5,470
		210	0.7	<0.2	5,730	3,440	210	0.7	<0.2	5,730	4,300	210	0.8	<0.2	4,480	3,360

ℓ : Overhung length, Pf : Pick feed, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / UP & DOWN FINISHING

● MQX type (YPHW-15/-F type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		32/35					40/42					40				
		No. of teeth 6N					No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 (DH102)	~100	0.8	<0.2	4,480	4,830	~100	0.88	<0.2	3,580	3,870	~100	0.88	<0.2	3,580	4,520
		150	0.8	<0.2	4,480	4,830	150	0.88	<0.2	3,580	3,870	150	0.88	<0.2	3,580	4,520
		210	0.8	<0.2	3,480	3,130	210	0.88	<0.2	2,790	2,010	210	0.88	<0.2	2,790	2,350
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~100	0.8	<0.2	3,980	4,300	~100	0.88	<0.2	3,180	3,430	~100	0.88	<0.2	3,180	4,000
		150	0.8	<0.2	3,980	4,300	150	0.88	<0.2	3,180	3,430	150	0.88	<0.2	3,180	4,000
		210	0.8	<0.2	2,980	2,090	210	0.88	<0.2	2,390	1,720	210	0.88	<0.2	2,390	2,010
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~100	0.8	<0.2	3,480	3,130	~100	0.88	<0.2	2,790	2,510	~100	0.88	<0.2	2,790	2,930
		150	0.8	<0.2	3,480	3,130	150	0.88	<0.2	2,790	2,510	150	0.88	<0.2	2,790	2,930
		210	0.8	<0.2	2,490	1,500	210	0.88	<0.2	1,990	1,430	210	0.88	<0.2	1,990	1,670
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~100	0.8	<0.2	2,490	1,800	~100	0.88	<0.2	1,990	1,430	~100	0.88	<0.2	1,990	1,670
		150	0.8	<0.2	2,490	1,800	150	0.88	<0.2	1,990	1,430	150	0.88	<0.2	1,990	1,670
		210	0.8	<0.2	1,780	860	210	0.88	<0.2	1,420	820	210	0.88	<0.2	1,420	960
Hardened die steel SKD61, DAC, DHA (1.2344,1.2379) 42-52HRC	DH102 (JC8015)	~100	0.8	<0.15	1,690	1,020	~100	0.88	<0.15	1,350	810	~100	0.88	<0.15	1,350	950
		150	0.8	<0.15	1,690	1,020	150	0.88	<0.15	1,350	810	150	0.88	<0.15	1,350	950
		210	0.8	<0.15	1,210	490	210	0.88	<0.15	960	460	210	0.88	<0.15	960	540
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~100	0.8	<0.2	5,470	6,560	~100	0.88	<0.2	4,380	5,260	~100	0.88	<0.2	4,380	6,140
		150	0.8	<0.2	4,480	6,560	150	0.88	<0.2	4,380	5,260	150	0.88	<0.2	4,380	6,140
		210	0.8	<0.2	4,480	4,030	210	0.88	<0.2	3,580	3,220	210	0.88	<0.2	3,580	3,760

ℓ : Overhung length, Pf : Pick feed, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● MQX type (YPHW-15/-F type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~70	1.5	<0.2	12,900	3,870	~70	1.5	<0.2	10,300	4,640	~70	1.5	<0.2	10,300	6,190
		120	1	<0.2	8,950	2,150	120	1	<0.2	7,160	2,580	120	1	<0.2	7,160	3,440
		160	0.7	<0.2	8,950	1,790	190	0.7	<0.2	7,160	2,150	190	0.7	<0.2	7,160	2,870
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~70	1.5	<0.2	8,950	2,680	~70	1.5	<0.2	7,160	3,220	~70	1.5	<0.2	7,160	4,290
		120	1	<0.2	8,950	2,150	120	1	<0.2	7,160	2,580	120	1	<0.2	7,160	3,440
		160	0.7	<0.2	6,960	1,390	190	0.7	<0.2	5,570	1,670	190	0.7	<0.2	5,570	2,230
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~70	1.5	<0.2	8,950	2,680	~70	1.5	<0.2	7,160	3,220	~70	1.5	<0.2	7,160	4,290
		120	1	<0.2	8,950	2,150	120	1	<0.2	7,160	2,580	120	1	<0.2	7,160	3,440
		160	0.7	<0.2	6,960	1,390	190	0.7	<0.2	5,570	1,670	190	0.7	<0.2	5,570	2,230
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~70	1.5	<0.2	7,960	1,910	~70	1.5	<0.2	6,370	2,290	~70	1.5	<0.2	6,370	3,050
		120	1	<0.2	6,960	1,390	120	1	<0.2	5,570	1,670	120	1	<0.2	5,570	2,230
		160	0.7	<0.2	6,960	1,110	190	0.7	<0.2	5,570	1,340	190	0.7	<0.2	5,570	1,790
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~70	1.5	<0.2	3,980	800	~70	1.5	<0.2	3,180	950	~70	1.5	<0.2	3,180	1,270
		120	1	<0.2	3,380	540	120	1	<0.2	2,710	630	120	1	<0.2	2,710	840
		160	–	–	–	–	190	–	–	–	–	190	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~70	1	<0.2	3,580	720	~70	1	<0.2	2,860	860	~70	1	<0.2	2,860	1,150
		120	0.7	<0.2	2,980	480	120	0.7	<0.2	2,390	570	120	0.7	<0.2	2,390	760
		160	–	–	–	–	190	–	–	–	–	190	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~70	1.5	<0.2	10,900	3,270	~70	1.5	<0.2	8,750	3,940	~70	1.5	<0.2	8,750	5,250
		120	1	<0.2	8,950	2,150	120	1	<0.2	7,160	2,580	120	1	<0.2	7,160	3,440
		160	0.7	<0.2	8,950	1,790	190	0.7	<0.2	7,160	2,150	190	0.7	<0.2	7,160	2,870
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~70	1.5	<0.2	8,950	2,680	~70	1.5	<0.2	7,160	3,220	~70	1.5	<0.2	7,160	4,290
		120	1	<0.2	8,950	2,150	120	1	<0.2	7,160	2,580	120	1	<0.2	7,160	3,440
		160	0.7	<0.2	6,960	1,390	190	0.7	<0.2	5,570	1,670	190	0.7	<0.2	5,570	2,230
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~70	1.5	<0.2	1,790	430	~70	1.5	<0.2	1,430	520	~70	1.5	<0.2	1,430	690
		120	1	<0.2	1,390	280	120	1	<0.2	1,110	330	120	1	<0.2	1,110	440
		160	0.7	<0.2	1,390	220	190	0.7	<0.2	1,110	270	190	0.7	<0.2	1,110	360

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● MQX type (YPHW-15/-F type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 25/26									
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~90	1.5	<0.2	8,280	4,970	~90	1.5	<0.2	8,280	6,210
		140	1	<0.2	5,730	2,750	140	1	<0.2	5,730	3,440
		210	0.7	<0.2	5,730	2,290	210	0.7	<0.2	5,730	2,860
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~90	1.5	<0.2	5,730	3,440	~90	1.5	<0.2	5,730	4,300
		140	1	<0.2	5,730	2,750	140	1	<0.2	5,730	3,440
		210	0.7	<0.2	4,460	1,780	210	0.7	<0.2	4,460	2,230
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~90	1.5	<0.2	5,730	3,440	~90	1.5	<0.2	5,730	4,300
		140	1	<0.2	5,730	2,750	140	1	<0.2	5,730	3,440
		210	0.7	<0.2	4,460	1,780	210	0.7	<0.2	4,460	2,230
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~90	1.5	<0.2	5,090	2,440	~90	1.5	<0.2	5,090	3,050
		140	1	<0.2	4,460	1,780	140	1	<0.2	4,460	2,230
		210	0.7	<0.2	4,460	1,430	210	0.7	<0.2	4,460	1,790
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~90	1.5	<0.2	2,550	1,020	~90	1.5	<0.2	2,550	1,280
		140	1	<0.2	2,160	690	140	1	<0.2	2,160	860
		210	–	–	–	–	210	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~90	1	<0.2	2,290	920	~90	1	<0.2	2,290	1,150
		140	0.7	<0.2	1,910	610	140	0.7	<0.2	1,910	760
		210	–	–	–	–	210	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~90	1.5	<0.2	7,000	4,200	~90	1.5	<0.2	7,000	5,250
		140	1	<0.2	5,730	2,750	140	1	<0.2	5,730	3,440
		210	0.7	<0.2	5,730	2,290	210	0.7	<0.2	5,730	2,860
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~90	1.5	<0.2	5,730	3,440	~90	1.5	<0.2	5,730	4,300
		140	1	<0.2	5,730	2,750	140	1	<0.2	5,730	3,440
		210	0.7	<0.2	4,460	1,780	210	0.7	<0.2	4,460	2,230
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~90	1.5	<0.2	1,150	550	~90	1.5	<0.2	1,150	690
		140	1	<0.2	890	360	140	1	<0.2	890	450
		210	0.7	<0.2	890	280	210	0.7	<0.2	890	350

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● MQX type (YPHW-15/-F type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32/35					32/35				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~100	1.5	<0.2	6,470	4,850	~100	1.5	<0.2	6,470	5,820
		150	1.2	<0.2	4,480	2,690	150	1.2	<0.2	4,480	3,230
		210	1	<0.2	4,480	2,240	210	1	<0.2	4,480	2,690
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~100	1.5	<0.2	4,480	3,360	~100	1.5	<0.2	4,480	4,030
		150	1.2	<0.2	4,480	2,690	150	1.2	<0.2	4,480	3,230
		210	1	<0.2	3,480	1,740	210	1	<0.2	3,480	2,090
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~100	1.5	<0.2	4,480	3,360	~100	1.5	<0.2	4,480	4,030
		150	1.2	<0.2	4,480	2,690	150	1.2	<0.2	4,480	3,230
		210	1	<0.2	3,480	1,740	210	1	<0.2	3,480	2,090
Mold steel NAK80, HPM1, P21 (1.2311P21) 38-43HRC	JC8015 (DH102)	~100	1.5	<0.2	3,980	2,390	~100	1.5	<0.2	3,980	2,870
		150	1.2	<0.2	3,480	1,740	150	1.2	<0.2	3,480	2,090
		210	1	<0.2	3,480	1,390	210	1	<0.2	3,480	1,670
Hardened die steel SKD61,DAC,DHA (1.2344,1.2379) 42-52HRC	JC8015 (DH102)	~100	1.5	<0.2	2,000	1,000	~100	1.5	<0.2	2,000	1,200
		150	1.2	<0.2	1,690	680	150	1.2	<0.2	1,690	820
		210	1	<0.2	1,690	680	210	1	<0.2	1,690	820
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~100	1	<0.2	1,790	900	~100	1	<0.2	1,790	1,080
		150	0.8	<0.2	1,490	600	150	0.8	<0.2	1,490	720
		210	0.7	<0.2	1,490	420	210	0.7	<0.2	1,490	500
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~100	1.5	<0.2	5,470	4,100	~100	1.5	<0.2	5,470	4,920
		150	1.2	<0.2	4,480	2,690	150	1.2	<0.2	4,480	3,230
		210	1	<0.2	4,480	2,240	210	1	<0.2	4,480	2,690
Stainless steel SUS304 Below250HB	JC8015 (DH102)	~100	1.5	<0.2	4,480	3,360	~100	1.5	<0.2	4,480	4,030
		150	1.2	<0.2	4,480	2,690	150	1.2	<0.2	4,480	3,230
		210	1	<0.2	3,480	1,740	210	1	<0.2	3,480	2,090
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~100	1.5	<0.2	900	540	~100	1.5	<0.2	900	650
		150	1.2	<0.2	700	350	150	1.2	<0.2	700	420
		210	1	<0.2	700	280	210	1	<0.2	700	340

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● MQX type (YPHW-15/-F type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		40/42					40				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~100	1.5	<0.2	5,170	4,650	~100	1.5	<0.2	5,170	5,420
		150	1.5	<0.2	5,170	4,650	150	1.5	<0.2	5,170	5,420
		210	1	<0.2	3,580	2,580	210	1	<0.2	3,580	3,010
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~100	1.5	<0.2	3,580	3,220	~100	1.5	<0.2	3,580	3,760
		150	1.5	<0.2	3,580	3,220	150	1.5	<0.2	3,580	3,760
		210	1	<0.2	2,790	2,010	210	1	<0.2	2,790	2,350
Mold steel HPM7, PX5,P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~100	1.5	<0.2	3,580	3,220	~100	1.5	<0.2	3,580	3,760
		150	1.5	<0.2	3,580	3,220	150	1.5	<0.2	3,580	3,760
		210	1	<0.2	2,790	2,010	210	1	<0.2	2,790	2,350
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~100	1.5	<0.2	3,180	2,290	~100	1.5	<0.2	3,180	2,670
		150	1.5	<0.2	3,180	2,290	150	1.5	<0.2	3,180	2,670
		210	1	<0.2	2,790	1,670	210	1	<0.2	2,790	1,950
Hardened die steel SKD61,DAC,DHA (1.2344,1.2379) 42-52HRC	JC8015 (DH102)	~100	1.5	<0.2	1,590	950	~100	1.5	<0.2	1,590	1,110
		150	1.5	<0.2	1,590	950	150	1.5	<0.2	1,350	1,110
		210	1	<0.2	1,350	650	210	1	<0.2	1,350	760
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~100	1	<0.2	1,430	860	~100	1	<0.2	1,430	1,000
		150	1	<0.2	1,430	860	150	1	<0.2	1,430	1,000
		210	0.7	<0.2	1,190	570	210	0.7	<0.2	1,190	670
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~100	1.5	<0.2	4,380	3,940	~100	1.5	<0.2	4,380	4,600
		150	1.5	<0.2	3,580	3,940	150	1.5	<0.2	3,580	4,600
		210	1	<0.2	3,580	2,580	210	1	<0.2	3,580	3,010
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~100	1.5	<0.2	3,580	3,220	~100	1.5	<0.2	3,580	3,760
		150	1.5	<0.2	3,580	3,220	150	1.5	<0.2	3,580	3,760
		210	1	<0.2	2,790	2,010	210	1	<0.2	2,790	2,350
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~100	1.5	<0.2	720	520	~100	1.5	<0.2	720	610
		150	1.5	<0.2	560	520	150	1.5	<0.2	560	610
		210	1	<0.2	560	340	210	1	<0.2	560	400

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

■ NOTE

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2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

● MQX type (YPHW-15 type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C,S55C (C50, C55) Below 250HB	CX75 (DH102)	~70	0.2	8~16	5,200	2,600	~70	0.210	~20	4,200	3,150	~70	0.210	~18	4,200	4,200
		120	0.2	8~16	3,900	1,550	120	0.210	~20	3,200	1,950	120	0.210	~18	3,200	2,550
		160	0.2	8~10	3,400	1,200	190	0.210	~12	2,700	1,450	190	0.210	~12	2,700	1,900
Die steel SKD61,SKD11 (1.2344,1.2379) Below 255HB	CX75 (DH102)	~70	0.2	8~16	4,700	2,100	~70	0.210	~20	3,800	2,550	~70	0.210	~18	3,800	3,400
		120	0.2	8~16	3,500	1,400	120	0.210	~20	2,900	1,750	120	0.210	~18	2,900	2,350
		160	0.2	8~10	3,000	1,100	190	0.210	~12	2,450	1,300	190	0.210	~12	2,450	1,750
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	DH102	~70	0.2	8~16	4,350	1,750	~70	0.210	~20	3,500	2,100	~70	0.210	~18	3,500	2,800
		120	0.2	8~16	3,250	1,200	120	0.210	~20	2,650	1,450	120	0.210	~18	2,650	1,950
		160	0.2	8~10	2,750	950	190	0.210	~12	2,250	1,150	190	0.210	~12	2,250	1,500
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102	~70	0.2	8~16	4,000	960	~70	0.210	~20	3,200	1,150	~70	0.210	~18	3,200	1,500
		120	0.2	8~16	3,000	600	120	0.210	~20	2,400	720	120	0.210	~18	2,400	960
		160	0.2	8~10	2,550	500	190	0.210	~12	2,050	600	190	0.210	~12	2,050	800
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102	~70	0.2	8~16	2,000	400	~70	0.210	~20	1,600	480	~70	0.210	~18	1,600	640
		120	0.2	8~16	1,600	320	120	0.210	~20	1,280	380	120	0.210	~18	1,280	510
		160	-	-	-	-	190	-	-	-	-	190	-	-	-	-
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~70	0.2	8~16	1,400	200	~70	0.210	~20	1,120	240	~70	0.210	~18	1,120	320
		120	0.2	8~16	1,000	100	120	0.210	~20	800	120	120	0.210	~18	800	160
		160	-	-	-	-	190	-	-	-	-	190	-	-	-	-
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	DH102	~70	0.2	8~16	4,000	1,600	~70	0.210	~20	3,180	1,910	~70	0.210	~18	3,180	2,540
		120	0.2	8~16	3,000	900	120	0.210	~20	2,390	1,080	120	0.210	~18	2,390	1,430
		160	0.2	8~10	2,600	520	190	0.210	~12	2,070	630	190	0.210	~12	2,070	830
Stainless steel SUS304 Below 250HB	DH102	~70	0.2	8~16	3,600	1,080	~70	0.210	~20	2,860	1,290	~70	0.210	~18	2,860	1,720
		120	0.2	8~16	2,600	620	120	0.210	~20	2,070	750	120	0.210	~18	2,070	1,000
		160	0.2	8~10	2,000	400	190	0.210	~12	1,590	480	190	0.210	~12	1,590	640
Titanium alloy (Ti-6Al-4V)	DH102	~70	0.2	8~16	1,000	300	~70	0.210	~20	800	360	~70	0.210	~18	800	480
		120	0.2	8~16	600	120	120	0.210	~20	480	150	120	0.210	~18	480	200
		160	0.2	8~10	600	120	190	0.210	~12	480	150	190	0.210	~12	480	200

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■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

● MQX type (YPHW-15 type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 25/26									
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (DH102)	~90	0.2	12.5~25	3,400	3,400	~90	0.2	12.5~22	3,400	4,250
		140	0.2	12.5~25	2,500	2,000	140	0.2	12.5~22	2,500	2,500
		210	0.2	12.5~15	2,200	1,550	210	0.2	12.5~15	2,200	1,900
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (DH102)	~90	0.2	12.5~25	3,050	2,750	~90	0.2	12.5~22	3,050	3,400
		140	0.2	12.5~25	2,250	1,800	140	0.2	12.5~22	2,250	2,250
		210	0.2	12.5~15	2,000	1,400	210	0.2	12.5~15	2,000	1,750
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	DH102	~90	0.2	12.5~25	2,800	2,250	~90	0.2	12.5~22	2,800	2,800
		140	0.2	12.5~25	2,100	1,500	140	0.2	12.5~22	2,100	1,900
		210	0.2	12.5~15	1,800	1,200	210	0.2	12.5~15	1,800	1,500
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102	~90	0.2	12.5~25	2,550	1,250	~90	0.2	12.5~22	2,550	1,500
		140	0.2	12.5~25	1,900	750	140	0.2	12.5~22	1,900	950
		210	0.2	12.5~25	1,650	650	210	0.2	12.5~25	1,650	850
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102	~90	0.2	12.5~25	1,270	510	~90	0.2	12.5~22	1,270	640
		140	0.2	12.5~25	1,020	410	140	0.2	12.5~22	1,020	510
		210	-	-	-	-	210	-	-	-	-
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~90	0.2	12.5~25	890	250	~90	0.2	12.5~22	890	310
		140	0.2	12.5~25	640	130	140	0.2	12.5~22	640	160
		210	-	-	-	-	210	-	-	-	-
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	DH102	~90	0.2	12.5~25	2,550	2,040	~90	0.2	12.5~22	2,550	2,550
		140	0.2	12.5~25	1,910	1,150	140	0.2	12.5~22	1,910	1,440
		210	0.2	12.5~15	1,660	660	210	0.2	12.5~15	1,660	820
Stainless steel SUS304 Below 250HB	DH102	~90	0.2	12.5~25	2,290	1,370	~90	0.2	12.5~22	2,290	1,710
		140	0.2	12.5~25	1,660	800	140	0.2	12.5~22	1,660	1,000
		210	0.2	12.5~15	1,270	510	210	0.2	12.5~15	1,270	640
Titanium alloy (Ti-6Al-4V)	DH102	~90	0.2	12.5~25	640	380	~90	0.2	12.5~22	640	480
		140	0.2	12.5~25	380	150	140	0.2	12.5~22	380	190
		210	0.2	12.5~15	380	150	210	0.2	12.5~15	380	190

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

● MQX type (YPHW-15 type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32/35					32/35				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50,C55) Below250HB	CX75 (DH102)	~100	0.2	16~32	2,650	3,300	~100	0.2	16~30	2,650	3,950
		150	0.2	16~32	2,650	3,300	150	0.2	16~30	2,650	3,950
		210	0.2	16~32	2,000	2,000	210	0.2	16~30	2,000	2,400
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (DH102)	~100	0.2	16~32	2,400	2,700	~100	0.2	16~30	2,400	3,200
		150	0.2	16~32	2,400	2,700	150	0.2	16~30	2,400	3,200
		210	0.2	16~32	1,800	1,800	210	0.2	16~30	1,800	2,150
Mold steel HPM7,PX5, P20 (1.2311,P20) 30-36HRC	DH102	~100	0.2	16~32	2,200	2,200	~100	0.2	16~30	2,200	2,600
		150	0.2	16~32	2,200	2,200	150	0.2	16~30	2,200	2,600
		210	0.2	16~32	1,650	1,500	210	0.2	16~30	1,650	1,800
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102	~100	0.2	16~32	2,000	1,200	~100	0.2	16~30	2,000	1,450
		150	0.2	16~32	2,000	1,200	150	0.2	16~30	2,000	1,450
		210	0.2	16~32	1,500	750	210	0.2	16~30	1,500	900
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102	~100	0.2	16~32	1,000	500	~100	0.2	16~30	1,000	600
		150	0.2	16~32	1,000	500	150	0.2	16~30	1,000	600
		210	0.2	16~20	800	400	210	0.2	16~20	800	480
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~100	0.2	16~32	700	250	~100	0.2	16~30	700	300
		150	0.2	16~32	700	250	150	0.2	16~30	700	300
		210	0.2	16~20	500	130	210	0.2	16~20	500	160
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	DH102	~100	0.2	16~32	1,990	1,990	~100	0.2	16~30	1,990	2,390
		150	0.2	16~32	1,990	1,990	150	0.2	16~30	1,990	2,390
		210	0.2	16~32	1,490	1,120	210	0.2	16~30	1,490	1,340
Stainless steel SUS304 Below 250HB	DH102	~100	0.2	16~32	1,790	1,340	~100	0.2	16~30	1,790	1,610
		150	0.2	16~32	1,790	1,340	150	0.2	16~30	1,790	1,610
		210	0.2	16~32	1,290	770	210	0.2	16~30	1,290	920
Titanium alloy (Ti-6Al-4V)	DH102	~100	0.2	16~32	500	380	~100	0.2	16~30	500	460
		150	0.2	16~32	500	380	150	0.2	16~30	500	460
		210	0.2	16~20	300	150	210	0.2	16~20	300	180

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

● MQX type (YPHW-15 type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		40/42					40				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (DH102)	~100	0.2	20~40	2,100	3,150	~100	0.2	20~38	2,100	3,650
		150	0.2	20~40	2,100	3,150	150	0.2	20~38	2,100	3,650
		210	0.2	20~40	1,570	1,900	210	0.2	20~38	1,570	2,200
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (DH102)	~100	0.2	20~40	1,890	2,850	~100	0.2	20~38	1,890	3,300
		150	0.2	20~40	1,890	2,850	150	0.2	20~38	1,890	3,300
		210	0.2	20~40	1,410	1,700	210	0.2	20~38	1,410	2,000
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	DH102	~100	0.2	20~40	1,750	2,100	~100	0.2	20~38	1,750	2,450
		150	0.2	20~40	1,750	2,100	150	0.2	20~38	1,750	2,450
		210	0.2	20~40	1,300	1,400	210	0.2	20~38	1,300	1,650
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102	~100	0.2	20~40	1,600	1,150	~100	0.2	20~38	1,600	1,350
		150	0.2	20~40	1,600	1,150	150	0.2	20~38	1,600	1,350
		210	0.2	20~40	1,200	720	210	0.2	20~38	1,200	840
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102	~100	0.2	20~40	800	480	~100	0.2	20~38	800	560
		150	0.2	20~40	800	480	150	0.2	20~38	800	560
		210	0.2	20~40	640	380	210	0.2	20~38	640	440
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~100	0.2	20~40	560	240	~100	0.2	20~38	560	280
		150	0.2	20~40	560	240	150	0.2	20~38	560	280
		210	0.2	20~40	400	120	210	0.2	20~38	400	140
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	DH102	~100	0.2	20~40	1,590	1,910	~100	0.2	20~38	1,590	2,230
		150	0.2	20~40	1,590	1,910	150	0.2	20~38	1,590	2,230
		210	0.2	20~40	1,190	1,070	210	0.2	20~38	1,190	1,250
Stainless steel SUS304 Below 250HB	DH102	~100	0.2	20~40	1,430	1,290	~100	0.2	20~38	1,430	1,500
		150	0.2	20~40	1,430	1,290	150	0.2	20~38	1,430	1,500
		210	0.2	20~40	1,030	740	210	0.2	20~38	1,030	870
Titanium alloy (Ti-6Al-4V)	DH102	~100	0.2	20~40	400	360	~100	0.2	20~38	400	420
		150	0.2	20~40	400	360	150	0.2	20~38	400	420
		210	0.2	20~40	240	140	210	0.2	20~38	240	170

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING AT LOW FEED SPEED

● MQX type (YPHW-F/-24 type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	~70	0.2	8~16	4,000	1,200	~70	0.2	10~20	3,180	1,430	~70	0.2	10~18	3,180	1,900
		120	0.2	8~16	3,000	720	120	0.2	10~20	2,390	860	120	0.2	10~18	2,390	1,150
		160	0.2	8~10	2,600	520	190	0.2	10~12	2,070	620	190	0.2	10~12	2,070	830
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	~70	0.2	8~16	3,600	1,080	~70	0.2	10~20	2,860	1,290	~70	0.2	10~18	2,860	1,720
		120	0.2	8~16	2,600	620	120	0.2	10~20	2,070	750	120	0.2	10~18	2,070	1,000
		160	0.2	8~10	2,000	400	190	0.2	10~12	1,590	480	190	0.2	10~12	1,590	640
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015	~70	0.2	8~16	3,200	770	~70	0.2	10~20	2,550	920	~70	0.2	10~18	2,550	1,220
		120	0.2	8~16	2,400	480	120	0.2	10~20	1,910	570	120	0.2	10~18	1,910	760
		160	0.2	8~10	1,800	360	190	0.2	10~12	1,430	430	190	0.2	10~12	1,430	570
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015	~70	0.2	8~16	2,600	620	~70	0.2	10~20	2,070	750	~70	0.2	10~18	2,070	1,000
		120	0.2	8~16	2,200	440	120	0.2	10~20	1,750	530	120	0.2	10~18	1,750	700
		160	0.2	8~10	1,600	320	190	0.2	10~12	1,270	380	190	0.2	10~12	1,270	510
Hardened die steel SKD61, DAC, DHA 1.2344, 1.2379) 42-52HRC	JC8015	~70	0.2	8~16	2,000	400	~70	0.2	10~20	1,600	480	~70	0.2	10~18	1,600	640
		120	0.2	8~16	1,600	320	120	0.2	10~20	1,280	380	120	0.2	10~18	1,280	510
		160	–	–	–	–	190	–	–	–	–	190	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	~70	0.2	8~16	4,000	1,600	~70	0.2	10~20	3,180	1,910	~70	0.2	10~18	3,180	2,540
		120	0.2	8~16	3,000	900	120	0.2	10~20	2,390	1,080	120	0.2	10~18	2,390	1,430
		160	0.2	8~10	2,600	520	190	0.2	10~12	2,070	630	190	0.2	10~12	2,070	830
Stainless steel SUS304 Below 250HB	JC8015	~70	0.2	8~16	3,600	1,080	~70	0.2	10~20	2,860	1,290	~70	0.2	10~18	2,860	1,720
		120	0.2	8~16	2,600	620	120	0.2	10~20	2,070	750	120	0.2	10~18	2,070	1,000
		160	0.2	8~10	2,000	400	190	0.2	10~12	1,590	480	190	0.2	10~12	1,590	640
Titanium alloy (Ti-6Al-4V)	JC8015	~70	0.2	8~16	1,000	300	~70	0.2	10~20	800	360	~70	0.2	10~18	800	480
		120	0.2	8~16	600	120	120	0.2	10~20	480	150	120	0.2	10~18	480	200
		160	0.2	8~10	600	120	190	0.2	10~12	480	150	190	0.2	10~12	480	200

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) Recommend to use YPHW-F type insert for better surface roughness.

QM MAX MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING AT LOW FEED SPEED

● MQX type (YPHW-F/-24 type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 25/26									
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	~90	0.2	12.5~25	2,550	1,530	~90	0.2	12.5~22	2,550	1,910
		140	0.2	12.5~25	1,910	920	140	0.2	12.5~22	1,910	1,150
		210	0.2	12.5~15	1,660	660	210	0.2	12.5~15	1,660	830
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	~90	0.2	12.5~25	2,290	1,370	~90	0.2	12.5~22	2,290	1,710
		140	0.2	12.5~25	1,660	800	140	0.2	12.5~22	1,660	1,000
		210	0.2	12.5~15	1,270	510	210	0.2	12.5~15	1,270	640
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015	~90	0.2	12.5~25	2,040	980	~90	0.2	12.5~22	2,040	1,220
		140	0.2	12.5~25	1,530	610	140	0.2	12.5~22	1,530	770
		210	0.2	12.5~15	1,150	460	210	0.2	12.5~15	1,150	580
Mold steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8015	~90	0.2	12.5~25	1,660	800	~90	0.2	12.5~22	1,660	1,000
		140	0.2	12.5~25	1,400	560	140	0.2	12.5~22	1,400	700
		210	0.2	12.5~15	1,020	410	210	0.2	12.5~15	1,020	510
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015	~90	0.2	12.5~25	1,270	510	~90	0.2	12.5~22	1,270	640
		140	0.2	12.5~25	1,020	410	140	0.2	12.5~22	1,020	510
		210	–	–	–	–	210	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	~90	0.2	12.5~25	2,550	2,040	~90	0.2	12.5~22	2,550	2,550
		140	0.2	12.5~25	1,910	1,150	140	0.2	12.5~22	1,910	1,440
		210	0.2	12.5~15	1,660	660	210	0.2	12.5~15	1,660	820
Stainless steel SUS304 Below 250HB	JC8015	~90	0.2	12.5~25	2,290	1,370	~90	0.2	12.5~22	2,290	1,710
		140	0.2	12.5~25	1,660	800	140	0.2	12.5~22	1,660	1,000
		210	0.2	12.5~15	1,270	510	210	0.2	12.5~15	1,270	640
Titanium alloy (Ti-6Al-4V)	JC8015	~90	0.2	12.5~25	640	380	~90	0.2	12.5~22	640	480
		140	0.2	12.5~25	380	150	140	0.2	12.5~22	380	190
		210	0.2	12.5~15	380	150	210	0.2	12.5~15	380	190

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) Recommend to use YPHW-F type insert for better surface roughness.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING AT LOW FEED SPEED

● MQX type (YPHW-F/-24 type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32/35					32/35				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	~100	0.2	16~32	1,990	1,490	~100	0.2	16~30	1,990	1,790
		150	0.2	16~32	1,990	1,490	150	0.2	16~30	1,990	1,790
		210	0.2	16~32	1,490	900	210	0.2	16~30	1,490	1,070
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	~100	0.2	16~32	1,790	1,340	~100	0.2	16~30	1,790	1,610
		150	0.2	16~32	1,790	1,340	150	0.2	16~30	1,790	1,610
		210	0.2	16~32	1,290	770	210	0.2	16~30	1,290	920
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015	~100	0.2	16~32	1,600	960	~100	0.2	16~30	1,600	1,150
		150	0.2	16~32	1,600	960	150	0.2	16~30	1,600	1,150
		210	0.2	16~32	1,200	600	210	0.2	16~30	1,200	720
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015	~100	0.2	16~32	1,300	780	~100	0.2	16~30	1,300	940
		150	0.2	16~32	1,300	780	150	0.2	16~30	1,300	940
		210	0.2	16~32	1,100	550	210	0.2	16~30	1,100	660
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015	~100	0.2	16~32	1,000	500	~100	0.2	16~30	1,000	600
		150	0.2	16~32	1,000	500	150	0.2	16~30	1,000	600
		210	0.2	16~20	800	400	210	0.2	16~20	800	480
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	~100	0.2	16~32	1,990	1,990	~100	0.2	16~30	1,990	2,390
		150	0.2	16~32	1,990	1,990	150	0.2	16~30	1,990	2,390
		210	0.2	16~32	1,490	1,120	210	0.2	16~30	1,490	1,340
Stainless steel SUS304 Below 250HB	JC8015	~100	0.2	16~32	1,790	1,340	~100	0.2	16~30	1,790	1,610
		150	0.2	16~32	1,790	1,340	150	0.2	16~30	1,790	1,610
		210	0.2	16~32	1,290	770	210	0.2	16~30	1,290	920
Titanium alloy (Ti-6Al-4V)	JC8015	~100	0.2	16~32	500	380	~100	0.2	16~30	500	460
		150	0.2	16~32	500	380	150	0.2	16~30	500	460
		210	0.2	16~20	300	150	210	0.2	16~20	300	180

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) Recommend to use YPHW-F type insert for better surface roughness.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING AT LOW FEED SPEED

● **MQX type (YPHW-F/-24 type insert) + MSN Carbide Shank Holder**

Work Materials	Insert Grades	Tool dia. (mm)									
		40/42					40				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	~100	0.2	20~40	1,590	1,430	~100	0.2	20~38	1,590	1,670
		150	0.2	20~40	1,590	1,430	150	0.2	20~38	1,590	1,670
		210	0.2	20~40	1,190	860	210	0.2	20~38	1,190	1,000
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	~100	0.2	20~40	1,430	1,290	~100	0.2	20~38	1,430	1,500
		150	0.2	20~40	1,430	1,290	150	0.2	20~38	1,430	1,500
		210	0.2	20~40	1,030	740	210	0.2	20~38	1,030	870
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015	~100	0.2	20~40	1,270	920	~100	0.2	20~38	1,270	1,070
		150	0.2	20~40	1,270	920	150	0.2	20~38	1,270	1,070
		210	0.2	20~40	950	570	210	0.2	20~38	950	670
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015	~100	0.2	20~40	1,030	740	~100	0.2	20~38	1,030	870
		150	0.2	20~40	1,030	740	150	0.2	20~38	1,030	870
		210	0.2	20~40	870	520	210	0.2	20~38	870	610
Hardened die steel SKD61, DAC,DHA (1.2344, 1.2379) 42-52HRC	JC8015	~100	0.2	20~40	800	480	~100	0.2	20~38	800	560
		150	0.2	20~40	800	480	150	0.2	20~38	800	560
		210	0.2	20~40	640	380	210	0.2	20~38	640	440
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	~100	0.2	20~40	1,590	1,910	~100	0.2	20~38	1,590	2,230
		150	0.2	20~40	1,590	1,910	150	0.2	20~38	1,590	2,230
		210	0.2	20~40	1,190	1,070	210	0.2	20~38	1,190	1,250
Stainless steel SUS304 Below 250HB	JC8015	~100	0.2	20~40	1,430	1,290	~100	0.2	20~38	1,430	1,500
		150	0.2	20~40	1,430	1,290	150	0.2	20~38	1,430	1,500
		210	0.2	20~40	1,030	740	210	0.2	20~38	1,030	870
Titanium alloy (Ti-6Al-4V)	JC8015	~100	0.2	20~40	400	360	~100	0.2	20~38	400	420
		150	0.2	20~40	400	360	150	0.2	20~38	400	420
		210	0.2	20~40	240	140	210	0.2	20~38	240	170

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) Recommend to use YPHW-F type insert for better surface roughness.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / CONTOURING MILLING

● MQX type (YPHW-24 type insert)+ MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		16/17									
		No. of teeth 2N									
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)					
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~70	0.4	<7	4,400	2,200					
		120	0.3	<7	4,400	2,200					
		160	0.2	<7	4,400	2,200					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~70	0.25	<7	3,200	1,600					
		120	0.2	<7	3,200	1,600					
		160	-	-	-	-					
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~70	0.2	<6	2,000	800					
		120	0.15	<6	2,000	800					
		160	-	-	-	-					

Work Materials	Insert Grades	Tool dia. (mm)									
		20					20/21				
		No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~70	0.4	<9	3,500	2,600	~70	0.4	<9	3,500	3,500
		120	0.3	<9	3,500	2,600	120	0.3	<9	3,500	3,500
		190	0.2	<9	3,500	2,600	190	0.2	<9	3,500	3,500
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~70	0.25	<9	2,550	1,900	~70	0.25	<9	2,550	2,550
		120	0.2	<9	2,550	1,900	120	0.2	<9	2,550	2,550
		190	-	-	-	-	190	-	-	-	-
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~70	0.2	<7	1,600	960	~70	0.2	<7	1,600	1,280
		120	0.15	<7	1,600	960	120	0.15	<7	1,600	1,280
		190	-	-	-	-	190	-	-	-	-

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / CONTOURING MILLING

● MQX type (YPHW-24 type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia.(mm) 25/26 No. of teeth 4N					Tool dia.(mm) 25/26 No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~90	0.4	<10	2,800	2,800	~90	0.4	<10	2,800	3,500
		140	0.3	<10	2,800	2,800	140	0.3	<10	2,800	3,500
		210	0.2	<10	2,800	2,800	210	0.2	<10	2,800	3,500
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~90	0.25	<10	2,040	2,040	~90	0.25	<10	2,040	2,550
		140	0.2	<10	2,040	2,040	140	0.2	<10	2,040	2,550
		210	-	-	-	-	210	-	-	-	-
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~90	0.2	<8	1,270	1,020	~90	0.2	<8	1,270	1,360
		140	0.15	<8	1,270	1,020	140	0.15	<8	1,270	1,360
		210	-	-	-	-	210	-	-	-	-

Work Materials	Insert Grades	Tool dia. (mm) 30/32/35 No. of teeth 5N					Tool dia. (mm) 32/35 No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~100	0.4	<13	2,200	2,750	~100	0.4	<13	2,200	3,300
		150	0.3	<13	2,200	2,750	150	0.3	<13	2,200	3,300
		210	0.2	<13	2,200	2,750	210	0.2	<13	2,200	3,300
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~100	0.25	<13	1,600	2,000	~100	0.25	<13	1,600	2,400
		150	0.2	<13	1,600	2,000	150	0.2	<13	1,600	2,400
		210	0.15	<13	1,600	2,000	210	0.15	<13	1,600	2,400
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~100	0.2	<10	1,000	1,000	~100	0.2	<10	1,000	1,200
		150	0.15	<10	1,000	1,000	150	0.15	<10	1,000	1,200
		210	0.1	<10	1,000	1,000	210	0.1	<10	1,000	1,200

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS / CONTOURING MILLING

● MQX type (YPHW-24 type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		40/42					40				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~100	0.4	<17	1,750	2,620	~100	0.4	<17	1,750	3,060
		150	0.3	<17	1,750	2,620	150	0.3	<17	1,750	3,060
		210	0.2	<17	1,750	2,620	210	0.2	<17	1,750	3,060
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~100	0.25	<17	1,270	1,900	~100	0.25	<17	1,270	2,220
		150	0.2	<17	1,270	1,900	150	0.2	<17	1,270	2,220
		210	0.15	<17	1,270	1,900	210	0.15	<17	1,270	2,220
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~100	0.2	<13	800	960	~100	0.2	<13	800	1,120
		150	0.15	<13	800	960	150	0.15	<13	800	1,120
		210	0.1	<13	800	960	210	0.1	<13	800	1,120

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS "ZPMT＊-PL-TYPE INSERTS" (FOR SIDE FINISHING)

● MQX + MSN type

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 JC8015	~80	≦5.0	<0.20	6,400	3,840	~100	≦5.0	<0.20	5,100	4,590	~100	≦5.0	<0.20	5,100	6,120
		120	≦3.0	<0.15	5,120	2,460	150	≦3.0	<0.15	4,080	2,940	150	≦3.0	<0.15	4,080	3,920
		160	≦2.5	<0.10	3,840	1,380	190	≦2.5	<0.10	3,060	1,650	190	≦2.5	<0.10	3,060	2,200
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 JC8015	~80	≦5.0	<0.20	6,000	3,000	~100	≦5.0	<0.20	4,800	3,600	~100	≦5.0	<0.20	4,800	4,800
		120	≦3.0	<0.15	4,800	1,920	150	≦3.0	<0.15	3,840	2,300	150	≦3.0	<0.15	3,840	3,070
		160	≦2.5	<0.10	3,600	1,080	190	≦2.5	<0.10	2,880	1,300	190	≦2.5	<0.10	2,880	1,730
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~80	≦5.0	<0.20	6,000	3,000	~100	≦5.0	<0.20	4,800	3,600	~100	≦5.0	<0.20	4,800	4,800
		120	≦3.0	<0.15	4,800	1,920	150	≦3.0	<0.15	3,840	2,300	150	≦3.0	<0.15	3,840	3,070
		160	≦2.5	<0.10	3,600	1,080	190	≦2.5	<0.10	2,880	1,300	190	≦2.5	<0.10	2,880	1,730
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~80	≦4.0	<0.20	5,000	2,500	~100	≦4.0	<0.20	4,000	3,000	~100	≦4.0	<0.20	4,000	4,000
		120	≦2.5	<0.15	4,000	1,600	150	≦2.5	<0.15	3,200	1,920	150	≦2.5	<0.15	3,200	2,560
		160	≦2.0	<0.10	3,000	900	190	≦2.0	<0.10	2,400	1,080	190	≦2.0	<0.10	2,400	1,440
Hardened die steel SKD61, DAC, DHA 1.2344, 1.2379) 42-52HRC	DH102 JC8015	~80	≦3.5	<0.20	4,200	1,680	~100	≦3.5	<0.20	3,350	2,010	~100	≦3.5	<0.20	3,350	2,680
		120	≦2.5	<0.15	3,360	1,080	150	≦2.5	<0.15	2,680	1,290	150	≦2.5	<0.15	2,680	1,720
		160	–	–	–	–	190	–	–	–	–	190	–	–	–	–
Hardened die steel SKD11, SLD, DC11 1.2344, 1.2379) 55-62HRC	DH102	~80	≦2.5	<0.15	3,600	1,080	~100	≦2.5	<0.15	2,900	1,310	~100	≦2.5	<0.15	2,900	1,740
		120	≦2.0	<0.12	2,880	690	150	≦2.0	<0.12	2,320	840	150	≦2.0	<0.12	2,320	1,110
		160	–	–	–	–	190	–	–	–	–	190	–	–	–	–
Grey & Nodular cast iron (FC, FCD) (GG, GGG) Below 300HB	JC8015 (DH102)	~80	≦5.0	<0.20	5,600	2,080	~100	≦5.0	<0.20	4,500	4,050	~100	≦5.0	<0.20	4,500	5,400
		120	≦3.0	<0.15	4,480	1,250	150	≦3.0	<0.15	3,600	2,590	150	≦3.0	<0.15	3,600	3,460
		160	≦2.5	<0.10	3,360	750	190	≦2.5	<0.10	2,700	1,460	190	≦2.5	<0.10	2,700	1,940
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~80	≦5.0	<0.20	6,000	3,000	~100	≦5.0	<0.20	4,800	3,600	~100	≦5.0	<0.20	4,800	4,800
		120	≦3.0	<0.15	4,800	1,920	150	≦3.0	<0.15	3,840	2,300	150	≦3.0	<0.15	3,840	3,070
		160	≦2.5	<0.10	3,600	1,080	190	≦2.5	<0.10	2,880	1,300	190	≦2.5	<0.10	2,880	1,730
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~80	≦5.0	<0.20	1,800	900	~100	≦5.0	<0.20	1,450	1,090	~100	≦5.0	<0.20	1,450	1,450
		120	≦3.0	<0.15	1,440	580	150	≦3.0	<0.15	1,160	700	150	≦3.0	<0.15	1,160	930
		160	≦2.5	<0.10	1,080	320	190	≦2.5	<0.10	870	390	190	≦2.5	<0.10	870	520

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

■ NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut ap or Feed speed.
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.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS "ZPMT＊-PL-TYPE INSERTS" (FOR SIDE FINISHING)

● MQX + MSN type

Work Materials	Insert Grades	Tool dia. (mm) 25/26 No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 JC8015	~120	≦5.0	<0.20	4,100	4,920	~120	≦5.0	<0.20	4,100	6,150
		190	≦3.0	<0.15	3,300	3,170	190	≦3.0	<0.15	3,300	3,960
		235	≦2.5	<0.10	2,500	1,800	235	≦2.5	<0.10	2,500	2,250
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 JC8015	~120	≦5.0	<0.20	3,820	3,820	~120	≦5.0	<0.20	3,820	4,780
		190	≦3.0	<0.15	3,060	2,450	190	≦3.0	<0.15	3,060	3,060
		235	≦2.5	<0.10	2,290	1,370	235	≦2.5	<0.10	2,290	1,720
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~120	≦5.0	<0.20	3,820	3,820	~120	≦5.0	<0.20	3,820	4,780
		190	≦3.0	<0.15	3,060	2,450	190	≦3.0	<0.15	3,060	3,060
		235	≦2.5	<0.10	2,290	1,370	235	≦2.5	<0.10	2,290	1,720
Mold steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~120	≦4.0	<0.20	3,200	3,200	~120	≦4.0	<0.20	3,200	4,000
		190	≦2.5	<0.15	2,560	2,050	190	≦2.5	<0.15	2,560	2,560
		235	≦2.0	<0.10	1,920	1,150	235	≦2.0	<0.10	1,920	1,440
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 JC8015	~120	≦3.5	<0.20	2,700	2,160	~120	≦3.5	<0.20	2,700	2,700
		190	≦2.5	<0.15	2,160	1,380	190	≦2.5	<0.15	2,160	1,730
		235	–	–	–	–	235	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~120	≦2.5	<0.15	2,300	1,380	~120	≦2.5	<0.15	2,300	1,720
		190	≦2.0	<0.12	1,840	880	190	≦2.0	<0.12	1,840	1,100
		235	–	–	–	–	235	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~120	≦5.0	<0.20	3,570	4,280	~120	≦5.0	<0.20	3,570	5,350
		190	≦3.0	<0.15	2,860	2,750	190	≦3.0	<0.15	2,860	3,430
		235	≦2.5	<0.10	2,140	1,540	235	≦2.5	<0.10	2,140	1,930
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~120	≦5.0	<0.20	3,820	3,820	~120	≦5.0	<0.20	3,820	4,780
		190	≦3.0	<0.15	3,060	2,450	190	≦3.0	<0.15	3,060	3,060
		235	≦2.5	<0.10	2,290	1,370	235	≦2.5	<0.10	2,290	1,720
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~120	≦5.0	<0.20	1,150	1,150	~120	≦5.0	<0.20	1,150	1,440
		190	≦3.0	<0.15	920	740	190	≦3.0	<0.15	920	920
		235	≦2.5	<0.10	690	420	235	≦2.5	<0.10	690	520

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

■NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut ap or Feed speed.
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.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS "ZPMT＊-PL-TYPE INSERTS" (FOR SIDE FINISHING)

● MQX + MSN type

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32/35					32/35				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 JC8015	~160	≦5.0	<0.20	3,200	4,800	~160	≦5.0	<0.20	3,200	5,760
		240	≦3.0	<0.15	2,560	3,070	240	≦3.0	<0.15	2,560	3,690
		290	≦2.5	<0.10	1,920	1,730	290	≦2.5	<0.10	1,920	2,070
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 JC8015	~160	≦5.0	<0.20	3,000	3,750	~160	≦5.0	<0.20	3,000	4,500
		240	≦3.0	<0.15	2,400	2,400	240	≦3.0	<0.15	2,400	2,880
		290	≦2.5	<0.10	1,800	1,350	290	≦2.5	<0.10	1,800	1,620
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~160	≦5.0	<0.20	3,000	3,750	~160	≦5.0	<0.20	3,000	4,500
		240	≦3.0	<0.15	2,400	2,400	240	≦3.0	<0.15	2,400	2,880
		290	≦2.5	<0.10	1,800	1,350	290	≦2.5	<0.10	1,800	1,620
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~160	≦4.0	<0.20	2,500	3,120	~160	≦4.0	<0.20	2,500	3,750
		240	≦2.5	<0.15	2,000	2,000	240	≦2.5	<0.15	2,000	2,400
		290	≦2.0	<0.10	1,500	1,130	290	≦2.0	<0.10	1,500	1,350
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 JC8015	~160	≦3.5	<0.20	2,100	2,100	~160	≦3.5	<0.20	2,100	2,520
		240	≦2.5	<0.15	1,680	1,340	240	≦2.5	<0.15	1,680	1,610
		290	–	–	–	–	290	–	–	–	–
Hardened die steel SKD11,SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~160	≦2.5	<0.15	1,800	1350	~160	≦2.5	<0.15	1,800	1620
		240	≦2.0	<0.12	1,440	870	240	≦2.0	<0.12	1,440	1040
		290	–	–	–	–	290	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~160	≦5.0	<0.20	2,800	4,200	~160	≦5.0	<0.20	2,800	5,040
		240	≦3.0	<0.15	2,240	2,690	240	≦3.0	<0.15	2,240	3,230
		290	≦2.5	<0.10	1,680	1,510	290	≦2.5	<0.10	1,680	1,810
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~160	≦5.0	<0.20	3,000	3,750	~160	≦5.0	<0.20	3,000	4,500
		240	≦3.0	<0.15	2,400	2,400	240	≦3.0	<0.15	2,400	2,880
		290	≦2.5	<0.10	1,800	1,350	290	≦2.5	<0.10	1,800	1,620
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~160	≦5.0	<0.20	900	1,130	~160	≦5.0	<0.20	900	1,350
		240	≦3.0	<0.15	720	720	240	≦3.0	<0.15	720	860
		290	≦2.5	<0.10	540	410	290	≦2.5	<0.10	540	490

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

■NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut ap or Feed speed.
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.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS "ZPMT＊-PL-TYPE INSERTS" (FOR SIDE FINISHING)

● MQX + MSN type

Work Materials	Insert Grades	Tool dia. (mm)									
		40/42					40				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 JC8015	~160	≦5.0	<0.20	2,550	4,590	~160	≦5.0	<0.20	2,550	5,350
		240	≦3.0	<0.15	2,040	2,940	240	≦3.0	<0.15	2,040	3,430
		290	≦2.5	<0.10	1,530	1,650	290	≦2.5	<0.10	1,530	1,930
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 JC8015	~160	≦5.0	<0.20	2,400	3,600	~160	≦5.0	<0.20	2,400	4,200
		240	≦3.0	<0.15	1,920	2,300	240	≦3.0	<0.15	1,920	2,690
		290	≦2.5	<0.10	1,440	1,300	290	≦2.5	<0.10	1,440	1,510
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~160	≦5.0	<0.20	2,400	3,600	~160	≦5.0	<0.20	2,400	4,200
		240	≦3.0	<0.15	1,920	2,300	240	≦3.0	<0.15	1,920	2,690
		290	≦2.5	<0.10	1,440	1,300	290	≦2.5	<0.10	1,440	1,510
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~160	≦4.0	<0.20	2,000	3,000	~160	≦4.0	<0.20	2,000	3,500
		240	≦2.5	<0.15	1,600	1,920	240	≦2.5	<0.15	1,600	2,240
		290	≦2.0	<0.10	1,200	1,080	290	≦2.0	<0.10	1,200	1,260
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 JC8015	~160	≦3.5	<0.20	1,670	2,000	~160	≦3.5	<0.20	1,670	2,340
		240	≦2.5	<0.15	1,340	1,290	240	≦2.5	<0.15	1,340	1,500
		290	–	–	–	–	290	–	–	–	–
Hardened die steel SKD11,SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~160	≦2.5	<0.15	1,430	1,290	~160	≦2.5	<0.15	1,430	1,500
		240	≦2.0	<0.12	1,140	820	240	≦2.0	<0.12	1,140	960
		290	–	–	–	–	290	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~160	≦5.0	<0.20	2,230	4,010	~160	≦5.0	<0.20	2,230	4,680
		240	≦3.0	<0.15	1,780	2,560	240	≦3.0	<0.15	1,780	2,990
		290	≦2.5	<0.10	1,340	1,450	290	≦2.5	<0.10	1,340	1,690
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~160	≦5.0	<0.20	2,400	3,600	~160	≦5.0	<0.20	2,400	4,200
		240	≦3.0	<0.15	1,920	2,300	240	≦3.0	<0.15	1,920	2,690
		290	≦2.5	<0.10	1,440	1,300	290	≦2.5	<0.10	1,440	1,510
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~160	≦5.0	<0.20	720	1,080	~160	≦5.0	<0.20	720	1,260
		240	≦3.0	<0.15	580	700	240	≦3.0	<0.15	580	810
		290	≦2.5	<0.10	430	390	290	≦2.5	<0.10	430	450

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

■NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut ap or Feed speed.
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.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS "ZPMT＊-PL-TYPE INSERTS" (FOR BOTTOM FACE FINISHING)

● MQX + MSN type

Work Materials	Insert Grades	Tool dia. (mm) 16/17 No. of teeth 2N					Tool dia. (mm) 20 No. of teeth 3N					Tool dia. (mm) 20/21 No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 JC8015	~80	≦0.20	6~14	3,600	1,080	~100	≦0.20	8~18	2,900	1,310	~100	≦0.20	8~18	2,900	1,740
		120	≦0.15	6~14	2,700	650	150	≦0.15	8~18	2,200	790	150	≦0.15	8~18	2,200	1,060
		160	≦0.10	6~10	1,800	360	190	≦0.10	8~12	1,500	450	190	≦0.10	8~12	1,500	600
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 JC8015	~80	≦0.20	6~14	3,200	960	~100	≦0.20	8~18	2,600	1,170	~100	≦0.20	8~18	2,600	1,560
		120	≦0.15	6~14	2,400	580	150	≦0.15	8~18	2,000	720	150	≦0.15	8~18	2,000	960
		160	≦0.10	6~10	1,600	320	190	≦0.10	8~12	1,300	390	190	≦0.10	8~12	1,300	520
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~80	≦0.20	6~14	3,200	960	~100	≦0.20	8~18	2,600	1,170	~100	≦0.20	8~18	2,600	1,560
		120	≦0.15	6~14	2,400	580	150	≦0.15	8~18	2,000	720	150	≦0.15	8~18	2,000	960
		160	≦0.10	6~10	1,600	320	190	≦0.10	8~12	1,300	390	190	≦0.10	8~12	1,300	520
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~80	≦0.20	6~14	2,800	840	~100	≦0.20	8~18	2,240	1,010	~100	≦0.20	8~18	2,240	1,340
		120	≦0.15	6~14	2,100	500	150	≦0.15	8~18	1,680	600	150	≦0.15	8~18	1,680	800
		160	≦0.10	6~10	1,400	280	190	≦0.10	8~12	1,120	340	190	≦0.10	8~12	1,120	450
Hardened die steel SKD61, DAC, DHA 1.2344, 1.2379) 42-52HRC	DH102 JC8015	~80	≦0.15	6~14	2,000	480	~100	≦0.15	8~18	1,600	580	~100	≦0.15	8~18	1,600	770
		120	≦0.10	6~14	1,500	300	150	≦0.10	8~18	1,200	360	150	≦0.10	8~18	1,200	480
		160	–	–	–	–	190	–	–	–	–	190	–	–	–	–
Hardened die steel SKD11, SLD, DC11 1.2344, 1.2379) 55-62HRC	DH102	~80	≦0.12	6~14	1,400	280	~100	≦0.12	8~18	1,100	330	~100	≦0.12	8~18	1,100	440
		120	≦0.10	6~14	1,050	170	150	≦0.10	8~18	820	200	150	≦0.10	8~18	820	260
		160	–	–	–	–	190	–	–	–	–	190	–	–	–	–
Grey & Nodular cast iron (FC, FCD) (GG, GGG) Below 300HB	JC8015 (DH102)	~80	≦0.20	6~14	3,600	1,300	~100	≦0.20	8~18	2,900	1,570	~100	≦0.20	8~18	2,900	2,090
		120	≦0.15	6~14	2,700	810	150	≦0.15	8~18	2,200	990	150	≦0.15	8~18	2,200	1,320
		160	≦0.10	6~10	1,800	430	190	≦0.10	8~12	1,500	540	190	≦0.10	8~12	1,500	720
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~80	≦0.20	6~14	3,200	960	~100	≦0.20	8~18	2,600	1,170	~100	≦0.20	8~18	2,600	1,560
		120	≦0.15	6~14	2,400	580	150	≦0.15	8~18	2,000	720	150	≦0.15	8~18	2,000	960
		160	≦0.10	6~10	1,600	320	190	≦0.10	8~12	1,300	390	190	≦0.10	8~12	1,300	520
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~80	≦0.20	6~14	1,000	240	~100	≦0.20	8~18	800	290	~100	≦0.20	8~18	800	380
		120	≦0.15	6~14	750	160	150	≦0.15	8~18	600	200	150	≦0.15	8~18	600	260
		160	≦0.10	6~10	500	100	190	≦0.10	8~12	400	120	190	≦0.10	8~12	400	160

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■NOTE

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2 In case of chatter occurring, recommend to reduce the depth of cut ap or Feed speed.
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.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS "ZPMT＊-PL-TYPE INSERTS" (FOR BOTTOM FACE FINISHING)

● MQX + MSN type

Work Materials	Insert Grades	Tool dia. (mm) 25/26 No. of teeth 4N ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	No. of teeth 5N ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 JC8015	~120	≦0.20	9~23	2,300	1,380	~120	≦0.20	9~23	2,300	1,720
		190	≦0.15	9~23	1,700	820	190	≦0.15	9~23	1,700	1,020
		235	≦0.10	9~15	1,150	460	235	≦0.10	9~15	1,150	580
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 JC8015	~120	≦0.20	9~23	2,000	1,200	~120	≦0.20	9~23	2,000	1,500
		190	≦0.15	9~23	1,500	720	190	≦0.15	9~23	1,500	900
		235	≦0.10	9~15	1,000	400	235	≦0.10	9~15	1,000	500
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~120	≦0.20	9~23	2,000	1,200	~120	≦0.20	9~23	2,000	1,500
		190	≦0.15	9~23	1,500	720	190	≦0.15	9~23	1,500	900
		235	≦0.10	9~15	1,000	400	235	≦0.10	9~15	1,000	500
Mold steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~120	≦0.20	9~23	1,800	1,080	~120	≦0.20	9~23	1,800	1,350
		190	≦0.15	9~23	1,350	650	190	≦0.15	9~23	1,350	810
		235	≦0.10	9~15	900	360	235	≦0.10	9~15	900	450
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 JC8015	~120	≦0.15	9~23	1,300	620	~120	≦0.15	9~23	1,300	780
		190	≦0.10	9~23	1,000	400	190	≦0.10	9~23	1,000	500
		235	–	–	–	–	235	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~120	≦0.12	9~23	900	360	~120	≦0.12	9~23	900	450
		190	≦0.10	9~23	680	220	190	≦0.10	9~23	680	270
		235	–	–	–	–	235	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~120	≦0.20	9~23	2,300	1,660	~120	≦0.20	9~23	2,300	2,070
		190	≦0.15	9~23	1,700	1,020	190	≦0.15	9~23	1,700	1,280
		235	≦0.10	9~15	1,150	550	235	≦0.10	9~15	1,150	690
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~120	≦0.20	9~23	2,000	1,200	~120	≦0.20	9~23	2,000	1,500
		190	≦0.15	9~23	1,500	720	190	≦0.15	9~23	1,500	900
		235	≦0.10	9~15	1,000	400	235	≦0.10	9~15	1,000	500
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~120	≦0.20	9~23	640	310	~120	≦0.20	9~23	640	380
		190	≦0.15	9~23	480	210	190	≦0.15	9~23	480	260
		235	≦0.10	9~15	320	130	235	≦0.10	9~15	320	160

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

■NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
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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.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS "ZPMT＊-PL-TYPE INSERTS" (FOR BOTTOM FACE FINISHING)

● MQX + MSN type

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32/35					32/35				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 JC8015	~160	≦0.20	11~28	1,800	1,350	~160	≦0.20	11~28	1,800	1,620
		240	≦0.15	11~28	1,350	810	240	≦0.15	11~28	1,350	970
		290	≦0.10	11~20	900	450	290	≦0.10	11~20	900	540
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 JC8015	~160	≦0.20	11~28	1,600	1,200	~160	≦0.20	11~28	1,600	1,440
		240	≦0.15	11~28	1,200	720	240	≦0.15	11~28	1,200	860
		290	≦0.10	11~20	800	400	290	≦0.10	11~20	800	480
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~160	≦0.20	11~28	1,600	1,200	~160	≦0.20	11~28	1,600	1,440
		240	≦0.15	11~28	1,200	720	240	≦0.15	11~28	1,200	860
		290	≦0.10	11~20	800	400	290	≦0.10	11~20	800	480
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~160	≦0.20	11~28	1,400	1,050	~160	≦0.20	11~28	1,400	1,260
		240	≦0.15	11~28	1,050	630	240	≦0.15	11~28	1,050	760
		290	≦0.10	11~20	700	350	290	≦0.10	11~20	700	420
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 JC8015	~160	≦0.15	11~28	1,000	600	~160	≦0.15	11~28	1,000	720
		240	≦0.10	11~28	750	380	240	≦0.10	11~28	750	450
		290	–	–	–	–	290	–	–	–	–
Hardened die steel SKD11,SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~160	≦0.12	11~28	700	350	~160	≦0.12	11~28	700	420
		240	≦0.10	11~28	530	210	240	≦0.10	11~28	530	250
		290	–	–	–	–	290	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~160	≦0.20	11~28	1,800	1,620	~160	≦0.20	11~28	1,800	1,940
		240	≦0.15	11~28	1,350	1,010	240	≦0.15	11~28	1,350	1,220
		290	≦0.10	11~20	900	540	290	≦0.10	11~20	900	650
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~160	≦0.20	11~28	1,600	1,200	~160	≦0.20	11~28	1,600	1,440
		240	≦0.15	11~28	1,200	720	240	≦0.15	11~28	1,200	860
		290	≦0.10	11~20	800	400	290	≦0.10	11~20	800	480
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~160	≦0.20	11~28	500	300	~160	≦0.20	11~28	500	360
		240	≦0.15	11~28	380	210	240	≦0.15	11~28	380	250
		290	≦0.10	11~20	250	120	290	≦0.10	11~20	250	150

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

■NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut ap or Feed speed.
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.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS "ZPMT＊-PL-TYPE INSERTS" (FOR BOTTOM FACE FINISHING)

● MQX + MSN type

Work Materials	Insert Grades	Tool dia. (mm)									
		40/42					40				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 JC8015	~160	≦0.20	13~38	1,400	1,260	~160	≦0.20	13~38	1,400	1,470
		240	≦0.15	13~38	1,050	760	240	≦0.15	13~38	1,050	880
		290	≦0.10	13~24	700	420	290	≦0.10	13~24	700	490
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 JC8015	~160	≦0.20	13~38	1,300	1,170	~160	≦0.20	13~38	1,300	1,360
		240	≦0.15	13~38	980	710	240	≦0.15	13~38	980	820
		290	≦0.10	13~24	650	390	290	≦0.10	13~24	650	450
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~160	≦0.20	13~38	1,300	1,170	~160	≦0.20	13~38	1,300	1,360
		240	≦0.15	13~38	980	710	240	≦0.15	13~38	980	820
		290	≦0.10	13~24	650	390	290	≦0.10	13~24	650	450
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~160	≦0.20	13~38	1,110	1,000	~160	≦0.20	13~38	1,110	1,160
		240	≦0.15	13~38	830	600	240	≦0.15	13~38	830	700
		290	≦0.10	13~24	560	340	290	≦0.10	13~24	560	390
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 JC8015	~160	≦0.15	13~38	800	580	~160	≦0.15	13~38	800	670
		240	≦0.10	13~38	600	360	240	≦0.10	13~38	600	420
		290	–	–	–	–	290	–	–	–	–
Hardened die steel SKD11,SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~160	≦0.12	13~38	560	340	~160	≦0.12	13~38	560	390
		240	≦0.10	13~38	420	200	240	≦0.10	13~38	420	230
		290	–	–	–	–	290	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~160	≦0.20	13~38	1,400	1,510	~160	≦0.20	13~38	1,400	1,760
		240	≦0.15	13~38	1,050	950	240	≦0.15	13~38	1,050	1,100
		290	≦0.10	13~24	700	500	290	≦0.10	13~24	700	590
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~160	≦0.20	13~38	1,300	1,170	~160	≦0.20	13~38	1,300	1,360
		240	≦0.15	13~38	980	710	240	≦0.15	13~38	980	820
		290	≦0.10	13~24	650	390	290	≦0.10	13~24	650	450
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~160	≦0.20	13~38	400	290	~160	≦0.20	13~38	400	340
		240	≦0.15	13~38	300	200	240	≦0.15	13~38	300	230
		290	≦0.10	13~24	200	120	290	≦0.10	13~24	200	140

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

■NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut ap or Feed speed.
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.

QM MAX MQXTYPE

■ RECOMMENDED CUTTING CONDITIONS FOR MQX AND MSN (ZPMT-NL-type)

● MQX + MSN type

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	apxae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	apxae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	apxae (mm)	n (min-1)	Vf (mm/min)
Aluminum alloy 50-110HB	FZ15 FC18 NL Type	~80	~5.0	~32.0	12,000	3,600	~100	~5.0	~40.0	9,600	4,320	~100	~5.0	~40.0	9,600	5,760
		120	~3.5	~8.0	9,000	1,800	150	~3.5	~10.0	7,200	2,160	150	~3.5	~10.0	7,200	2,880
		160	~2.0	~4.0	6,000	1,200	190	~2.0	~5.0	4,800	1,440	290	~2.0	~5.0	4,800	1,920

Work Materials	Insert Grades	Tool dia. (mm)														
		25/26										30/32/35				
		No. of teeth 4N					No. of teeth 5N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	apxae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	apxae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	apxae (mm)	n (min-1)	Vf (mm/min)
Aluminum alloy 50-110HB	FC15 FZ18 NL Type	~120	~5.0	~50.0	7,650	4,590	~120	~5.0	~50.0	7,650	5,740	~160	~5.0	~64.0	6,000	4,500
		190	~3.5	~12.5	5,750	2,300	190	~3.5	~12.5	5,750	2,880	240	~3.5	~16.0	4,500	2,250
		235	~2.0	~6.2	3,850	1,540	235	~2.0	~6.2	3,850	1,920	290	~2.0	~8.0	3,000	1,500

Work Materials	Insert Grades	Tool dia. (mm)														
		32/35					40/42					40				
		No. of teeth 6N					No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	apxae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	apxae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	apxae (mm)	n (min-1)	Vf (mm/min)
Aluminum alloy 50-110HB	FZ15 FC18 NL Type	~160	~5.0	~64.0	6,000	5,400	~160	~5.0	~80.0	4,800	4,320	~160	~5.0	~80.0	4,800	5,040
		240	~3.5	~16.0	4,500	2,700	240	~3.5	~20.0	3,600	2,160	240	~3.5	~20.0	3,600	2,520
		290	~2.0	~8.0	3,000	1,800	290	~2.0	~10.0	2,400	1,440	290	~2.0	~10.0	2,400	1,680

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

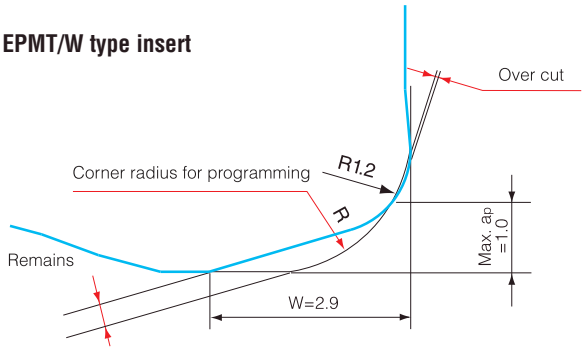
■NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut ap or Feed speed.
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.

QM MAX MQXTYPE

■ Definition of corner radius for programming

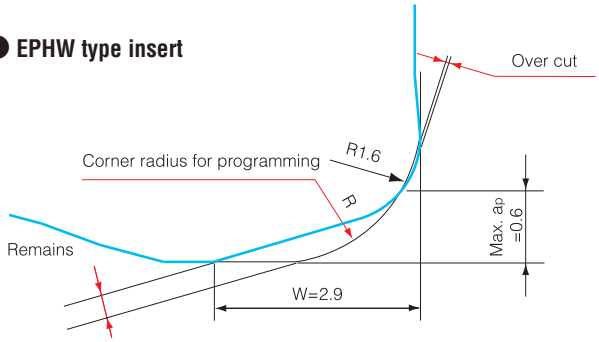
● EPMT/W type insert



(mm)

Corner radius for programming	Over cut	Remains
R1.0	0	0.57
R1.5 (Recommended)	0	0.45
R2.0	0.04	0.33
R2.5	0.21	0.21
R3.0	0.40	0.09

● EPHW type insert



(mm)

Corner radius for programming	Over cut	Remains
R1.0	0	0.42
R1.5 (Recommended)	0	0.33
R2.0	0.01	0.23
R2.5	0.17	0.14
R3.0	0.37	0.05

■ Guidelines for selection of the EP** type insert

Work Materials	Carbon steel S50C, S55C (C50, C55) Below 250HB				Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB				Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC				Moldsteel NAK80,HPM1,P21 (1.2311,P21) 38-43HRC			
Grades / Cat. No.	JC5118	JC8050	JC7560	DH102	JC5118	JC8050	JC7560	DH102	JC5118	JC8050	JC7560	DH102	JC5118	JC8050	JC7560	DH102
EPMT100312ZER	☆	☆	☆		☆	☆	☆		☆	☆	☆		☆	☆		
EPMW100312ZER														○		
EPMW100312ZTR	○	○	◎		○	○	◎		○	○	◎		○	◎		
EPHW100316ZTR																○

Work Materials	Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC				Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC				Grey & Nodularcastiron FC, FCD (GG, GGG) Below 300HB				Stainless steel SUS304 Below 250HB			
Grades / Cat. No.	JC5118	JC8050	JC7560	DH102	JC5118	JC8050	JC7560	DH102	JC5118	JC8050	JC7560	DH102	JC5118	JC8050	JC7560	DH102
EPMT100312ZER	☆				×	×			○					○	◎	
EPMW100312ZER	○				○				◎					●		
EPMW100312ZTR	●				●				●		○					
EPHW100316ZTR				◎				◎								

WorkMaterials	Titanium alloy Ti-6Al-4V				Inconel INCO718			
Grades / Cat. No.	JC5118	JC8050	JC7560	DH102	JC5118	JC8050	JC7560	DH102
EPMT100312ZER	○	○	◎		◎	○	○	
EPMW100312ZER		●				●		
EPMW100312ZTR								
EPHW100316ZTR								

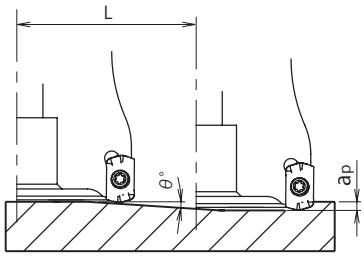
- EPMW type: Without chip breaker • EPMT type: With chip breaker
- EPHW type: Without chip breaker

◎: First Choice, Good Condition ○: Moderate Condition
●: Unfavorable Condition ☆: Light Cutting ×: No good

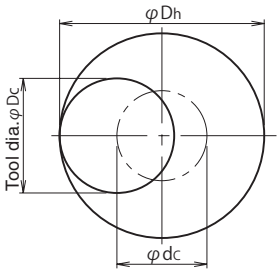
QM MAX MQXTYPE

■ Instructions for profile milling with EMPT/W type insert

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

$$\varphi dc = \varphi Dh - \varphi Dc$$

Tool pass dia. Bore dia. Tool dia.

● Depth of cut per one circle should not exceed max. depth of cut ap.

● Down cutting is recommended, so tool pass rotation should be counterclockwise.

- In case of ramping and helical interpolation, apply 70% or less feed speed from standard cutting conditiontable.
- In case of drilling, apply 50% or less Zaxis feed speed fromstandard cutting conditiontable.
- Long continous chips may come out in case of drilling, confirm the correct cutting parameters.

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation	
				Max. ramping angle θ°	Total cutting length L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)
MQX-*016-M8	16	10.2	0.8	1°48´	25.5	22	30
MQX-*017-M8	17	11.2	0.8	1°36´	28.6	24	32
MQX-*020-M10	20	14.1	0.8	1°24´	32.7	30	38
MQX-*021-M10	21	15.1	0.8	1°18´	35.3	32	40
MQX-*025-M12	25	19.1	0.8	1°	45.8	40	48
MQX-*026-M12	26	20.1	0.8	0°57´	48.2	42	50
MQX-*030-M16	30	24.1	0.8	0°48´	57.3	50	58
MQX-*032-M16	32	26.1	0.8	0°42´	65.5	54	62
MQX-*035-M16	35	29.1	0.8	0°36´	76.4	60	68
MQX-*040-M16	40	34.1	0.8	0°30´	91.7	70	78
MQX-*042-M16	42	36.2	0.8	0°27´	101.9	74	82

Note) The ramping angle 0.5° or less is recommended (please refer to the above table).

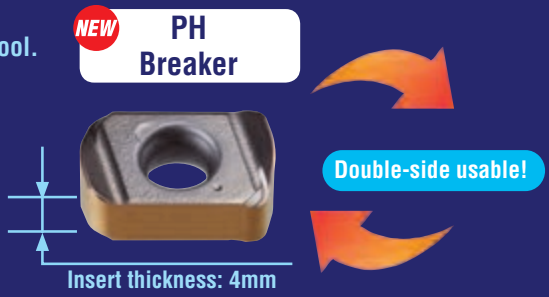
QM MAX G II — MXG TYPE

Feature of product

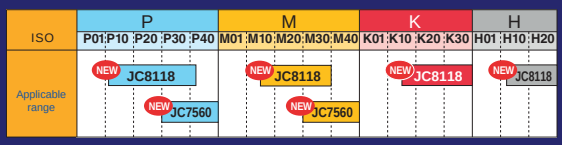
"QM MAX G II" GMX / MXG type, indexable cutter with high efficient roughing.

- **Low cutting force inserts with optimum cutting edge for high feed machining.**
  * Compared with conventional positive type cutter, chips thickness of QM MAX G II reduces by 14% (in case of ap=0.6mm).

- **Insert thickness: 4mm improved strength by 1.2 times compared with conventional tool.**
- **Economical double-side insert (4 corners).**
- **New strong edge type "PH breaker insert" is excellent in fracture resistance and applicable to heavy cutting.**



- **2 insert grades "JC8118" & "JC7560" can be widely applied from general & mold steel to hardened die steel & high strength stainless steel .**
- **Application**



<JC8118>

"JC8118" for high hardened steel less than 50HRC & high strength stainless steel.

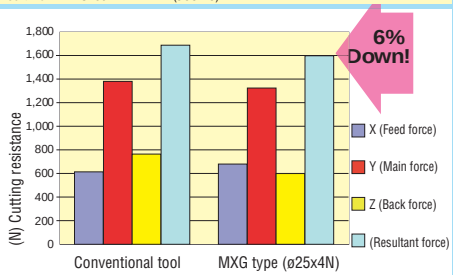
<JC7560>

"JC7560" for general & mold steel less than 35HRC.

Cutting performance

● Cutting force comparison

Material: S50C C50
Cutting conditions: Vc=120/min, fz=1.0mm/t, ap=0,6mm, ae=15mm
Dow cut Air blow, Tool No.: MXG-4025-M12,
Insert No.: ENMU100412ZER-PH (JC8118)



● feed limit comparison

Material: SKD61 (46HRC) 1.2344
Cutting conditions: Vc=95m/min, **ap=1,0mm**, ae=0–19mm
Up & down cut Air blow
Tool No.: MXG-4025-M12
Insert No.: ENMU100412ZER-PH (JC8118)

	fz=1.1mm/t	fz=1.4mm/t	fz=1.6mm/t
NEW PH	○	○	○

New strong edge type "PH breaker insert" is excellent in fracture resistance and possible to higher feed machining than conventional tool.

QM MAX G II

MXG TYPE

Greatly improved metal removal rate!

- Possible to stable high feed machining in case of long overhung length over L/D=6.
- Excellent in ramping and helical interpolation, and possible to high efficient pocket milling.

* Possible to Max. ramping angle 1° in case of using ø 25 mm tool dia.

G-Body

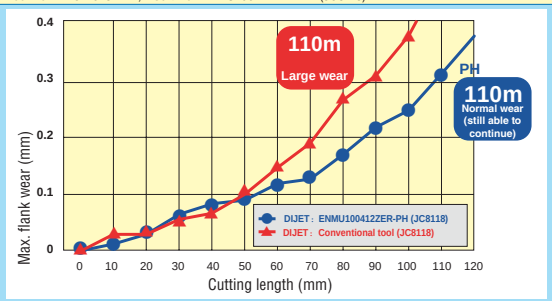
Adopted GN surface-hardening treatment on thermal resistant high strength steel gives high hardness over 65HRC and secure insert pocket and holder against thermal deformation, improved body durability and tool life by 30% or more. Make it difficult to be damaged even under severe cutting conditions. Also rust-proof and anti-welding effect is much improved.

Cutting performance

- Tool life comparison

Material: SKD11 (1.2379, Cutting conditions: Vc=180mm/min, fz=1.2mm/t, ap=0,8mm,
Pocket milling 75x60x30mm, Down cut Air blow
Overhung length 60mm, Ramping angle 1°
Tool No.: MXG-4025-M12, Insert No.: ENMU100412ZER-PH (JC8118)

New strong edge type "PH breaker insert" supressed small chipping and achieved longer tool life compared with conventional tool.

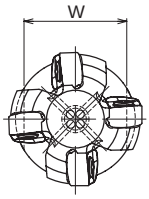


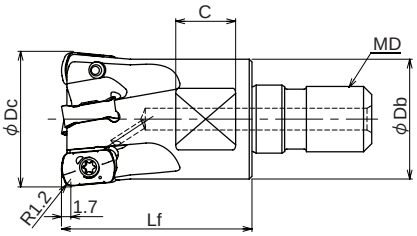
QM MAX G II — MXG TYPE

MXG TYPE

Through coolant hole

G-Body





■ BODY

Cat No.	Stock	No. of inserts	Dimensions (mm) φ Dc	Lf	φ Db	MD	C	W	Applicable Inserts	Parts Clamp Screw	Parts Wrench
											
MXG-2016-M8	●	2	16	23	14	M8	8	12			
MXG-2017-M8	●	2	17	23	14	M8	8	12			
MXG-3020-M10	●	3	20	30	18	M10	9	14			
MXG-3021-M10	●	3	21	30	18	M10	9	14			
MXG-3025-M12	●	3	25	35	22	M12	11	19			
MXG-4025-M12	●	4	25	35	22	M12	11	19	ENMU100412ZER-PH	TSW-2567H	A-08
MXG-4026-M12	●	4	26	35	22.5	M12	11	19			
MXG-5030-M16	●	5	30	43	27	M16	12	22			
MXG-5032-M16	●	5	32	43	29	M16	12	22			
MXG-5035M16	●	5	35	43	29	M16	12	22			
MXG-6040-M16	●	6	40	43	32	M16	14	26			
MXG-6042-M16	●	6	42	43	32	M16	14	26			

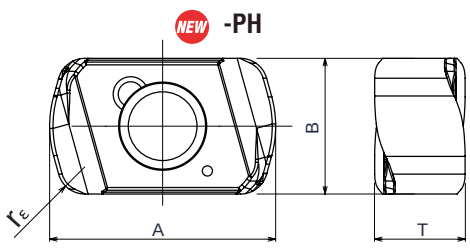
Note) 1. All cutters are supplied without inserts.
2. Please see page B009 for recommended tightening torque.

Arbor B193

Clamp Screw	Recommended Torque (N•m)
TSW-2567H	1.1

MXG TYPE

■ Inserts



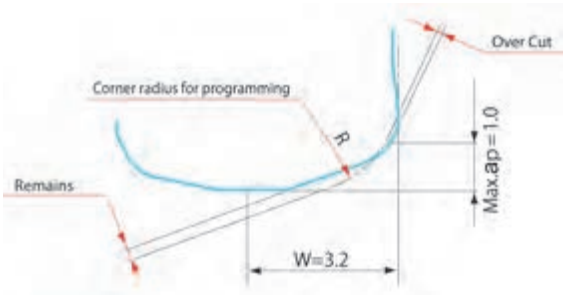
Cat. No.	Tole-rance	Dimensions (mm) A	T	B	rε	PVD coated NEW JC8118	NEW JC7560
ENMU100412ZER-PH	M	10	4	6	1.2	●	●

10 inserts per case

● Standard stock items

QM MAX G II — MXG TYPE

Definition of corner shape for programming

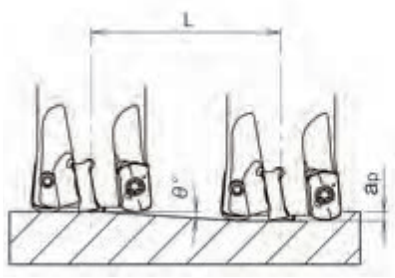


(mm)

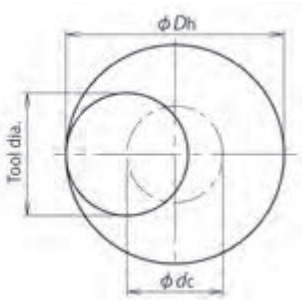
Corner radius for programming	Over cut	Remains
R1.0	0	0.52
R1.5 (Standard)	0	0.38
R2.0	0.08	0.24

■ Attention for profile milling

● **Ramping**



● **Helical interpolation**



● Calculation of tool passdia.

$$\varphi dc = \varphi Dh - \varphi Dc$$

Tool pass dia. Bore dia. Tool dia.

● Depth of cut per one circuit should not exceed max. depth of cut ap.

● Down cutting is recommended, so tool pass rotation should be counterclockwise.

● In case of ramping and helical interpolation, apply 70% or less feed speed from standard cutting condition table.
● In case of drilling, apply 50% or less Z axis feed speed from standard cutting condition table.
● Long consecutive chips may come out in case of drilling, confirm the safe condition sufficiently.

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max.depth of cut ap (mm)	Ramping		Helical interpolation	
				Max. ramping angle θ°	Total cutting length L (mm) at max.ap	Min. bore dia. Dh min (mm)	Max.bore dia. Dh max (mm)
MXG-2016-M8	16	10.1	0.7	1°36'	25.1	22	30
MXG-2017-M8	17	11.1	0.7	1°36'	25.1	24	32
MXG-3020-M10	20	13.9	1	1°30'	38.2	30	38
MXG-3021-M10	21	14.9	1	1°30'	38.2	31	40
MXG-*025-M12	25	18.9	1	1°12'	47.7	40	48
MXG-4026-M12	26	19.9	1	1°12'	47.7	42	50
MXG-5030-M16	30	23.9	1	0°54'	63.6	50	58
MXG-5032-M16	32	25.9	1	0°54'	63.6	54	62
MXG-5035-M16	35	28.8	1	0°42'	81.8	60	68
MXG-6040-M16	40	33.8	1	0°30'	114.5	70	78
MXG-6042-M16	42	35.8	1	0°30'	114.5	74	82

QM MAX G II — GMX/MXG TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MXG + MSN type

Work Material	Grades	Tool dia. (mm)														
		16/17					20/21					25				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC7560 (JC8118)	~50	0.8	~10	3,580	8,590	~60	0.8	~14	2,860	10,300	~75	0.8	~19	2,290	8,240
		80	0.6	~10	3,580	8,590	100	0.6	~14	2,860	10,300	125	0.6	~19	2,290	8,240
		120	0.6	~10	3,180	7,630	140	0.6	~14	2,550	9,180	175	0.6	~19	2,040	7,340
Die steel (1.2344, 1.2379) Below 255HB	JC7560 (JC8118)	~50	0.8	~10	3,580	8,590	~60	0.8	~14	2,860	10,300	~75	0.8	~19	2,290	8,240
		80	0.6	~10	3,580	8,590	100	0.6	~14	2,860	10,300	125	0.6	~19	2,290	8,240
		120	0.6	~10	3,180	7,630	140	0.6	~14	2,550	9,180	175	0.6	~19	2,040	7,340
Mold steel (1.2311, P20) 30-36HRC	JC7560 (JC8118)	~50	0.8	~10	3,180	7,630	~60	0.8	~14	2,550	9,180	~75	0.8	~19	2,040	7,340
		80	0.6	~10	3,180	7,630	100	0.6	~14	2,550	9,180	125	0.6	~19	2,040	7,340
		120	0.6	~10	2,590	6,220	140	0.6	~14	2,070	7,450	175	0.6	~19	1,660	5,980
Mold steel (1.2311, P21) 38-43HRC	JC8118	~50	0.6	~10	1,890	4,160	~60	0.6	~14	1,510	4,980	~75	0.6	~19	1,210	3,990
		80	0.5	~10	1,690	3,040	100	0.5	~14	1,350	3,650	125	0.5	~19	1,080	2,920
		120	0.5	~10	1,590	2,860	140	0.5	~14	1,270	3,430	175	0.5	~19	1,020	2,750
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~50	0.6	~10	1,890	4,160	~60	0.6	~14	1,510	4,980	~75	0.6	~19	1,210	3,990
		80	0.5	~10	1,690	3,040	100	0.5	~14	1,350	3,650	125	0.5	~19	1,080	2,920
		120	0.5	~10	1,590	2,860	140	0.5	~14	1,270	3,430	175	0.5	~19	1,020	2,750
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8118	~50	1.0	~10	3,980	11,940	~60	1.0	~14	3,180	14,310	~75	1.0	~19	2,550	11,480
		80	0.8	~10	3,980	11,940	100	0.8	~14	3,180	14,310	125	0.8	~19	2,550	11,480
		120	0.6	~10	3,580	8,590	140	0.6	~14	2,860	10,300	175	0.6	~19	2,290	8,240
Stainless steel Below 250HB	JC7560 (JC8118)	~50	0.6	~10	2,390	4,780	~60	0.6	~14	1,910	5,730	~75	0.6	~19	1,530	4,590
		80	0.5	~10	2,390	4,780	100	0.5	~14	1,910	5,730	125	0.5	~19	1,530	4,590
		120	0.5	~10	1,990	3,180	140	0.5	~14	1,590	3,820	175	0.5	~19	1,270	3,050

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MAX G II — GMX/MXG TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MXG + MSN type

Work Material	Grades	Tool dia. (mm)														
		25/26					30/32/35					40/42				
		No. of teeth 4N					No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC7560 (JC8118)	~75	0.8	~19	2,290	10,990	~90	0.8	~25	1,910	11,460	~120	0.8	~32	1,430	10,300
		125	0.6	~19	2,290	10,990	150	0.6	~25	1,910	11,460	200	0.6	~32	1,430	10,300
		175	0.6	~19	2,040	9,790	210	0.6	~25	1,700	10,200	280	0.6	~32	1,270	9,140
Die steel (1.2344, 1.2379) Below 255HB	JC7560 (JC8118)	~75	0.8	~19	2,290	10,990	~90	0.8	~25	1,910	11,460	~120	0.8	~32	1,430	10,300
		125	0.6	~19	2,290	10,990	150	0.6	~25	1,910	11,460	200	0.6	~32	1,430	10,300
		175	0.6	~19	2,040	9,790	210	0.6	~25	1,700	10,200	280	0.6	~32	1,270	9,140
Mold steel (1.2311, P20) 30-36HRC	JC7560 (JC8118)	~75	0.8	~19	2,040	9,790	~90	0.8	~25	1,700	10,200	~120	0.8	~32	1,270	9,140
		125	0.6	~19	2,040	9,790	150	0.6	~25	1,700	10,200	200	0.6	~32	1,270	9,140
		175	0.6	~19	1,660	7,970	210	0.6	~25	1,380	8,280	280	0.6	~32	1,030	7,420
Mold steel (1.2311, P21) 38-43HRC	JC8118	~75	0.6	~19	1,210	5,320	~90	0.6	~25	1,010	5,560	~120	0.6	~32	760	5,200
		125	0.5	~19	1,080	3,890	150	0.5	~25	900	4,050	200	0.5	~32	680	3,670
		175	0.5	~19	1,020	3,670	210	0.5	~25	850	3,830	280	0.5	~32	640	3,460
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~75	0.6	~19	1,210	5,320	~90	0.6	~25	1,010	5,560	~120	0.6	~32	760	5,020
		125	0.5	~19	1,080	3,890	150	0.5	~25	900	4,050	205	0.5	~32	680	3,670
		175	0.5	~19	1,020	3,670	210	0.5	~25	850	3,830	280	0.5	~32	640	3,460
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8118	~75	1.0	~19	2,550	15,300	~90	1.0	~25	2,120	15,900	~120	1.0	~32	1,590	14,310
		125	0.8	~19	2,550	15,300	150	0.8	~25	2,120	15,900	200	0.8	~32	1,590	14,310
		175	0.6	~19	2,290	10,990	210	0.6	~25	1,910	11,460	280	0.6	~32	1,430	10,300
Stainless steel Below 250HB	JC7560 (JC8118)	~75	0.6	~19	1,530	6,120	~90	0.6	~25	1,270	6,350	~120	0.6	~32	950	5,700
		125	0.5	~19	1,530	6,120	150	0.5	~25	1,270	6,350	200	0.5	~32	950	5,700
		175	0.5	~19	1,270	4,060	210	0.5	~25	1,060	4,240	280	0.5	~32	800	3,840

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

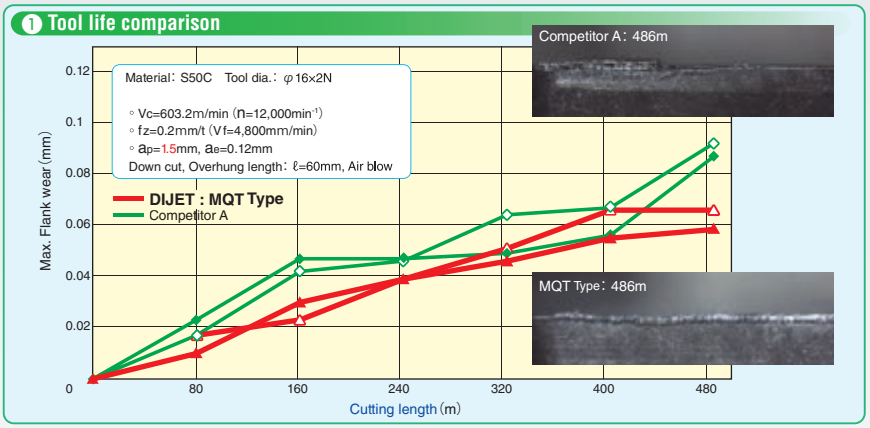
QM MAX MQT TYPE

High precision QM MAX BARREL TOOL Tuff Modular Heads System

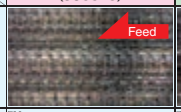
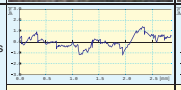
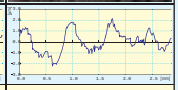
1. High precision QM Max MQT type improved balance of holder than conventional holders. Possible to adapt multi-machining machines such as 5 axis machines. Lineded up high precision H grade inserts. High efficient machining is possible by adapting malti-blades specification.
   ➡ Accuracy of tool dia. with master inserts –0.02 mm ～ –0.05 mm (XPHW/T tType inserts)
2. Lineuped holders with cutting edge angle 3°, 5°. Complex shape machining with inclination is possible by 3 axis machine.
3. Adopted 2 grades: PVD coated grade “JC8015” for general & mold steel, stainless steel and cast iron. Cermet grade “CX75” for improving surface roughness.

Cutting performance

① Tool life comparison



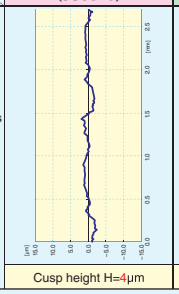
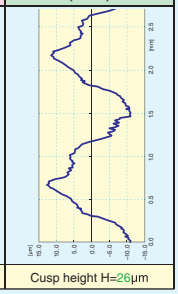
② Surface roughness (After 486m machining)

	XPHT100308ZER-R (JC8015)	Competitor A (PVD)
Photo of Work surface		
Surface roughness (2N) Feed direction	 Ra=0.19μm Rz=1.18μm	 Ra=0.44μm Rz=2.02μm
Machining time	101.2min	101.2min

QM Max MQT type achived good surface roughness and low cusp height even if ap=1.5mm.Frank wear also small.

Material: S50C
Tool dia.: φ16×2N
Cutting conditions:
◦ Vc=603.2m/min (n=12,000min⁻¹)
◦ f=0.4mm/rev (Vf=4,800mm/min)
◦ ap=1.5mm×27pass (Effective), ae=0.12mm
Down cut, Overhung length: ℓ=60mm

③ Cusp height (After 486m machining)

	XPHT100308ZER-R (JC8015)	Competitor A (PVD)
Surface roughness (2N) Vertical direction of feed	 Cusp height H=4μm	 Cusp height H=26μm

Material: S50C
Tool dia.: φ16×2N
Cutting conditions:
◦ Vc=603.2m/min (n=12,000min⁻¹)
◦ f=0.4mm/rev (Vf=4,800mm/min)
◦ ap=1.5mm, ae=0.12mm
Down cut, Overhung length: ℓ=60mm

QM MAX MQT TYPE

MQT TYPE ■ Modular head MQT type

Through coolant hole

Fig.1

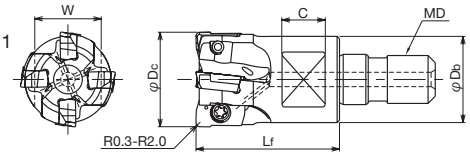
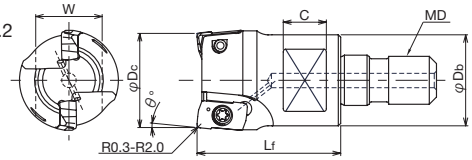


Fig.2



Inclined angle θ°	Cat No.	Stock	No. of inserts	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Applicable Inserts	Parts: Clamp Screw	Parts: Wrench	Fig.
0°	MQT-2016A00-M8	●	2	16	23	14	M8	8	12	XP＊＊100308ZER-R YPHW1003＊＊Z＊R-＊＊ ZPMT1003＊＊ZER-PL	TSW-2556H	A-08	1
	MQT-4020A00-M10	●	4	20	30	18	M10	9	14		TSW-2556H		
	MQT-5025A00-M12	●	5	25	35	22.5	M12	10	17		DSW-2563H		
	MQT-6035A00-M16	●	6	35	43	29	M16	12	22		DSW-2563H		
3°	MQT-2016A03-M8	●	2	16	23	14	M8	8	12		TSW-2556H		2
	MQT-2020A03-M10	●	2	20	30	18	M10	9	14		TSW-2556H		
5°	MQT-2016A05-M8	●	2	16	23	14	M8	8	12		TSW-2556H		
	MQT-2020A05-M10	●	2	20	30	18	M10	9	14		TSW-2556H		

Note) 1. All cutters are supplied without inserts.
2. All cutters are supplied without wrench & MOLY.

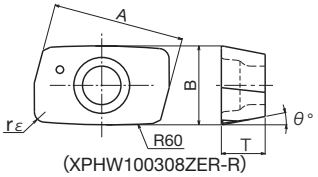
Clamp Screw	Recommended Torque (N•m)
TSW-2556H	1.1
DSW-2563H	1.1

QM MAX MQT TYPE

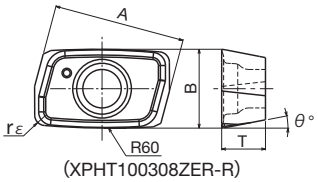
MQT TYPE

■ Inserts

For tilted wall finishing
(XPHW100308ZER-R) (XPHT100308ZER-R)

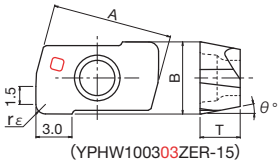


(XPHW100308ZER-R)

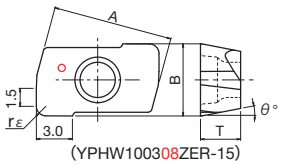


(XPHT100308ZER-R)

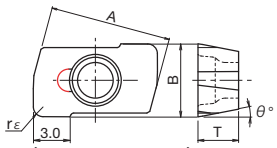
For finishing side face
(YPHW1003＊＊ZER-15) (YPHW100308ZER-F)
(YPHW100308ZTR-F1)



(YPHW100303ZER-15)

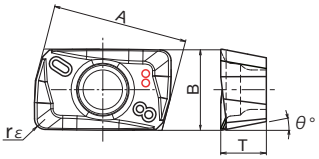


(YPHW100308ZER-15)



(YPHW100308ZER-F)

Shoulder milling insert (From semi-finishing to finishing)
(ZPMT1003＊＊ZER-PL)



Type	Cat. No.	Tole-rance	PVD coated			Cermet	Dimensions (mm)				
			JC8015	JC8118	DH102	CX75	A	T	B	rε	θ°
NEW For tilted wall finishing	**XPHW100308ZER-R**	H	●			◎	10.06	3.35	6	0.8	11°
	XPHT100308ZER-R	H	●			◎	10.06	3.35	6	0.8	11°
For finishing side face	**YPHW100303ZER-15**	H	●		●	●	10.06	3.35	6	0.3	11°
	YPHW100308ZER-15	H			●	●	10.06	3.35	6	0.8	11°
	YPHW100308ZER-F	H	●				10.06	3.35	6	0.8	11°
NEW Shoulder milling insert (From semi-finishing to finishing)	**ZPMT100304ZER-PL**	M		◎	◎	◎	10.08	3.4	6	0.4	11°
	ZPMT100308ZER-PL	M	○	◎	●	●	10.08	3.4	6	0.8	11°
	ZPMT100320ZER-PL	M		◎	◎	◎	10.08	3.4	6	2.0	11°

10 inserts per case.

● Standard stock items ◎: Soon to be stocked ○: Soon to be deleted

QM MAX MQT TYPE

MQT TYPE Definition of flute shape for programming

MQT-...A03/A05 Holder

Fig.1 XPHW/T Type

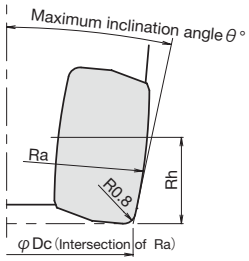
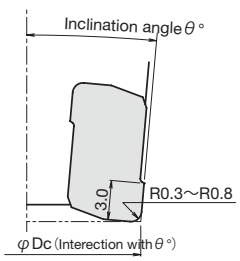


Fig.2 YPHW Type



° Accuracy of tool dia. with master inserts –0.02~–0.05

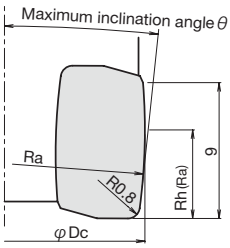
Fig.	Cat No.	Dc (mm)	Ra (mm)	Rh (mm)	Inclination angle
1	MQT-2016A03-M8	φ15.5	R64.19	8.76	1°~6°
1	MQT-2016A05-M8	φ15.5	R64.34	10.98	3°~8°
1	MQT-2020A03-M10	φ19.5	R63.34	8.67	1°~6°
1	MQT-2020A05-M10	φ19.5	R63.46	10.85	3°~8°

° Tool dia. with YPHW Type inserts (Inclination angle: 3°、5°)

Fig.	Cat No.	Dc (mm)	Inclination angle
2	MQT-2016A03-M8	φ16	3°
2	MQT-2016A05-M8	φ16	5°
2	MQT-2020A03-M10	φ20	3°
2	MQT-2020A05-M10	φ20	5°

MQT-...A00 Holder

Fig. 3 XPHW/Type



° Accuracy of tool dia. with master inserts –0.02~–0.05

Fig.	Cat No.	Dc (mm)	Ra (mm)	Rh (mm)	Inclination angle
3	MQT-2016A00-M8	φ16	R63.27	5.48	0°~3°
3	MQT-4020A00-M10	φ20	R64.29	5.48	0°~3°
3	MQT-5025A00-M12	φ25	R63.26	5.48	0°~3°
3	MQT-6035A00-M16	φ35	R62.16	5.48	0°~3°

° Tool dia. with YPHW Type inserts (Inclination angle: 0°)

Fig.	Cat No.	Dc (mm)	Inclination angle
–	MQT-2016A00-M8	φ16	0°
–	MQT-4020A00-M10	φ20	0°
–	MQT-5025A00-M12	φ25	0°
–	MQT-6035A00-M16	φ35	0°

MQT TYPE Recommended cutting conditions for MQT

MQT Type + MSN Carbide Shank holder

Basic parameter of cutting conditions <Tilted wall finishing>: XPHT/W Type

Work	L/D	~3.5	3.5~5	5~6.5	6.5~
	Vc	1	x0.75	x0.6	x0.5
Carbon steel S50C, S55C (C50, C55) Below 250HB	ap (mm)	≦1.5	≦1.2	≦1.2	≦1.0
	ae (mm)	<0.12	<0.10	<0.10	<0.10
	Vc (m/min)	600	450	360	300
	fz (mm/t)	0.2	0.2	0.2	0.2
Die steel SKD61, SKD11 (1.2344,1.2379) Below 255HB	ap (mm)	≦1.5	≦1.2	≦1.2	≦1.0
	ae (mm)	<0.12	<0.10	<0.10	<0.10
	Vc (m/min)	500	375	300	250
	fz (mm/t)	0.2	0.2	0.2	0.2
Mold steel HPM7, PX5, P20 (1.2311, P20) 30~36HRC	ap (mm)	≦1.2	≦1.0	≦1.0	≦0.8
	ae (mm)	<0.12	<0.10	<0.10	<0.10
	Vc (m/min)	450	337	270	225
	fz (mm/t)	0.2	0.2	0.2	0.2
Mold steel NAK80, HPM1, P21 (1.2311,P21) 38~43HRC	ap (mm)	≦1.0	≦0.8	≦0.8	≦0.6
	ae (mm)	<0.12	<0.10	<0.10	<0.10
	Vc (m/min)	400	300	240	200
	fz (mm/t)	0.2	0.2	0.2	0.2
Hardened die steel SKD61, DAC, DHA (1.2344,1.2379) 42~52HRC	ap (mm)	≦1.0	≦0.8	≦0.8	≦0.6
	ae (mm)	<0.10	<0.08	<0.08	<0.08
	Vc (m/min)	250	187	150	125
	fz (mm/t)	0.15	0.15	0.15	0.15
Grey & Nodular cast iron FC, FCD (GG,GGG) Below 300HB	ap (mm)	≦1.5	≦1.2	≦1.2	≦1.0
	ae (mm)	<0.12	<0.10	<0.10	<0.10
	Vc (m/min)	600	450	360	300
	fz (mm/t)	0.25	0.25	0.25	0.25
Stainless steel SUS304 Below 250HB	ap (mm)	≦1.2	≦1.0	≦1.0	≦0.8
	ae (mm)	<0.12	<0.10	<0.10	<0.10
	Vc (m/min)	500	375	300	250
	fz (mm/t)	0.2	0.2	0.2	0.2

Theoretical cusp height: XPHT/W Type

Cusp height (μm)	ap(mm)
0.50	0.5
0.71	0.6
0.97	0.7
1.27	0.8
1.61	0.9
1.98	1.0
2.40	1.1
2.86	1.2
3.35	1.3
3.89	1.4
4.46	1.5

NOTE

1) The figure to be adjusted according to the machine rigidity or work regidity.
2) In case of chatter occurring, recommend to reduce the depth of cut ap and Pick feed ae.
3) Use air blow.
4) In case carbon steel or die steel machining by CX75 inserts, reduce 80% above Vc, fz.

1) Shape of cutting edge is different depends on combination of inserts and holder. Please refer to the table above.
2) Regarding detail of the tool shape we will provide DXF file so please contact our closest distributor.

QM MILL MPM TYPE

Low cutting force

Adopted unique 3D geometry insert with low cutting force and multi blades, even if small insert, QM MILL achieved high speed and high efficient machining. G-Body

Possible to use on low power and compact machines such as BT30.

Multi blades

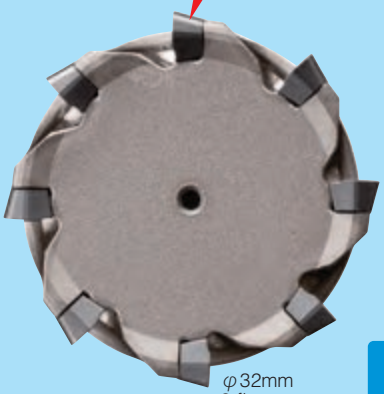
Diameter 10mm: 2 flutes and diameter 32mm : 8 flutes

Vibration free

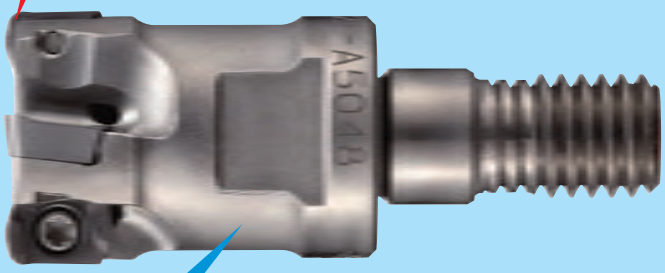
"QM MILL" MPM type can achieve high efficient machining and longer tool life by controlling the vibration with the combination of MSN carbide shank holder.

Insert with low cutting force geometry

High productivity by multi blades
High metal removal rate



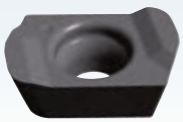
φ32mm
8 flutes



Adopted high rigid G-Body. Highly accurate G-body can achieve high feed rate and longer tool life

Insert variation

High feed and shoulder milling is possible with the same body.

High feed insert	High feed insert for unfavourable condition	Shoulder milling insert Deflection below 0.02mm	For high hardened steel insert	NEW "MIRROR INSERT" for finishing side & bottom face
				
EOMT0602..ZER (R1.0,2.0)	EOMW060210ZER	ZOMT0602...ZER (R0.2,0.4,0.8)	EOHW060210ZTR	YOHW0602...ZER-12

"JC5118" can cut general steel, hardened material, Titanium alloy and heat-resistant alloy.
Tough grade "JC8050" for interrupted cutting. "JC7560" improved heat-fracture and impact strength for rough milling.
"DH102" for hardened steel at high feed machining.

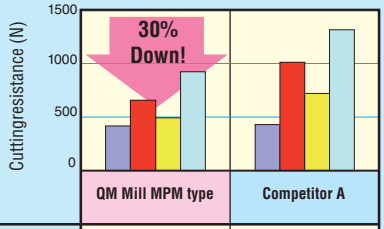
QM MILL MPMTYPE

■ Cutting performance of QM MILL against competitor

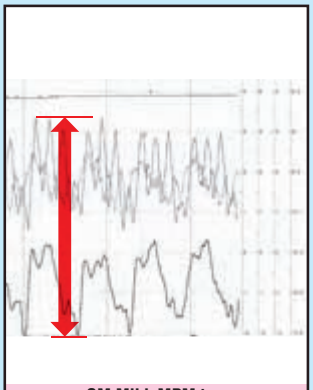
Cutting force comparison (f=5.2mm/rev)

Material: S50C (C50, 1049)
Cutting conditions: Dc=16mm, Vc=120m/min, ap=0.3mm, ae=9mm, Down Cut

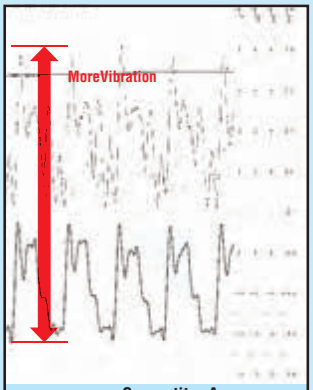
Low Cutting Force



	QM Mill MPM type	Competitor A
X Feed force	420	430
Y Main force	660	1020
Z Back force	500	730
Resultant force	928	1326



QM MILL MPM type
f=5.2mm/rev

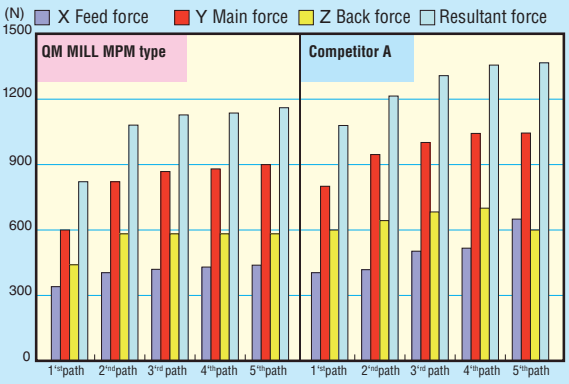


Competitor A
f=5.2mm/rev

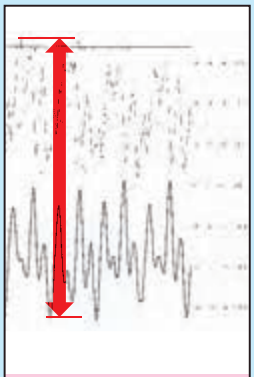
Cutting force comparison (f=4.0mm/rev)

Material: S50C (C50,1049)
Cutting conditions: Dc=16mm,Vc=120m/min, ap=0.3mm, ae=9mm, Down Cut

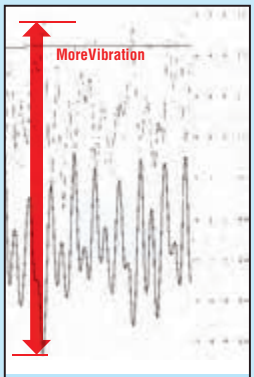
Vibration Free



In QM MILL, very less variation of cutting force after 3rd path



QM MILL MPM type:
5th path



Competitor: 5th path

Chip shape (f=4.0mm/rev)

	1st path	2nd path	3rd path	4th path	5th path
QM MILL MPM type					
Competitor A					

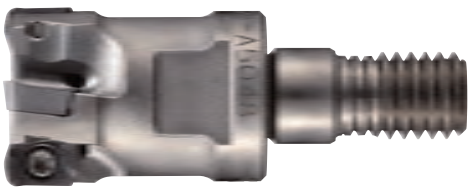
Chips by QM MILL show smooth cut and less heat generation.

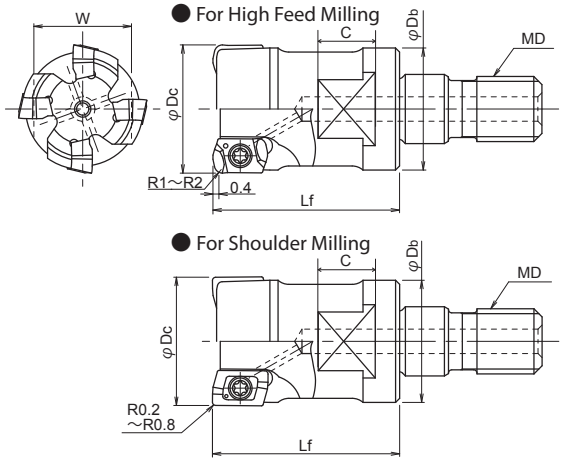
QM MILL MPM TYPE

G-Body

Through Coolant Hole

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





■ BODY

Cat. No.	Stock	No. of flutes	Dimensions(mm) φDc	Lf φ	Db	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
MPM-2010-M6	●	2	10	18	9.5	M6	6.5	8	EO※※0602※※Z※R ZOMT0602※※ZER	DSW-1840H	A-06
MPM-2011-M6	●	2	11	18	9.7	M6	6.5	8			
MPM-3012-M6	●	3	12	20	11.2	M6	6.5	8			
MPM-3013-M6	●	3	13	20	11.5	M6	6.5	8			
MPM-4016-M8	●	4	16	23	15	M8	6.5	12			
MPM-4017-M8	●	4	17	23	15	M8	8	12			
MPM-5020-M10	●	5	20	30	19	M10	8	14			
MPM-5021-M10	●	5	21	30	19	M10	9	14			
MPM-6025-M12	●	6	25	35	23.6	M12	9	17			
MPM-7030-M16	□	7	30	43	29	M16	10	22			
MPM-8032-M16	●	8	32	43	29	M16	12	22			

Note) 1. Please refer page B092-B106 for recommended cutting conditions.
2. All cutters are supplie dwithout inserts
3. Please refer page B009 for recommended tightening torque

Arbor B193

Clamp Screw	Recommended torque (N•m)
DSW-1840H	0.4

● Standard stock items □: Stock in Japan ○: Soon to be deleted

QM MILL — MPM TYPE

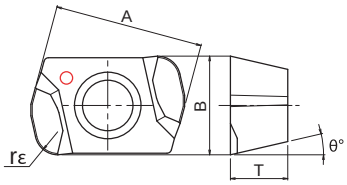
MPM / PME TYPE

■ INSERTS

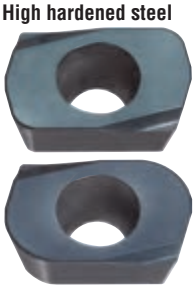
High feed insert

Grade (JC7560)

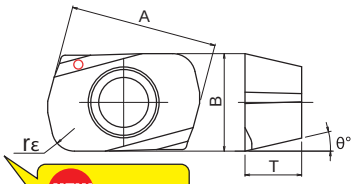
Cutting condition B092~B094



High hardened steel



Cutting condition B095~B096

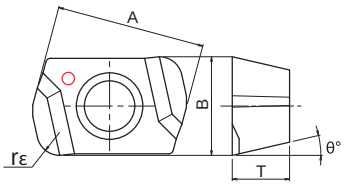


NEW R2 type

High feed insert for unfavourable condition

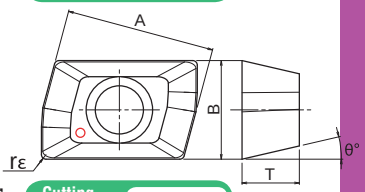
Grade (JC7560)

Cutting condition B092~B094



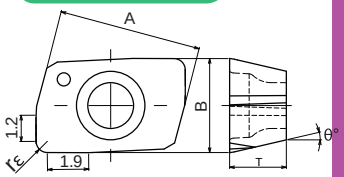
Shoulder milling insert

Cutting condition B097~B099



NEW "MIRROR INSERT" for finishing side & bottom face

Cutting condition B101~B106

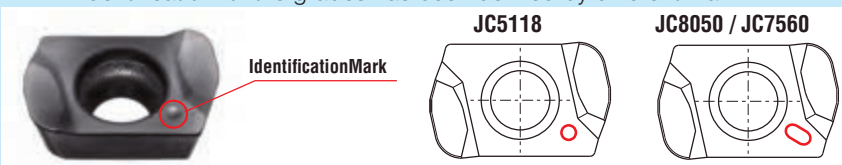


Type	Cat. No.	Tole-rance	PVD coated						Dimensions (mm)				
			JC5118	JC8015	DH102	JC7560	JC8050	JC8118	A	T	B	rε	θ°
High feed insert	EOMT060210ZER	M	○			●	●	●	6.5	2.5	4.3	1.0	13°
	EOMT060220ZER	M	○				●	●	6.5	2.5	4.3	2.0	13°
High feed insert for unfavourable condition	EOMW060210ZER	M	○			●	●	●	6.5	2.5	4.3	1.0	13°
High hardened steel	EOHW060210ZTR	H			●			●	6.5	2.5	4.3	1.0	13°
	NEW EOHW060220ZTR	H			●			●	6.5	2.5	4.3	2.0	13°
Shoulder milling insert	ZOMT060202ZER	M	●				●		6.5	2.5	4.3	0.2	13°
	ZOMT060204ZER	M	●				●		6.5	2.5	4.3	0.4	13°
	ZOMT060208ZER	M	●				●		6.5	2.5	4.3	0.8	13°
"Mirror Insert" for finishing side & bottom face	NEW YOHW060203ZER-12	H		●	●				6.5	2.6	4.3	0.3	13°
	NEW YOHW060205ZER-12	H		●	●				6.5	2.6	4.3	0.5	13°
	NEW YOHW060208ZER-12	H		●	●				6.5	2.6	4.3	0.8	13°

10 inserts per case.

Identification of grade for QM MILL insert

Identification for the grades has been defined by different mark.



● Standard stock items ☐ Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MPM type (EOMT/W type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		10/11					12/13					16/17				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50,C55) Below 250HB	JC7560 (JC8050) (JC5118) (JC8118)	50	0.3	~6	3,820	4,580	60	0.3	~8	3,180	5,720	70	0.4	~12	2,390	8,600
		75	0.25	~6	3,440	3,720	80	0.25	~8	2,860	4,630	120	0.3	~12	2,150	6,970
		100	0.2	~5	3,060	2,940	110	0.2	~7	2,540	3,660	160	0.25	~12	1,910	5,500
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC8050) (JC5118) (JC8118)	50	0.3	~6	3,500	4,200	60	0.3	~8	2,920	5,260	70	0.4	~12	2,190	7,880
		75	0.2	~6	3,150	3,400	80	0.2	~8	2,630	4,260	120	0.3	~12	1,970	6,380
		100	0.15	~5	2,800	2,690	110	0.15	~7	2,340	3,370	160	0.25	~12	1,750	4,900
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 (JC8050) (JC5118) (JC8118)	50	0.3	~6	3,500	4,200	60	0.3	~8	2,920	5,260	70	0.4	~12	2,190	7,880
		75	0.25	~6	3,150	3,400	80	0.25	~8	2,630	4,260	120	0.3	~12	1,970	6,380
		100	0.2	~5	2,800	2,690	110	0.2	~7	2,340	3,370	160	0.25	~12	1,750	4,900
Mold steel NAK80, HPM1, P21 (1.2311,P21) 38-43HRC	JC8050 (JC5118) (JC8118)	50	0.3	~6	2,860	3,150	60	0.3	~8	2,390	3,940	70	0.3	~12	1,790	5,010
		75	0.25	~6	2,570	2,540	80	0.25	~8	2,150	3,190	120	0.25	~12	1,610	4,060
		100	0.2	~5	2,290	2,010	110	0.2	~7	1,910	2,520	160	0.2	~12	1,430	3,200
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 JC5118 (JC8050)	50	0.25	~6	2,230	2,230	60	0.25	~8	1,860	2,790	70	0.3	~12	1,390	3,340
		75	0.15	~6	2,010	1,810	80	0.15	~8	1,670	2,250	120	0.2	~12	1,250	2,700
		100	–	–	–	–	110	–	–	–	–	160	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8118 JC5118 EOMWtype	50	0.1	~6	950	470	60	0.1	~8	800	600	70	0.15	~12	600	600
		75	–	–	–	–	80	–	–	–	–	120	0.1	~12	540	490
		100	–	–	–	–	110	–	–	–	–	160	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 JC5118 (JC7560)	50	0.3	~6	4,780	5,740	60	0.3	~8	3,980	7,160	70	0.4	~12	2,980	10,730
		75	0.25	~6	4,300	4,640	80	0.25	~8	3,580	5,800	120	0.35	~12	2,680	8,680
		100	0.2	~6	3,820	3,670	110	0.2	~8	3,180	4,580	160	0.3	~12	2,380	6,850
Stainless steel SUS304 Below 250HB	JC7560 (JC8050)	50	0.3	~6	3,820	4,580	60	0.3	~8	3,180	5,720	70	0.4	~12	2,390	8,600
		75	0.2	~6	3,440	3,720	80	0.2	~8	2,860	4,630	120	0.3	~12	2,150	6,880
		100	0.15	~5	3,060	2,940	110	0.15	~7	2,540	3,660	160	0.25	~12	1,910	5,350
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050) (JC8118)	50	0.3	~6	1,910	1,910	60	0.3	~8	1,590	2,380	70	0.3	~12	1,190	2,380
		75	0.2	~6	1,720	1,550	80	0.2	~8	1,430	1,930	120	0.25	~12	1,070	1,930
		100	0.15	~5	1,530	1,220	110	0.15	~7	1,270	1,520	160	0.2	~12	950	1,520
Inconel (INCO718)	JC8118 JC5118 (JC8050) (JC7560)	50	0.3	~6	950	760	60	0.3	~8	800	960	70	0.3	~12	600	960
		75	0.2	~6	850	760	80	0.2	~8	720	780	120	0.25	~12	540	780
		100	0.15	~5	760	610	110	0.15	~7	640	610	160	0.2	~12	480	610

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3)If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4)Use air blow to flush the chip sout.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MPM type (EOMT/W type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		20/21					25				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (JC5118) (JC8118)	70	0.4	~14	1,910	8,600	90	0.4	~18	1,530	8,260
		120	0.3	~14	1,720	6,970	140	0.3	~18	1,380	6,710
		190	0.25	~14	1,530	5,510	210	0.25	~18	1,220	5,270
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC8050) (JC5118) (JC8118)	70	0.4	~14	1,750	7,880	90	0.4	~18	1,400	7,560
		120	0.3	~14	1,580	6,400	140	0.3	~18	1,260	6,120
		190	0.25	~14	1,400	5,040	210	0.25	~18	1,120	4,840
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 (JC8050) (JC5118) (JC8118)	70	0.4	~14	1,750	7,880	90	0.4	~18	1,400	7,560
		120	0.3	~14	1,580	6,400	140	0.3	~18	1,260	6,120
		190	0.25	~14	1,400	5,040	210	0.25	~18	1,120	4,840
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC5118) (JC8118)	70	0.3	~14	1,430	5,000	90	0.3	~18	1,150	4,830
		120	0.25	~14	1,290	4,060	140	0.25	~18	1,040	3,930
		190	0.2	~14	1,140	3,190	210	0.2	~18	920	3,090
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 JC5118 (JC8050)	70	0.3	~14	1,110	3,330	90	0.3	~18	890	3,200
		120	0.2	~14	1,000	2,700	140	0.2	~18	800	2,590
		190	–	–	–	–	210	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8118 JC5118 EOMWtype	70	0.15	~14	480	600	90	0.15	~18	380	570
		120	0.1	~14	430	480	140	0.1	~18	340	460
		190	–	–	–	–	210	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 JC5118 (JC7560)	70	0.4	~14	2,390	10,750	90	0.4	~18	1,910	10,310
		120	0.35	~14	2,150	8,710	140	0.35	~18	1,720	8,360
		190	0.3	~14	1,910	6,880	210	0.3	~18	1,530	6,610
Stainless steel SUS304 Below 250HB	JC7560 (JC8050)	70	0.4	~14	1,910	8,600	90	0.4	~18	1,530	8,260
		120	0.3	~14	1,720	6,970	140	0.3	~18	1,380	6,710
		190	0.25	~14	1,530	5,510	210	0.25	~18	1,220	5,270
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050) (JC8118)	70	0.3	~14	950	2,380	90	0.3	~18	760	2,280
		120	0.25	~14	860	1,940	140	0.25	~18	680	1,840
		190	0.2	~14	760	1,520	210	0.2	~18	610	1,460
Inconel (INCO718)	JC8118 JC5118 (JC8050) (JC7560)	70	0.3	~14	480	960	90	0.3	~18	380	910
		120	0.25	~14	430	860	140	0.25	~18	340	730
		190	0.2	~14	380	610	210	0.2	~18	300	580

ℓ :Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3)If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4)Use air blow to flush the chip sout.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MPM type (EOMT/W type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		30					32				
		No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (JC5118) (JC8118)	100	0.4	~22	1,270	8,000	100	0.4	~24	1,190	8,570
		150	0.3	~22	1,140	6,460	150	0.3	~24	1,070	6,930
		210	0.25	~22	1,020	5,140	210	0.25	~24	950	5,470
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC8050) (JC5118) (JC8118)	100	0.4	~22	1,170	7,370	100	0.4	~24	1,090	7,850
		150	0.3	~22	1,050	5,950	150	0.3	~24	980	6,350
		210	0.25	~22	940	5,330	210	0.25	~24	870	5,010
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 (JC8050) (JC5118) (JC8118)	100	0.4	~22	1,170	7,370	100	0.4	~24	1,090	7,850
		150	0.3	~22	1,050	5,950	150	0.3	~24	980	6,350
		210	0.25	~22	940	5,330	210	0.25	~24	870	5,010
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC5118) (JC8118)	100	0.3	~22	950	4,660	100	0.3	~24	900	5,040
		150	0.25	~22	860	3,790	150	0.25	~24	810	4,080
		210	0.2	~22	760	2,980	210	0.2	~24	720	3,220
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 JC5118 (JC8050)	100	0.3	~22	740	3,110	100	0.3	~24	700	3,360
		150	0.2	~22	670	2,530	150	0.2	~24	600	2,590
		210	0.15	~22	590	1,980	210	0.15	~24	500	1,920
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8118 JC5118 EOMWtype	100	0.15	~22	320	560	100	0.15	~24	300	600
		150	0.1	~22	290	460	150	0.1	~24	270	490
		210	–	–	–	–	210	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 JC5118 (JC7560)	100	0.4	~22	1,590	10,000	100	0.4	~24	1,490	10,730
		150	0.35	~22	1,430	8,110	150	0.35	~24	1,340	8,680
		210	0.3	~22	1,270	6,400	210	0.3	~24	1,190	6,850
Stainless steel SUS304 Below 250HB	JC7560 (JC8050)	100	0.4	~22	1,270	8,000	100	0.4	~24	1,190	8,570
		150	0.3	~22	1,140	6,460	150	0.3	~24	1,070	6,930
		210	0.25	~22	1,020	5,140	210	0.25	~24	950	5,470
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050) (JC8118)	100	0.3	~22	640	2,240	100	0.3	~24	600	2,400
		150	0.25	~22	580	1,830	150	0.25	~24	540	1,940
		210	0.2	~22	510	1,430	210	0.2	~24	480	1,540
Inconel (INCO718)	JC8118 JC5118 (JC8050) (JC7560)	100	0.3	~22	320	900	100	0.3	~24	300	960
		150	0.25	~22	290	730	150	0.25	~24	270	780
		210	0.2	~22	260	580	210	0.2	~24	240	610

ℓ :Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3)If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4)Use air blow to flush the chip sout.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● MPM type (EOHW type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		10/11					12/13					16/17				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	40	0.20	~6	2,880	2,880	50	0.20	~7	2,390	3,590	65	0.25	~12	1,790	4,300
		60	0.15	~6	2,570	2,060	70	0.15	~7	2,150	2,580	95	0.20	~12	1,610	3,090
		80	0.10	~6	2,290	1,370	95	0.10	~7	1,910	1,720	125	0.10	~12	1,430	2,080
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	40	0.15	~6	2,550	1,530	50	0.15	~7	2,120	1,900	65	0.15	~12	1,590	1,900
		60	0.10	~6	2,300	1,240	70	0.10	~7	1,910	1,550	95	0.10	~12	1,430	1,520
		80	–	–	–	–	95	–	–	–	–	125	–	–	–	–

ℓ :Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3)If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4)Use air blow to flush the chip sout.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● MPM type (EOHW type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		20/21					25				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	80	0.25	~14	1,430	4,290	100	0.25	~18	1,150	4,140
		120	0.20	~14	1,280	3,100	150	0.20	~18	1,040	3,000
		160	0.10	~14	1,140	2,050	200	0.10	~18	920	1,990
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	80	0.15	~14	1,270	1,900	100	0.15	~18	1,020	1,840
		120	0.10	~14	1,140	1,540	150	0.10	~18	920	1,490
		160	–	–	–	–	200	–	–	–	–

Work Materials	Insert Grades	Tool dia. (mm)									
		30					32				
		No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	120	0.25	~22	950	3,990	120	0.25	~24	890	4,320
		180	0.20	~22	860	2,890	180	0.20	~24	810	3,110
		240	0.10	~22	760	1,920	240	0.10	~24	720	2,070
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	120	0.15	~22	850	1,780	120	0.15	~24	800	1,920
		180	0.10	~22	760	1,430	180	0.10	~24	720	1,560
		240	–	–	–	–	240	–	–	–	–

ℓ : Overhung length, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, V_f: Feed speed

■NOTE

1)The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2)In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3)If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4)Use air blow to flush the chip sout.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MPM type (ZOMT type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		10/11					12/13					16/17				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	50	~4.0	~6.0	5,090	810	60	~4.0	~8.0	4,240	1,020	70	~5.0	~10.0	3,180	1,020
		75	~1.2	~1.8	4,580	640	80	~1.7	~2.6	3,820	800	120	~2.0	~3.0	2,860	800
		100	~0.5	~0.8	4,070	490	110	~0.6	~1.2	3,390	610	160	~0.7	~1.3	2,540	610
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	50	~4.0	~6.0	4,780	570	60	~4.0	~8.0	3,980	720	70	~5.0	~10.0	2,990	720
		75	~1.2	~1.8	4,300	430	80	~1.7	~2.6	3,580	540	120	~2.0	~3.0	2,690	540
		100	~0.5	~0.8	3,820	310	110	~0.6	~1.2	3,180	380	160	~0.7	~1.3	2,390	380
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 (JC5118)	50	~3.0	~4.0	3,820	460	60	~3.0	~4.5	3,180	570	70	~4.0	~6.0	2,390	570
		75	~1.2	~1.6	3,440	340	80	~1.3	~1.8	2,860	430	120	~1.7	~2.2	2,150	430
		100	~0.5	~0.8	3,060	240	110	~0.6	~1.0	2,540	300	160	~0.6	~1.1	1,910	300
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	50	~4.0	~6.0	4,780	760	60	~4.0	~8.0	3,980	960	70	~5.0	~10.0	2,990	960
		75	~1.2	~1.8	4,300	600	80	~1.7	~2.6	3,580	750	120	~2.0	~3.0	2,690	750
		100	~0.5	~0.8	3,980	480	110	~0.6	~1.2	3,180	570	160	~0.7	~1.3	2,390	570
Stainless steel SUS304 Below 250HB	JC8050	50	~4.0	~6.0	4,780	570	60	~4.0	~8.0	3,980	720	70	~5.0	~10.0	2,990	720
		75	~1.2	~1.8	4,300	430	80	~1.7	~2.6	3,580	540	120	~2.0	~3.0	2,690	540
		100	~0.5	~0.8	3,820	310	110	~0.6	~1.2	3,180	380	160	~0.7	~1.3	2,390	380

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3)If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4)Use air blow to flush the chip sout.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MPM type (ZOMT type insert) + MS Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		20/21					25				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	70	~5.0	~16.0	2,550	1,020	90	~5.0	~20.0	2,040	980
		120	~4.0	~8.0	2,300	800	140	~4.0	~10.0	1,840	770
		190	~3.0	~4.0	2,040	610	210	~3.0	~8.0	1,630	590
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	70	~5.0	~16.0	2,390	720	90	~5.0	~20.0	1,910	690
		120	~4.0	~8.0	2,150	540	140	~4.0	~10.0	1,720	520
		190	~3.0	~4.0	1,910	380	210	~3.0	~8.0	1,530	370
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 (JC5118)	70	~4.0	~16.0	1,910	570	90	~4.0	~20.0	1,530	550
		120	~3.0	~8.0	1,720	430	140	~3.0	~10.0	1,380	410
		190	~2.0	~4.0	1,530	300	210	~2.0	~8.0	1,220	290
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	70	~5.0	~18.0	2,390	960	90	~5.0	~25.0	1,910	920
		120	~4.0	~10.0	2,150	750	140	~4.0	~12.0	1,720	720
		190	~3.0	~5.0	1,910	570	210	~3.0	~9.0	1,530	550
Stainless steel SUS304 Below 250HB	JC8050	70	~5.0	~16.0	2,390	720	90	~5.0	~20.0	1,910	690
		120	~4.0	~8.0	2,150	540	140	~4.0	~10.0	1,720	520
		190	~3.0	~4.0	1,910	380	210	~3.0	~8.0	1,530	370

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3)If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4)Use air blow to flush the chip sout.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MPM type (ZOMT type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		30					32				
		No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	100	~5.0	~22.0	1,700	950	100	~5.0	~22.0	1,590	1,020
		150	~4.0	~15.0	1,530	750	150	~4.0	~15.0	1,430	800
		210	~3.0	~8.0	1,360	570	210	~3.0	~8.0	1,270	610
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	100	~5.0	~22.0	1,590	670	100	~5.0	~22.0	1,490	720
		150	~4.0	~15.0	1,430	500	150	~4.0	~15.0	1,340	540
		210	~3.0	~8.0	1,270	360	210	~3.0	~8.0	1,190	380
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 (JC5118)	100	~5.0	~22.0	1,270	530	100	~5.0	~22.0	1,190	570
		150	~4.0	~15.0	1,140	400	150	~4.0	~15.0	1,070	430
		210	~3.0	~8.0	1,020	280	210	~3.0	~8.0	950	300
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	100	~5.0	~24.0	1,590	890	100	~5.0	~24.0	1,490	960
		150	~4.0	~16.0	1,430	700	150	~4.0	~16.0	1,340	750
		210	~3.0	~9.0	1,270	530	210	~3.0	~9.0	1,190	570
Stainless steel SUS304 Below 250HB	JC8050	100	~5.0	~22.0	1,590	670	100	~5.0	~22.0	1,490	720
		150	~4.0	~15.0	1,430	500	150	~4.0	~15.0	1,340	540
		210	~3.0	~8.0	1,270	360	210	~3.0	~8.0	1,190	380

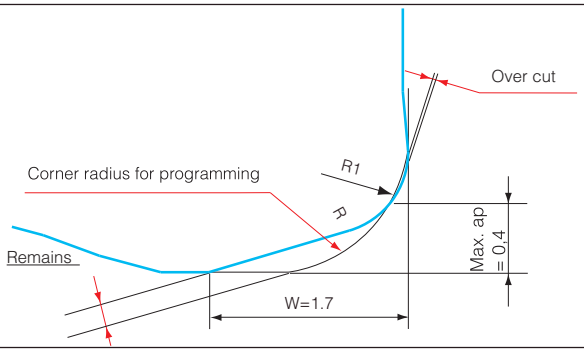
ℓ : Overhung length, ap: Axial depth of cut, ae: Radial depth of cut, n: Spindle speed, Vf: Feed speed

■NOTE

1)The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2)In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping feed per tooth.
3)If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4)Use air blow to flush the chip sout.

QM MILL MPM TYPE

■ Definition of corner radius for programming



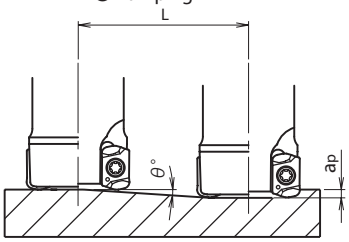
(mm)

Corner radius for programming	Over cut	Remains
R1.0(Recommended)	0	0.17
R1.5	0.09	0.08
R2.0	0.30	0

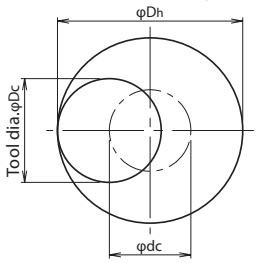
Note) In case of setting corner radius for programming to R2, recommend to use EOMT060220ZER or EOHW060220ZTR.

■ Instructions for profile milling with EO ※※ type insert

● Ramping



● Helical interpolation



●Calculation of tool pass dia.

$$\varphi dc = \varphi Dh - \varphi Dc$$

Tool pass dia. Bore dia. Tool dia.

●Depth of cut per one circle should not exceed max. depth of cut ap.

● Down cutting is recommended, so tool pass rotation should becounterclockwise.

•In case of ramping and helical interpolation, apply 70% or less feed speed from standard cutting condition table.
•In case of drilling, apply 50% or less Z axis feed speed from standard cutting condition table.
•Long continous chips may come out incase of drilling, confirm the correct cuttin gparameters.

Cat.No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation	
				Max.ramping angle θ°	Total cutting length L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)
MPM-2010-M6	10	6.6	0.3	2°18´	7.5	15	18
MPM-2011-M6	11	7.6	0.3	1°54´	9	17	20
MPM-3012-M6	12	8.5	0.3	1°36´	10.7	19	22
MPM-3013-M6	13	9.5	0.3	1°24´	12.3	21	24
MPM-4016-M8	16	12.5	0.4	1°	22.9	27	30
MPM-4017-M8	17	13.5	0.4	0°54´	25.5	29	32
MPM-5020-M10	20	16.5	0.4	0°45´	30.6	35	38
MPM-5021-M10	21	17.5	0.4	0°42´	32.7	37	40
MPM-6025-M12	25	21.5	0.4	0°30´	45.8	45	48
MPM-7030-M16	30	26.5	0.4	0°27´	50.9	55	58
MPM-8032-M16	32	28.5	0.4	0°24´	57.3	59	62

Note) The ramping angle 0.5° or less is recommended (please refer to the above table).

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● MPM type (YOHW type insert) + MSN Carbide Shank Holder

Material to be cut	Grades	Tool dia. (mm)									
		10/11					12/13				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~50	≦1.2	≦0.10	12,800	3,780	~60	≦1.2	≦0.10	10,600	4,770
		75	≦0.8	≦0.08	8,820	2,120	80	≦0.8	≦0.08	7,420	2,670
		100	≦0.6	≦0.08	8,820	1,760	110	≦0.6	≦0.08	7,420	2,230
Die steel (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~50	≦1.0	≦0.10	11,400	3,420	~60	≦1.0	≦0.10	9,550	4,300
		75	≦0.7	≦0.08	7,980	1,920	80	≦0.7	≦0.08	6,690	2,400
		100	≦0.5	≦0.08	7,980	1,600	110	≦0.5	≦0.08	6,690	2,000
Mold steel (1.2311, P20) 30-36HRC	JC8015 (DH102)	~50	≦1.0	≦0.10	11,400	3,420	~60	≦1.0	≦0.10	9,550	4,300
		75	≦0.7	≦0.08	7,980	1,920	80	≦0.7	≦0.08	6,690	2,400
		100	≦0.5	≦0.08	7,980	1,600	110	≦0.5	≦0.08	6,690	2,000
Mold steel (1.2311P21) 38-43HRC	DH102 (JC8015)	~50	≦1.0	≦0.10	8,880	2,130	~60	≦1.0	≦0.10	7,430	2,670
		75	≦0.7	≦0.08	6,180	1,240	80	≦0.7	≦0.08	5,200	1,560
		100	≦0.5	≦0.08	6,180	990	110	≦0.5	≦0.08	5,200	1,250
Hardened die steel (1.2344,1.2379) 42-52HRC	DH102 (JC8015)	~50	≦0.8	≦0.10	6,360	1,270	~60	≦0.8	≦0.10	5,300	1,590
		75	≦0.5	≦0.08	4,440	710	80	≦0.5	≦0.08	3,710	890
		100	–	–	–	–	110	–	–	–	–
Hardened die steel (1.2344, 1.2379) 55-62HRC	DH102	~50	≦0.5	≦0.10	4,740	950	~60	≦0.5	≦0.10	3,980	1,190
		75	≦0.3	≦0.08	3,300	530	80	≦0.3	≦0.08	2,790	670
		100	–	–	–	–	110	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8015 (DH102)	~50	≦1.2	≦0.12	12,600	3,780	~60	≦1.2	≦0.12	10,600	4,770
		75	≦0.8	≦0.10	8,820	2,120	80	≦0.8	≦0.10	7,420	2,670
		100	≦0.6	≦0.08	8,820	1,760	110	≦0.6	≦0.08	7,420	2,230
Stainless steel Below250HB	JC8015 (DH102)	~50	≦1.0	≦0.10	11,400	3,420	~60	≦1.0	≦0.10	9,550	4,300
		75	≦0.7	≦0.08	7,980	1,920	80	≦0.7	≦0.08	6,690	2,400
		100	≦0.5	≦0.08	7,980	1,600	110	≦0.5	≦0.08	6,690	2,000
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~50	≦1.0	≦0.10	2,520	600	~60	≦1.0	≦0.10	2,120	760
		75	≦0.7	≦0.08	1,740	350	80	≦0.7	≦0.08	1,480	450
		100	≦0.5	≦0.08	1,740	280	110	≦0.5	≦0.08	1,480	360

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● MPM type (YOHW type insert) + MSN Carbide Shank Holder

Material to be cut	Grades	Tool dia. (mm)									
		16/17					20/21				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~80	≦1.2	≦0.10	7,960	4,770	~100	≦1.2	≦0.10	6,300	4,770
		120	≦0.8	≦0.08	5,560	2,670	150	≦0.8	≦0.08	4,410	2,670
		160	≦0.6	≦0.08	5,560	2,230	190	≦0.6	≦0.08	4,410	2,230
Die steel (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~80	≦1.0	≦0.10	7,160	4,300	~100	≦1.0	≦0.10	5,700	4,300
		120	≦0.7	≦0.08	5,000	2,400	150	≦0.7	≦0.08	3,990	2,400
		160	≦0.5	≦0.08	5,000	2,000	190	≦0.5	≦0.08	3,990	2,000
Mold steel (1.2311, P20) 30-36HRC	JC8015 (DH102)	~80	≦1.0	≦0.10	7,160	4,300	~100	≦1.0	≦0.10	5,700	4,300
		120	≦0.7	≦0.08	5,000	2,400	150	≦0.7	≦0.08	3,990	2,400
		160	≦0.5	≦0.08	5,000	2,000	190	≦0.5	≦0.08	3,990	2,000
Mold steel (1.2311P21) 38-43HRC	DH102 (JC8015)	~80	≦1.0	≦0.10	5,560	2,670	~100	≦1.0	≦0.10	4,440	2,670
		120	≦0.7	≦0.08	3,900	1,580	150	≦0.7	≦0.08	3,090	1,560
		160	≦0.5	≦0.08	3,900	1,250	190	≦0.5	≦0.08	3,090	1,250
Hardened die steel (1.2344,1.2379) 42-52HRC	DH102 (JC8015)	~80	≦0.8	≦0.10	3,980	1,590	~100	≦0.8	≦0.10	3,180	1,590
		120	≦0.5	≦0.08	2,780	890	150	≦0.5	≦0.08	2,220	890
		160	–	–	–	–	190	–	–	–	–
Hardened die steel (1.2344, 1.2379) 55-62HRC	DH102	~80	≦0.5	≦0.10	2,980	1,190	~100	≦0.5	≦0.10	2,370	1,190
		120	≦0.3	≦0.08	2,080	670	150	≦0.3	≦0.08	1,650	670
		160	–	–	–	–	190	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8015 (DH102)	~80	≦1.2	≦0.12	7,960	4,770	~100	≦1.2	≦0.12	6,300	4,770
		120	≦0.8	≦0.10	5,560	2,670	150	≦0.8	≦0.10	4,410	2,670
		160	≦0.6	≦0.08	5,560	2,230	190	≦0.6	≦0.08	4,410	2,230
Stainless steel Below250HB	JC8015 (DH102)	~80	≦1.0	≦0.10	7,160	4,300	~100	≦1.0	≦0.10	5,700	4,300
		120	≦0.7	≦0.08	5,000	2,400	150	≦0.7	≦0.08	3,990	2,400
		160	≦0.5	≦0.08	5,000	2,000	190	≦0.5	≦0.08	3,990	2,000
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~80	≦1.0	≦0.10	1,160	760	~100	≦1.0	≦0.10	1,260	760
		120	≦0.7	≦0.08	1,120	450	150	≦0.7	≦0.08	870	450
		160	≦0.5	≦0.08	1,120	360	190	≦0.5	≦0.08	870	360

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● MPM type (YOHW type insert) + MSN Carbide Shank Holder

Material to be cut	Grades	Tool dia. (mm)														
		25					30					32				
		No. of teeth 6N					No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8015 (DH102)	~120	≦1.2	≦0.10	5,090	4,580	~160	≦1.2	≦0.10	4,200	4,410	~160	≦1.2	≦0.10	3,980	4,770
		190	≦0.8	≦0.08	3,560	2,560	240	≦0.8	≦0.08	2,940	2,470	240	≦0.8	≦0.08	2,780	2,670
		235	≦0.6	≦0.08	3,560	2,140	290	≦0.6	≦0.08	2,940	2,060	290	≦0.6	≦0.08	2,780	2,230
Die steel (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~120	≦1.0	≦0.10	4,580	4,120	~160	≦1.0	≦0.10	3,800	3,990	~160	≦1.0	≦0.10	3,580	4,300
		190	≦0.7	≦0.08	3,200	2,300	240	≦0.7	≦0.08	2,660	2,230	240	≦0.7	≦0.08	2,500	2,400
		235	≦0.5	≦0.08	3,200	1,920	290	≦0.5	≦0.08	2,660	1,860	290	≦0.5	≦0.08	2,500	2,000
Mold steel (1.2311, P20) 30-36HRC	JC8015 (DH102)	~120	≦1.0	≦0.10	4,580	4,120	~160	≦1.0	≦0.10	3,800	3,990	~160	≦1.0	≦0.10	3,580	4,300
		190	≦0.7	≦0.08	3,200	2,300	240	≦0.7	≦0.08	2,660	2,320	240	≦0.7	≦0.08	2,500	2,400
		235	≦0.5	≦0.08	3,200	1,920	290	≦0.5	≦0.08	2,660	1,860	290	≦0.5	≦0.08	2,500	2,000
Mold steel (1.2311, P21) 38-43HRC	DH102 (JC8015)	~120	≦1.0	≦0.10	3,560	2,560	~160	≦1.0	≦0.10	2,960	2,490	~160	≦1.0	≦0.10	2,780	2,670
		190	≦0.7	≦0.08	2,490	1,490	240	≦0.7	≦0.08	2,060	1,440	240	≦0.7	≦0.08	1,950	1,560
		235	≦0.5	≦0.08	2,490	1,200	290	≦0.5	≦0.08	2,060	1,150	290	≦0.5	≦0.08	1,950	1,250
Hardened die steel (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~120	≦0.8	≦0.10	2,550	1,530	~160	≦0.8	≦0.10	2,120	1,480	~160	≦0.8	≦0.10	1,990	1,590
		190	≦0.5	≦0.08	1,780	850	240	≦0.5	≦0.08	1,480	830	240	≦0.5	≦0.08	1,390	890
		235	–	–	–	–	290	–	–	–	–	290	–	–	–	–
Hardened die steel (1.2344, 1.2379) 55-62HRC	DH102	~120	≦0.5	≦0.10	1,910	1,150	~160	≦0.5	≦0.10	1,580	1,110	~160	≦0.5	≦0.10	1,490	1,190
		190	≦0.3	≦0.08	1,340	640	240	≦0.3	≦0.08	1,100	620	240	≦0.3	≦0.08	1,040	670
		235	–	–	–	–	290	–	–	–	–	290	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8015 (DH102)	~120	≦1.2	≦0.12	5,090	4,580	~160	≦1.2	≦0.12	4,200	4,410	~160	≦1.2	≦0.12	3,980	4,770
		190	≦0.8	≦0.10	3,560	2,560	240	≦0.8	≦0.10	2,940	2,470	240	≦0.8	≦0.10	2,780	2,670
		235	≦0.6	≦0.08	3,560	2,140	290	≦0.6	≦0.08	2,940	2,060	290	≦0.6	≦0.08	2,780	2,230
Stainless steel Below 250HB	JC8015 (DH102)	~120	≦1.0	≦0.10	4,580	4,120	~160	≦1.0	≦0.10	3,800	3,990	~160	≦1.0	≦0.10	3,580	4,300
		190	≦0.7	≦0.08	3,200	2,300	240	≦0.7	≦0.08	2,660	2,230	240	≦0.7	≦0.08	2,500	2,400
		235	≦0.5	≦0.08	3,200	1,920	290	≦0.5	≦0.08	2,660	1,860	290	≦0.5	≦0.08	2,500	2,000
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~120	≦1.0	≦0.10	1,020	730	~160	≦1.0	≦0.10	840	710	~160	≦1.0	≦0.10	800	760
		190	≦0.7	≦0.08	710	430	240	≦0.7	≦0.08	580	410	240	≦0.7	≦0.08	560	450
		235	≦0.5	≦0.08	710	340	290	≦0.5	≦0.08	580	320	290	≦0.5	≦0.08	560	360

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

● MPM type (YOHW type insert) + MSN Carbide Shank Holder

Material to be cut	Grades	Tool dia. (mm)									
		10/11					12/13				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8015 (DH102)	~50	≦0,12	5~10	7,920	3,170	~60	≦0,12	6~12	6,630	3,980
		75	≦0.10	5~10	5,940	1,900	80	≦0.10	6~12	4,970	2,380
		100	≦0.10	5~8	5.100	1,430	110	≦0.10	6~10	4,300	1,800
Die steel (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~50	≦0,12	5~10	7,320	2,640	~60	≦0,12	6~12	6,100	3,290
		75	≦0.10	5~10	5,460	1,580	80	≦0.10	6~12	4,580	1,980
		100	≦0.10	5~8	4,740	1,190	110	≦0.10	6~10	3,960	1,500
Mold steel (1.2311, P20) 30-36HRC	JC8015 (DH102)	~50	≦0,12	5~10	7,320	2,640	~60	≦0,12	6~12	6,100	3,290
		75	≦0.10	5~10	5,460	1,580	80	≦0.10	6~12	4,580	1,980
		100	≦0.10	5~8	4,740	1,190	110	≦0.10	6~10	3,960	1,500
Mold steel (1.2311P21) 38-43HRC	DH102 (JC8015)	~50	≦0,12	5~10	6,360	1,530	~60	≦0,12	6~12	5,300	1,910
		75	≦0.10	5~10	4,800	920	80	≦0.10	6~12	3,980	1,150
		100	≦0.10	5~8	4,140	700	110	≦0.10	6~10	3,450	870
Hardened die steel (1.2344,1.2379) 42-52HRC	DH102 (JC8015)	~50	≦0.10	5~10	3,840	770	~60	≦0.10	6~12	3,180	960
		75	≦0.08	5~10	2,880	460	80	≦0.08	6~12	2,380	570
		100	–	–	–	–	110	–	–	–	–
Hardened die steel (1.2344, 1.2379) 55-62HRC	DH102	~50	≦0.10	5~10	2,220	350	~60	≦0.10	6~12	1,860	450
		75	≦0.08	5~10	1,680	210	80	≦0.08	6~12	1,400	270
		100	–	–	–	–	110	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8015 (DH102)	~50	≦0.15	5~10	6,360	1,910	~60	≦0.15	6~12	5,300	2,380
		75	≦0.12	5~10	4,800	1,150	80	≦0.12	6~12	3,980	1,430
		100	≦0.10	5~8	4,140	810	110	≦0.10	6~10	3,450	1,010
Stainless steel Below250HB	JC8015 (DH102)	~50	≦0.12	5~10	7,320	2,640	~60	≦0.12	6~12	6,100	3,290
		75	≦0.10	5~10	5,460	1,580	80	≦0.10	6~12	4,580	1,980
		100	≦0.10	5~8	4,740	1,190	110	≦0.10	6~10	3,960	1,500
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~50	≦0.12	5~10	1,560	370	~60	≦0.12	6~12	1,330	480
		75	≦0.10	5~10	1,200	230	80	≦0.10	6~12	1,000	290
		100	≦0.10	5~8	1,020	170	110	≦0.10	6~10	860	220

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

● MPM type (YOHW type insert) + MSN Carbide Shank Holder

Material to be cut	Grades	Tool dia. (mm)									
		16/17					20/21				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8015 (DH102)	~80	≦0,12	8~16	4,980	3,980	~100	≦0,12	10~20	3,960	3,980
		120	≦0.10	8~16	3,740	2,380	150	≦0.10	10~20	2,970	2,380
		160	≦0.10	8~13	3,240	1,800	190	≦0.10	10~16	2,550	1,800
Die steel (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~80	≦0,12	8~16	4,580	3,290	~100	≦0,12	10~20	3,660	3,290
		120	≦0.10	8~16	3,440	1,980	150	≦0.10	10~20	2,730	1,980
		160	≦0.10	8~13	2,880	1,500	190	≦0.10	10~16	2,370	1,500
Mold steel (1.2311, P20) 30-36HRC	JC8015 (DH102)	~80	≦0,12	8~16	4,480	3,290	~100	≦0,12	10~20	3,660	3,290
		120	≦0.10	8~16	3,440	1,980	150	≦0.10	10~20	2,730	1,980
		160	≦0.10	8~13	2,980	1,500	190	≦0.10	10~16	2,370	1,500
Mold steel (1.2311P21) 38-43HRC	DH102 (JC8015)	~80	≦0,12	8~16	3,980	1,910	~100	≦0,12	10~20	3,180	1,910
		120	≦0.10	8~16	2,980	1,150	150	≦0.10	10~20	2,400	1,150
		160	≦0.10	8~13	2,580	870	190	≦0.10	10~16	2,070	870
Hardened die steel (1.2344,1.2379) 42-52HRC	DH102 (JC8015)	~80	≦0.10	8~16	2,380	960	~100	≦0.10	10~20	1,920	960
		120	≦0.08	8~16	1,780	570	150	≦0.08	10~20	1,440	570
		160	–	–	–	–	190	–	–	–	–
Hardened die steel (1.2344, 1.2379) 55-62HRC	DH102	~80	≦0.10	8~16	1,400	450	~100	≦0.10	10~20	1,110	450
		120	≦0.08	8~16	1,040	270	150	≦0.08	10~20	840	270
		160	–	–	–	–	190	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8015 (DH102)	~80	≦0.15	8~16	3,980	2,380	~100	≦0.15	10~20	3,180	2,380
		120	≦0.12	8~16	2,980	1,430	150	≦0.12	10~20	2,400	1,430
		160	≦0.10	8~13	2,580	1,010	190	≦0.10	10~16	2,070	1,010
Stainless steel Below250HB	JC8015 (DH102)	~80	≦0.12	8~16	4,580	3,290	~100	≦0.12	10~20	3,660	3,290
		120	≦0.10	8~16	3,440	1,980	150	≦0.10	10~20	2,730	1,980
		160	≦0.10	8~13	2,980	1,500	190	≦0.10	10~16	2,370	1,500
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~80	≦0.12	8~16	1,000	480	~100	≦0.12	10~20	780	480
		120	≦0.10	8~16	740	290	150	≦0.10	10~20	600	290
		160	≦0.10	8~13	640	220	190	≦0.10	10~16	510	220

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

QM MILL MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

● MPM type (YOHW type insert) + MSN Carbide Shank Holder

Material to be cut	Grades	Tool dia. (mm)														
		25					30					32				
		No. of teeth 6N					No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8015 (DH102)	~120	≦0.12	12~25	3,180	3,820	~160	≦0.12	15~30	2,640	3,700	~160	≦0.12	16~32	2,490	3,980
		190	≦0.10	12~25	2,380	2,280	240	≦0.10	15~30	1,980	2,220	240	≦0.10	16~32	1,870	2,380
		235	≦0.06	12~20	2,070	1,740	290	≦0.06	15~24	1,700	1,670	290	≦0.06	16~26	1,620	1,800
Die steel (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~120	≦0.12	12~25	2,930	3,160	~160	≦0.12	15~30	2,440	3,070	~160	≦0.12	16~32	2,290	3,290
		190	≦0.10	12~25	2,200	1,900	240	≦0.10	15~30	1,820	1,830	240	≦0.10	16~32	1,720	1,980
		235	≦0.06	12~20	1,900	1,440	290	≦0.06	15~24	1,580	1,390	290	≦0.06	16~26	1,490	1,500
Mold steel (1.2311, P20) 30-36HRC	JC8015 (DH102)	~120	≦0.12	12~25	2.930	3,160	~160	≦0.12	15~30	2,440	3,070	~160	≦0.12	16~32	2,290	3,290
		190	≦0.10	12~25	2,200	1,900	240	≦0.10	15~30	1,820	1,830	240	≦0.10	16~32	1,720	1,980
		235	≦0.06	12~20	1,900	1,440	290	≦0.06	15~24	1,590	1,390	290	≦0.06	16~26	1,490	1,500
Mold steel (1.2311, P21) 38-43HRC	DH102 (JC8015)	~120	≦0.12	12~25	2,550	1,840	~160	≦0.12	15~30	2,120	1,780	~160	≦0.12	16~32	1,990	1,910
		190	≦0.10	12~25	1,910	1,100	240	≦0.10	15~30	1,600	1,080	240	≦0.10	16~32	1,490	1,150
		235	≦0.06	12~20	1,660	840	290	≦0.06	15~24	1,380	810	290	≦0.06	16~26	1,290	870
Hardened die steel (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~120	≦0.10	12~25	1,530	920	~160	≦0.10	15~30	1,280	900	~160	≦0.10	16~32	1,190	960
		190	≦0.08	12~25	1,150	550	240	≦0.08	15~30	960	540	240	≦0.08	16~32	890	570
		235	–	–	–	–	290	–	–	–	–	290	–	–	–	–
Hardened die steel (1.2344, 1.2379) 55-62HRC	DH102	~120	≦0.10	12~25	890	430	~160	≦0.10	15~30	740	410	~160	≦0.10	16~32	700	450
		190	≦0.08	12~25	670	260	240	≦0.08	15~30	560	250	240	≦0.08	16~32	520	270
		235	–	–	–	–	290	–	–	–	–	290	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8015 (DH102)	~120	≦0.15	12~25	2,550	2,300	~160	≦0.15	15~30	2,120	2,230	~160	≦0.15	16~32	1,990	2,380
		190	≦0.12	12~25	1,910	1,380	240	≦0.12	15~30	1,600	1,340	240	≦0.12	16~32	1,490	1,430
		235	≦0.10	12~20	1,660	970	290	≦0.10	15~24	1,380	940	290	≦0.10	16~26	1,290	1.010
Stainless steel Below 250HB	JC8015 (DH102)	~120	≦0.12	12~25	2,930	3,160	~160	≦0.12	15~30	2,440	3,070	~160	≦0.12	16~32	2,290	3,290
		190	≦0.12	12~25	2,200	1,900	240	≦0.12	15~30	1,820	1,830	240	≦0.12	16~32	1,720	1,980
		235	≦0.10	12~20	1,900	1,440	290	≦0.10	15~24	1,590	1,390	290	≦0.10	16~26	1,490	1,500
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~120	≦0.12	12~25	640	460	~160	≦0.12	15~30	520	440	~160	≦0.12	16~32	500	480
		190	≦0.10	12~25	480	280	240	≦0.10	15~30	400	270	240	≦0.10	16~32	370	290
		235	≦0.06	12~20	420	210	290	≦0.06	15~24	340	200	290	≦0.06	16~26	320	220

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

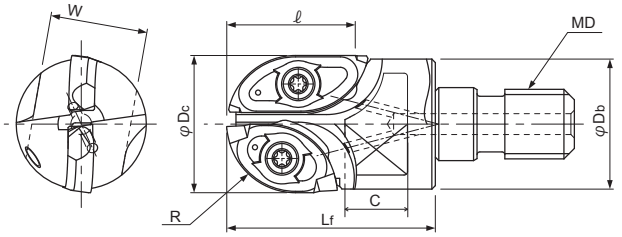
■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.

Swing Ball MSW TYPE

G-Body Through Coolant Hole

Clamp Screw	Recommended Torque N•m
DSW-2563H	0.9
DSW-307H	1.8
DSW-4085	3.6
DSW-511H	6.1
TSW-511	5.5



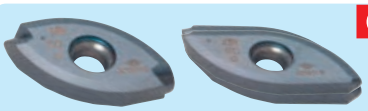
■ BODY

Arbor B193

Cat. No.	Stock	No. of flutes	Dimensions (mm) R	φDc	ℓ	Lf	φDb	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
MSW-1615-M8	●	2	8	16	15	23	15	M8	8	12	SWB216HM SWB216HS	DSW-2563H	A-08SD
MSW-2018-M10	●	2	10	20	18.5	30	18.7	M10	9	14	SWB220HM/HM-H/MMW SWB220HS/MSW	DSW-307H	A-10
MSW-2522-M12	●	2	12.5	25	21.9	35	23.5	M12	10	17	SWB225HM/HM-H/MMW SWB225HS/MSW	DSW-4085	A-15
MSW-3025-M16	□	2	15	30	25.9	43	28.2	M16	12.5	22	SWB230HM/HM-H/MMW SWB230HS/MSW	DSW-511H	A-20
MSW-3225-M16	●	2	16	32	29.5	43	29.9	M16	12.5	22	SWB232HM-G/MMW-G SWB232HS-G/MSW-G	TSW-511	A-20

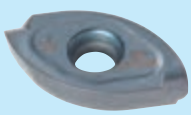
Note) 1. Please refer page B105-B106 for recommended cutting conditions
2. All cutters are supplied without inserts.
3. Please refer page B009 for recommended tightening torque.

Inserts series expansion.



① Insert for welded & hardened steel (-W type)

1. Improved insert strength
2. Suitable for welded & hardened steel (over 50HRC).

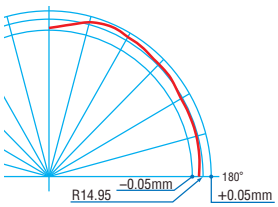


② Insert for semi-finishing (main blade -H type)

1. Main blades -H type for semi-finishing are available for φ20mm, φ25mm and φ30mm. In case of using -H type blade please confirm the grade of both inserts. It should be the same grade.
2. Able to use for semi-finishing by improving nose radius accuracy. Do not recommend to use for roughing.

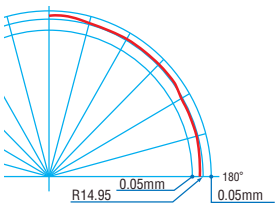
● Insert comparison

SWB-HM type for Regular purpose insert



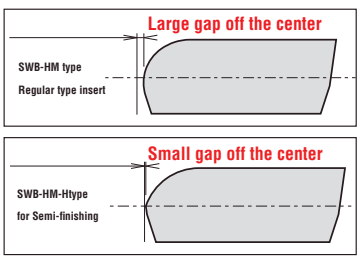
R min. 14.906
R max. 14.981

SWB-HM-H type Insert for Semi-finishing



R min. 14.938
R max. 14.983

Radius form accuracy on body



● Standard stock items □: Stock in Japan ○: Soon to be deleted

Swing Ball MSW TYPE

■ INSERTS

Fig.1 (Main blade)

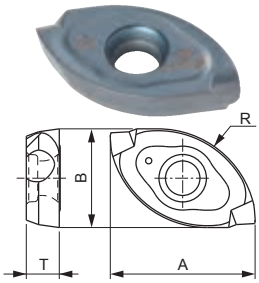


Fig. 2 (Sub blade)

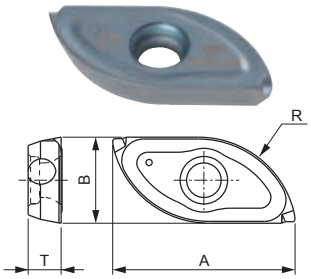


Fig. 3 (Main blade for welded & hardened steel)

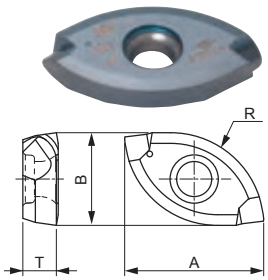
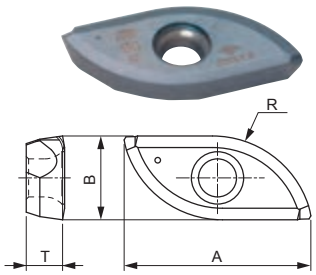


Fig. 4 (Sub blade for welded &hardened steel)

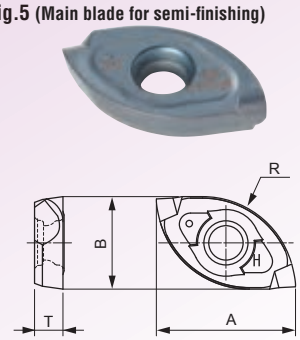


■ SWB-Htype
(Main blade for semi-finishing)

1. Added-H type semi-finishing main blade for φ20, φ25 and φ30.

2. For use in semi-finishing only
(Not recommend for roughing.)

Fig.5 (Main blade for semi-finishing)



Cat. No.	PVD coated				Dimensions (mm)				Fig.
	JC 5118	JC 8015	JC 8050	JC 5040	R	A	B	T	
SWB216HM	●		●		8	15	7.9	3	1
SWB216HS	●		●		8	16.1	6.6	3	2
SWB220HM		●		●	10	15.8	9.9	3.65	1
SWB220HM-H		●			10	16	9.9	3.65	5
SWB220MMW		●			10	15.8	9.9	3.65	3
SWB220HS		●		●	10	20	8.2	3.65	2
SWB220MSW		●			10	20	8.2	3.65	4
SWB225HM		●		●	12.5	18.5	12.4	3.8	1
SWB225HM-H		□			12.5	18.9	12.4	3.8	5
SWB225MMW		●			12.5	18.5	12.4	3.8	3
SWB225HS		●		●	12.5	23.8	10.5	3.8	2
SWB225MSW		●			12.5	23.8	10.5	3.8	4
SWB230HM		□		□	15	22.2	14.8	5.35	1
SWB230HM-H		□			15	22.4	14.8	5.35	5
SWB230MMW		□			15	22.2	14.8	5.35	3
SWB230HS		□		□	15	27.5	12.3	5.35	2
SWB230MSW		□			15	27.5	12.3	5.35	4
SWB232HM-G		●		●	16	26	16	5.35	1
SWB232MMW-G		●			16	26	16	5.35	3
SWB232HS-G		●		●	16	31.7	13.9	5.35	2
SWB232MSW-G		●			16	31.7	13.9	5.35	4

10 inserts per case, but SWB232HS-G and SWB232MSW-G : 5 pieces per case.

Note) 1. Please refer page B110 for machining form by swing ball.

2. Incase of using main blade -H type for semi-finishing, be sure to use the same grade of sub blade.

● Standard stock items □: Stock in Japan ○: Soon to be deleted

Swing Ball MSW TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MSW type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)				
		16				
		No. of teeth 2N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	50	1.1	1	4,200	2,900
		100	0.7	0.7	4,200	2,900
		150	0.3	0.3	3,600	2,520
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC5118	50	1.1	1	4,000	2,800
		100	0.7	0.7	4,000	2,800
		150	0.3	0.3	3,400	2,380
Die steel SKD61, SKD11 (1.2344, 1,2379) Below 255HB	JC5118 (JC8050)	50	1.1	1	4,000	2,800
		100	0.7	0.7	4,000	2,800
		150	0.3	0.3	3,400	2,400
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118	50	1	1	2,400	1,200
		100	0.6	0.6	2,000	1,000
		150	0.2	0.2	1,200	600
Hardened die steel SKD11 (1.2379) 55-62HRC	JC5118	50	0.5	0.5	1,800	700
		100	0.3	0.3	1,600	650
		150	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	50	1.3	1.3	4,000	2,800
		100	1.2	1	4,000	2,800
		150	0.7	0.5	3,400	2,400
Mold steel HPM7, PX5, NAK80, P20 (1.2311,P20) 30-43HRC	JC5118 (JC8050)	50	1.1	1	3,600	2,100
		100	0.7	0.7	3,600	2,100
		150	0.3	0.3	3,000	1,800
Stainless steel SUS304 Below 250HB	JC8050 (JC5118)	50	1.1	1	4,000	2,800
		100	0.7	0.7	4,000	2,800
		150	0.3	0.3	3,400	2,400

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) In case of short overhung length, ap xae = maximum 3mm can be applied except hardened steel. But please adjust Vf according to machine and work rigidity.

Swing Ball MSW TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MSW type + MSN Carbide Shank Holder

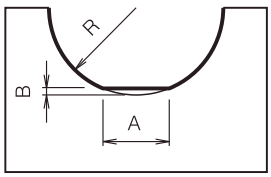
Work Materials	Insert Grades	Tool dia. (mm)														
		20					25					30/32				
		No. of teeth 2N					No. of teeth 2N					No. of teeth 2N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5040	70	1.3	1.3	4,800	3,360	90	1.3	1.3	3,800	2,700	100	1.5	1.5	3,000	2,100
		120	0.8	0.8	4,800	3,360	140	0.8	0.8	3,800	2,700	150	1.0	1.0	3,000	2,100
		190	0.3	0.4	4,000	2,800	210	0.3	0.5	3,200	2,200	210	0.3	0.7	2,650	1,860
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC5040 JC8015 For over 40HRC	70	1.3	1.3	4,000	2,800	90	1.3	1.3	3,200	2,240	100	1.5	1.5	2,600	1,820
		120	0.8	0.8	4,000	2,800	140	0.8	0.8	3,200	2,240	150	1.0	1.0	2,600	1,820
		190	0.3	0.4	3,600	2,500	210	0.3	0.5	2,800	1,960	210	0.3	0.7	2,300	1,600
Die steel SKD11, SX105V (1.2379) Below 255HB	JC5040	70	1.3	1.3	4,000	2,800	90	1.3	1.3	3,200	2,240	100	1.5	1.5	2,600	1,820
		120	0.8	0.8	4,000	2,800	140	0.8	0.8	3,200	2,240	150	1.0	1.0	2,600	1,820
		190	0.3	0.4	3,600	2,500	210	0.3	0.5	2,800	1,960	210	0.3	0.7	2,300	1,600
Hardened die steel SKD61, DAC (1.2344, 1.2379) 40-50HRC	JC8015 Recommend to use-M○W type insert	70	0.5	1.0	3,000	1,500	90	0.5	1.0	2,500	1,250	100	0.8	0.8	2,000	1,000
		120	0.3	0.4	2,500	1,250	140	0.3	0.5	2,000	1,000	150	0.5	0.7	1,800	900
		190	–	–	–	–	210	–	–	–	–	210	0.2	0.7	1,600	800
Hardened die steel SKD11 (1.2379) 55-62HRC	JC8015 Recommend to use-M○W type insert	70	0.5	0.5	2,300	920	90	0.5	0.7	1,900	760	100	0.6	0.8	1,600	720
		120	0.3	0.4	2,000	800	140	0.3	0.5	1,600	640	150	0.3	0.7	1,300	590
		190	–	–	–	–	210	–	–	–	–	210	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	70	1.5	1.5	4,000	3,200	90	1.5	1.5	3,200	2,560	100	1.5	1.5	2,600	2,100
		120	1.0	1.0	4,000	3,200	140	1.0	1.0	3,200	2,560	150	1.0	1.0	2,600	2,100
		190	0.3	0.4	3,600	2,900	210	0.3	0.5	2,800	2,240	210	0.3	0.7	2,300	1,800

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.

■MACHINED FORM BY SWING BALL



Note) At center point as shown in above figure material can be left as mentioned in chart

●SWB type

R	A	B
8	0.5	0.01
10	2.1	0.05
12.5	3.0	0.09
15	3.3	0.09
16	3.4	0.09

●SWB-H type (for semi finishing)

R	A	B
10	0.6	0.01
12.5	0.7	0.01
15	0.9	0.01

Super Diemaster SDH TYPE

High efficient machining tool with sharp and strong cutting edge.

Increased insert strength

68% stronger than conventional Diemaster (DDM) ISO insert. In addition to conventional insert grades, tough grade "JC8050" for unfavourable conditions and "JC5118" for general use are available.

Double clamping mechanism

Adopted double clamping mechanism for more rigidity.

Positive axial rake

- R3.5 & R5 inserts→ A.R.; +6°
- R6 & R8 inserts→A.R.; +8°

⇒Reduced cutting forces by 21% than conventional Diemaster.

G-Body Standard Type Through Coolant Hole

Fig. 1

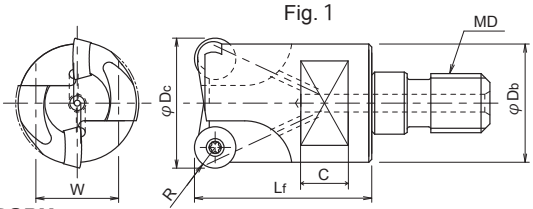
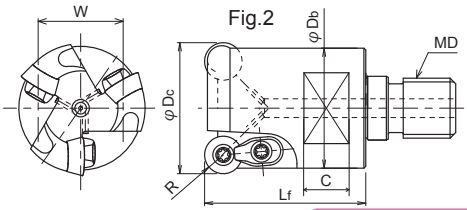


Fig.2



■ BODY

Arbor B193

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	R	Lf φ	Db	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Clamp Set	Parts: Wrench	Fig.
SDH-2150-R07-M8	●	2	15	3.5	23	13.8	M8	8	12	RD○○07T2MO...	TSW-2556H		A-08SD	1
SDH-2160-R07-M8	●	2	16	3.5	23	15	M8	8	12	RD○○07T2MO...	TSW-2556H	–	A-08SD	1
SDH-2200-R07-M10	●	2	20	3.5	30	18	M10	8	14	RD○○07T2MO...	TSW-2556H	–	A-08SD	1
SDH-2220-R07-M10	●	2	22	3.5	30	20	M10	8	14	RD○○07T2MO...	TSW-2556H	–	A-08SD	1
SDH-2250-R10-M12	●	2	25	5	35	23	M12	10	17	RD○○1004MO...	CSW-408H	DCM-18	A-15	2
SDH-2280-R10-M12	□	2	28	5	35	25	M12	10	17	RD○○1004MO...	CSW-408H	DCM-18	A-15	2
SDH-2300-R10-M16	□	2	30	5	43	28	M16	12	22	RD○○1004MO...	CSW-408H	DCM-18	A-15	2
SDH-2320-R12-M16	●	2	32	6	43	28	M16	12	22	RD○○1204MO...	DSW-410H	DCM-18	A-15	2
SDH-3320-R10-M16	●	3	32	5	43	28	M16	12	22	RD○○1004MO...	CSW-408H	DCM-18	A-15	2
SDH-2350-R12-M16	□	2	35	6	43	32	M16	12	22	RD○○1204MO...	DSW-410H	DCM-18	A-15	2
SDH-3350-R10-M16	●	3	35	5	43	32	M16	12	22	RD○○1004MO...	CSW-408H	DCM-18	A-15	2
SDH-2400-R12-M16	●	2	40	6	43	32	M16	13	26	RD○○1204MO...	DSW-410H	DCM-18	A-15	2

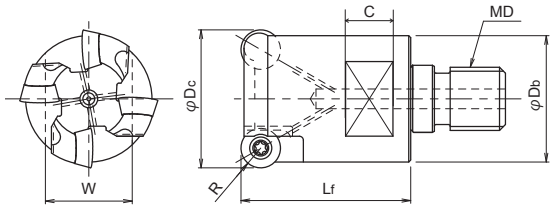
Note) 1. Please refer page B115-B125 for recommended cutting conditions.
2. All cutters are supplied without inserts.
3. Please refer page B009 for recommended tightening torque.
4. Incase of using double clamping mechanism type, please refer page B010 "Insertsetup installation points of double clamping mechanism type"

Clamp Screw	Recommended Torque (N•m)
TSW-2556H	0.9
CSW-408H	3.6
DSW-410H	3.6

● Standard stock items □: Stock in Japan ○: Soon to be deleted

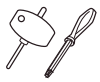
Super Diemaster SDH TYPE

G-Body Fine pitch type Through Coolant Hole



■ BODY

Arbor B193

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	R	Lf φ	Db	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
												
SDH-3200-R07-M10	●	3	20	3.5	30	18	M10	8	14	RD○○07T2MO...	TSW-2556H	A-08SD
SDH-3250-R10-M12	●	3	25	5	35	23	M12	10	17	RD○○1004MO...	CSW-408H	A-15
SDH-4300-R10-M16	●	4	30	5	43	28	M16	12	22	RD○○1004MO...	CSW-408H	A-15
SDH-4320-R10-M16	●	4	32	5	43	28	M16	12	22	RD○○1004MO...	CSW-408H	A-15
SDH-3350-R12-M16	●	3	35	6	43	32	M16	12	22	RD○○1204MO...	DSW-410H	A-15
SDH-4350-R10-M16	●	4	35	5	43	32	M16	12	22	RD○○1004MO...	CSW-408H	A-15
SDH-4400-R12-M16	●	4	40	6	43	32	M16	13	26	RD○○1204MO...	DSW-410H	A-15
SDH-5420-R10-M16	●	5	42	5	43	32	M16	13	26	RD○○1004MO...	CSW-408H	A-15

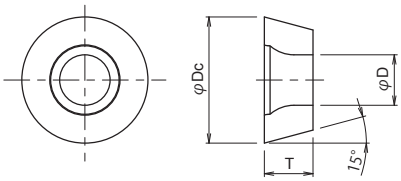
Note) 1. Please refer page B115-B125 for recommended cutting conditions.
2. All cutters are supplied without inserts.
3. Please refer page B009 for recommended tightening torque.

Clamp Screw	Recommended Torque (N•m)
TSW-2556H	0.9
CSW-408H	3.6
DSW-410H	3.6

Super Diemaster SDH TYPE

■INSERTS

Standard type
Without chipbreaker
Chamfer-MOT
General Cutting



Cat. No.	Tolerance	PVD coated			Dimensions (mm)		
		DH103	JC8015	JC5040	φDc	T	φD
RDMW07T2MOT	M	●	●	●	7	2.7	2.8
RDMW1004MOT	M	●	●	●	10	4.1	4.4
RDMW1204MOT	M	●	●	●	12	4.8	4.4

10 Inserts per case.

Standard type
With chipbreaker
Chamfer-MOT
R-honed -MOE
Stainless steel

With chipbreaker
R-honed -MOE
Titanium·Inconel

Fig.1

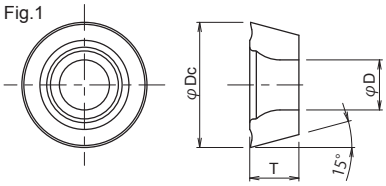
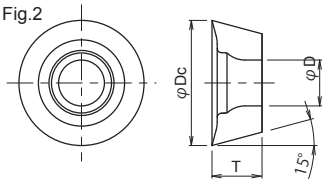


Fig.2



Cat. No.	Tolerance	PVD coated				Dimensions (mm)			Fig.
		JC5118	JC8015	JC8050	JC8118	φDc	T	φD	
RDGT07T2MOE	G		●	●			2.7	2.8	1
RDGT1004MOE	G		●	●		10	4.1	4.4	1
RDGT1004MOT	G		●	●					
RDGT1204MOE	G		●	●		12	4.8	4.4	1
RDGT1204MOT	G		●	●					
RDMT07T2MOE	M	○	○	●	◎	7	2.7	2.8	1
RDMT1004MOE	M	○	○	●	◎				1
RDMT1004MOE-ML	M			●		10	4.1	4.4	2
RDMT1004MOT	M	○	○	●	◎				1
RDMT1204MOE	M	○	○	●	◎				1
RDMT1204MOE-ML	M			●		12	4.8	4.4	2
RDMT1204MOT	M	○	○	●	◎				1

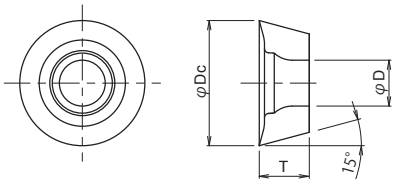
10 Inserts per case.

● Standard stock items ☐ Stock in Japan ◎: soon to be stocked ○: Soon to be deleted

Super Diemaster SDH TYPE

■ INSERTS

Low Cutting Force
Without chipbreaker
Sharp edge
Aluminium



Cat. No.	Tolerance	Uncoated	Dimensions (mm)		
		FZ05	φDc	T	φD
RDGT07T2MOF-AL	G	●	7	2.7	2.8
RDGT1004MOF-AL	G	●	10	4.1	4.4
RDGT1204MOF-AL	G	●	12	4.8	4.4

10 Inserts per case.

Note) In case of chip clogging, remove the clampset. (DCM-18)
(Only in case of Aluminium Machining)

Super Diemaster SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SDH type + MSN Carbide Shank Holder

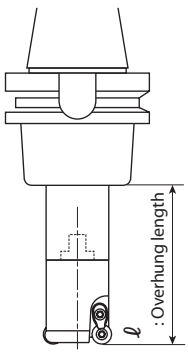
Work Materials	Insert Grades	Tool dia. (Insert size)							
		15/16 R3.5				20/22 R3.5			
		No. of teeth 2N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	70	1.4	3,500	1,650	70	1.5	2,900	1,450
		120	1.1	3,500	1,650	120	1.2	2,900	1,450
		160	0.6	3,300	1,500	160	0.7	2,800	1,350
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC5118 JC8118 JC8015 For over 40HRC	70	1.4	3,300	1,550	70	1.5	2,800	1,400
		120	1.1	3,300	1,550	120	1.2	2,800	1,400
		160	0.6	3,200	1,500	160	0.7	2,700	1,350
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC5118 JC8118	70	1.4	3,300	1,550	70	1.5	2,800	1,400
		120	1.1	3,300	1,550	120	1.2	2,800	1,400
		160	0.6	3,200	1,500	160	0.7	2,700	1,350
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC5118 JC8118	70	1.4	2,700	1,300	70	1.5	2,300	1,200
		120	1.1	2,700	1,300	120	1.2	2,300	1,200
		160	0.6	2,600	1,250	160	0.7	2,200	1,100
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8118 JC5118 JC8015 ※DH103	70	0.7	2,400	1,150	70	0.8	2,000	1,000
		120	0.5	2,400	1,150	120	0.6	2,000	1,000
		160	0.3	2,200	1,050	160	0.3	1,900	950
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 JC5118 JC8118	70	1.4	3,100	1,550	70	1.5	2,600	1,400
		120	1.1	3,100	1,550	120	1.2	2,600	1,400
		160	0.6	3,000	1,400	160	0.7	2,500	1,300
Titanium alloy 35-43HRC	JC8050 JC8015 JC5118 JC8118	70	0.5	1,200	600	70	0.5	1,000	500
		120	0.4	1,200	600	120	0.4	1,000	500
		160	0.2	1,100	490	160	0.2	980	440
Inconel 35-43HRC	JC8015 JC5118 JC8118 JC8050	70	0.5	620	190	70	0.5	510	160
		120	0.4	560	190	120	0.4	470	160
		160	0.2	520	190	160	0.2	440	160
Aluminium alloy 50-110HB	FZ05	70	2	8,600	4,800	70	2	7,200	4,300
		120	1.7	8,600	4,800	120	1.7	7,200	4,300
		160	1.2	7,000	4,900	160	1.2	5,800	4,300

ℓ : Overhung length, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

※For over 50HRC, recommend to use JC8003 without chipbreaker

■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity o rwork rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed. 4 Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



Super Diemaster SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SDH type + MSN Carbide Shank Holder

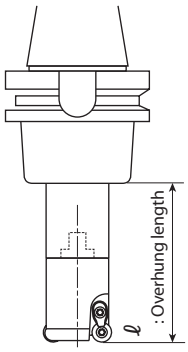
Work Materials	Insert Grades	Tool dia. (Insert size)							
		20/22 R3.5				25/28 R5			
		No. of teeth 3N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	70	1.2	3,500	2,900	90	2	2,400	1,400
		120	0.8	3,500	2,900	140	1.5	2,400	1,400
		160	0.5	3,200	2,700	210	1	2,300	1,300
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC5118 JC8118 JC8015 For over 40HRC	70	1.2	3,300	2,600	90	2	2,200	1,300
		120	0.8	3,300	2,600	140	1.5	2,200	1,300
		160	0.5	3,100	2,300	210	1	2,100	1,200
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC5118 JC8118	70	1.2	3,300	2,600	90	2	2,200	1,300
		120	0.8	3,300	2,600	140	1.5	2,200	1,300
		160	0.5	3,100	2,300	210	1	2,100	1,200
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC5118 JC8118	70	1.2	2,700	2,400	90	2	1,800	1,050
		120	0.8	2,700	2,400	140	1.5	1,800	1,050
		160	0.5	2,600	2,200	210	1	1,700	1,000
Hardened die steel SKD61,DAC,DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8118 JC8015 ※DH103	70	0.7	2,500	2,000	90	1	1,600	1,000
		120	0.5	2,500	2,000	140	0.5	1,600	1,000
		160	0.3	2,200	1,800	210	0.3	1,500	950
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 JC5118 JC8118	70	1.2	3,050	2,600	90	2	2,100	1,300
		120	0.8	3,050	2,600	140	1.5	2,100	1,300
		160	0.5	2,900	2,400	210	1	1,200	1,200
Titanium alloy 35-43HRC	JC8050 JC8015 JC5118 JC8118	70	0.5	1,000	750	90	0.5	780	460
		120	0.4	1,000	750	140	0.4	780	460
		160	0.2	980	660	210	0.2	750	410
Inconel 35-43HRC	JC8015 JC5118 JC8118 JC8050	70	0.5	510	240	90	0.5	430	170
		120	0.4	470	240	140	0.4	390	140
		160	0.2	440	240	210	0.2	370	140
Aluminium alloy 50-110HB	FZ05	70	2	7,200	6,400	90	3.5	5,700	3,400
		120	1.7	7,200	6,400	140	2	5,700	3,400
		160	1.2	5,800	4,300	210	1.5	4,500	2,200

ℓ : Overhung length, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

※For over 50HRC, recommend to use JC8003 without chipbreaker

■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity o rwork rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed. 4 Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



Super Diemaster SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SDH type + MSN Carbide Shank Holder

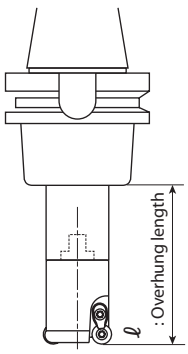
Work Materials	Insert Grades	Tool dia. (Insert size)							
		25 R3.5 /25 R5 /28 R5				30 R5 /32 R6 /35 R5			
		No. of teeth 3N				No. of teeth 2N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	90	1.5	2,800	2,100	100	2.5	2,000	1,100
		140	1.2	2,800	2,100	150	2	2,000	1,100
		210	0.7	2,600	1,900	210	1.2	1,900	1,000
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC5118 JC8118 JC8015 For over 40HRC	90	1.5	2,600	2,000	100	2.5	1,900	1,050
		140	1.2	2,600	2,000	150	2	1,900	1,050
		210	0.7	2,400	1,800	210	1.2	1,800	950
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC5118 JC8118	90	1.5	2,500	1,600	100	2.5	1,900	1,050
		140	1.2	2,500	1,600	150	2	1,900	1,050
		210	0.7	2,400	1,400	210	1.2	1,800	950
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC5118 JC8118	90	1.5	2,100	1,400	100	2.5	1,550	850
		140	1.2	2,100	1,400	150	2	1,550	850
		210	0.7	2,000	1,000	210	1.2	1,400	800
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8118 JC8015 ※DH103	90	0.8	1,900	1,400	100	1.5	1,300	750
		140	0.6	1,900	1,400	150	1.2	1,300	750
		210	0.4	1,800	1,000	210	0.7	1,200	700
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 JC5118 JC8118	90	1.2	2,500	2,200	100	2.5	1,800	1,000
		140	0.8	2,500	2,200	150	2	1,800	1,000
		210	0.5	2,300	1,700	210	1.2	1,700	900
Titanium alloy 35-43HRC	JC8050 JC8015 JC5118 JC8118	90	0.5	780	690	100	0.5	730	470
		140	0.4	780	690	150	0.4	730	330
		210	0.2	750	620	210	0.2	700	260
Inconel 35-43HRC	JC8015 JC5118 JC8118 JC8050	90	0.5	430	260	100	0.5	400	170
		140	0.4	390	210	150	0.4	380	150
		210	0.2	370	210	210	0.2	350	130
Aluminium alloy 50-110HB	FZ05	90	2.2	5,700	5,100	100	3.5	4,500	2,700
		120	1.9	5,700	5,100	150	2	4,500	2,700
		160	1.5	4,500	5,100	210	1.5	3,600	1,800

ℓ : Overhung length, a_p: Depth of cut, n: Spindle speed, V_f: Feed speed

※For over 50HRC, recommend to use JC8003 without chipbreaker

■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity o rwork rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed. 4 Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce a_p, n, V_f by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



Super Diemaster SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SDH type + MSN Carbide Shank Holder

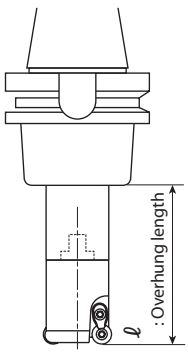
Work Materials	Insert Grades	Tool dia. (Insert size)							
		32/35 R5				30 R5 /35 R6			
		No. of teeth 3N				No. of teeth 3N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	100	2.5	2,000	1,600	100	2	2,100	1,900
		150	2	2,000	1,600	150	1.5	2,100	1,900
		210	1.2	1,900	1,400	210	0.8	2,000	1,600
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC5118 JC8118 JC8015 For over 40HRC	100	2.5	1,900	1,550	100	2	2,000	1,800
		150	2	1,900	1,550	150	1.5	2,000	1,800
		210	1.2	1,800	1,400	210	0.8	1,900	1,550
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC5118 JC8118	100	2.5	1,900	1,550	100	2	2,000	1,800
		150	2	1,900	1,550	150	1.5	2,000	1,800
		210	1.2	1,800	1,400	210	0.8	1,900	1,500
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC5118 JC8118	100	2.5	1,550	1,250	100	2	1,750	1,500
		150	2	1,550	1,250	150	1.5	1,750	1,500
		210	1.2	1,400	1,200	210	0.8	1,600	1,300
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8118 JC8015 ※DH103	100	1.5	1,300	1,100	100	1.2	1,400	1,250
		150	1.2	1,300	1,100	150	1	1,400	1,250
		210	0.7	1,200	950	210	0.5	1,300	1,100
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 JC5118 JC8118	100	2.5	1,800	1,500	100	2	1,900	1,700
		150	2	1,800	1,500	150	1.5	1,900	1,700
		210	1.2	1,700	1,350	210	0.8	1,800	1,600
Titanium alloy 35-43HRC	JC8050 JC8015 JC5118 JC8118	100	0.5	730	650	100	0.5	730	650
		150	0.4	730	650	150	0.4	730	650
		210	0.2	700	600	210	0.2	700	600
Inconel 35-43HRC	JC8015 JC5118 JC8118 JC8050	100	0.5	400	250	100	0.5	400	250
		150	0.4	380	230	150	0.4	380	230
		210	0.2	350	200	210	0.2	350	200
Aluminium alloy 50-110HB	FZ05	100	3.5	4,500	4,100	100	3.5	4,500	4,100
		150	2	4,500	4,100	150	2	4,500	4,100
		210	1.5	3,600	2,700	210	1.5	3,600	2,700

ℓ : Overhung length, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

※For over 50HRC, recommend to use JC8003 without chipbreaker

■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity o rwork rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed. 4 Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



Super Diemaster SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SDH type + MSN Carbide Shank Holder

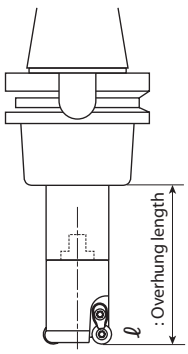
Work Materials	Insert Grades	Tool dia. (Insert size)							
		30/32/35 R5				40 R6			
		No. of teeth 4N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	100	2	2,100	2,500	100	2.5	1,550	890
		150	1.5	2,100	2,500	150	2	1,550	890
		210	0.8	2,000	2,400	210	1.2	1,450	780
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC5118 JC8118 JC8015 For over 40HRC	100	2	2,000	2,400	100	2.5	1,500	840
		150	1.5	2,000	2,400	150	2	1,500	840
		210	0.8	1,900	2,100	210	1.2	1,450	780
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC5118 JC8118	100	2	2,000	2,400	100	2.5	1,500	840
		150	1.5	2,000	2,400	150	2	1,500	840
		210	0.8	1,900	2,100	210	1.2	1,450	780
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC5118 JC8118	100	2	1,750	2,000	100	2.5	1,250	700
		150	1.5	1,750	2,000	150	2	1,250	700
		210	0.8	1,600	1,700	210	1.2	1,200	670
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8118 JC8015 ※DH103	100	1.2	1,400	1,850	100	1.5	1,050	550
		150	1	1,400	1,850	150	1.2	1,050	550
		210	0.5	1,300	1,700	210	0.7	1,000	520
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 JC5118 JC8118	100	2	1,900	2,250	100	2.5	1,400	800
		150	1.5	1,900	2,250	150	2	1,400	800
		210	0.8	1,800	2,100	210	1.2	1,300	750
Titanium alloy 35-43HRC	JC8050 JC8015 JC5118 JC8118	100	0.5	730	860	100	0.5	580	350
		150	0.4	730	860	150	0.4	580	350
		210	0.2	700	800	210	0.2	550	330
Inconel 35-43HRC	JC8015 JC5118 JC8118 JC8050	100	0.5	400	330	100	0.5	290	170
		150	0.4	380	310	150	0.4	270	160
		210	0.2	350	270	210	0.2	250	120
Aluminium alloy 50-110HB	FZ05	100	3.5	4,500	5,400	100	4	4,000	2,400
		150	2	4,500	5,400	150	2.5	4,000	2,400
		210	1.5	3,600	3,600	210	2	3,200	1,600

ℓ : Overhung length, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

※For over 50HRC, recommend to use JC8003 without chipbreaker

■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity o rwork rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed. 4 Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



Super Diemaster SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SDH type + MSN Carbide Shank Holder

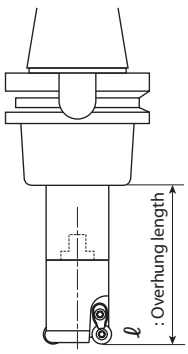
Work Materials	Insert Grades	Tool dia. (Insert size)							
		40 R6				42 R5			
		No. of teeth 4N				No. of teeth 5N			
		ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	100	2	1,900	2,300	100	1.8	1,750	2,600
		150	1.5	1,900	2,300	150	1.3	1,750	2,600
		210	0.8	1,800	2,200	210	0.7	1,650	2,400
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC5118 JC8118 JC8015 For over 40HRC	100	2	1,800	2,100	100	1.8	1,700	2,500
		150	1.5	1,800	2,100	150	1.3	1,700	2,500
		210	0.8	1,700	2,000	210	0.7	1,600	2,200
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC5118 JC8118	100	2	1,800	2,100	100	1.8	1,700	2,600
		150	1.5	1,800	2,100	150	1.3	1,700	2,600
		210	0.8	1,700	2,000	210	0.7	1,600	2,400
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC5118 JC8118	100	2	1,550	1,600	100	1.8	1,400	2,100
		150	1.5	1,550	1,600	150	1.3	1,400	2,100
		210	0.8	1,500	1,400	210	0.7	1,250	1,600
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8118 JC8015 ※DH103	100	1.2	1,350	1,350	100	1.1	1,250	1,500
		150	1	1,350	1,350	150	0.9	1,250	1,500
		210	0.5	1,300	1,100	210	0.4	1,150	1,300
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 JC5118 JC8118	100	2	1,700	2,050	100	1.8	1,650	2,400
		150	1.5	1,700	2,050	150	1.3	1,650	2,400
		210	0.8	1,600	1,800	210	0.7	1,550	2,200
Titanium alloy 35-43HRC	JC8050 JC8015 JC5118 JC8118	100	0.5	580	700	100	0.5	610	730
		150	0.4	580	700	150	0.4	610	730
		210	0.2	550	660	210	0.2	580	690
Inconel 35-43HRC	JC8015 JC5118 JC8118 JC8050	100	0.5	290	340	100	0.5	300	310
		150	0.4	270	320	150	0.4	280	290
		210	0.2	250	240	210	0.2	260	250
Aluminium alloy 50-110HB	FZ05	100	4	4,000	4,800	100	3.5	3,800	5,700
		150	2.5	4,000	4,800	150	2	3,800	5,700
		210	2	3,200	3,200	210	1.5	3,000	3,700

ℓ : Overhung length, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

※For over 50HRC, recommend to use JC8003 without chipbreaker

■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity o rwork rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed. 4 Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



Super Diemaster SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● SDH type + MSN Carbide Shank Holder

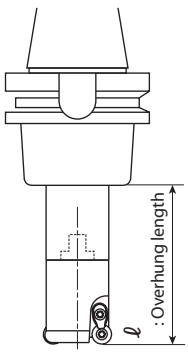
Work Materials	Insert Grades	Tool dia. (Insert size)							
		20/22 R3.5				25 R3.5 /25 R5 /28 R5			
		No. of teeth 3N				No. of teeth 3N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 Recommended to use without chipbreaker	70	0.3	5,400	4,800	90	0.3	4,200	3,800
		120	0.2	5,100	4,300	140	0.2	4,000	3,400
		160	0.1	4,300	3,600	210	0.1	3,400	2,850
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC		70	0.3	4,300	3,200	90	0.3	3,400	2,500
		120	0.2	4,100	2,900	140	0.2	3,200	2,250
		160	0.1	3,400	2,400	210	0.1	2,700	1,900
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB		70	0.3	4,300	3,200	90	0.3	3,400	2,500
		120	0.2	4,100	2,900	140	0.2	3,200	2,250
		160	0.1	3,400	2,400	210	0.1	2,700	1,900
Stainless steel SUS304 Below 250HB	JC8015 Recommended to use without chipbreaker	70	0.3	3,600	3,200	90	0.3	2,800	2,500
		120	0.2	3,400	2,900	140	0.2	2,700	2,250
		160	0.1	2,900	2,400	210	0.1	2,250	1,900
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	DH103	70	0.2	4,000	3,000	90	0.2	3,100	2,300
		120	0.12	3,700	2,600	140	0.12	3,000	2,100
		160	0.06	3,200	2,200	210	0.06	2,500	1,700
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	DH103	70	0.3	5,700	5,100	90	0.3	4,500	4,000
		120	0.2	5,100	4,600	140	0.2	4,300	3,600
		160	0.1	4,550	3,800	210	0.1	3,600	3,000
Aluminium alloy 50-110HB	FZ05	70	1.5	10,100	12,000	90	1.7	8,000	9,600
		120	1.2	10,100	12,000	140	1.4	8,000	9,600
		160	0.7	8,700	7,800	210	1	6,800	6,100

ℓ : Overhung length, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

※For over 50HRC, recommend to use JC8003 without chipbreaker

■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity o rwork rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed. 4 Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



Super Diemaster SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● SDH type + MSN Carbide Shank Holder

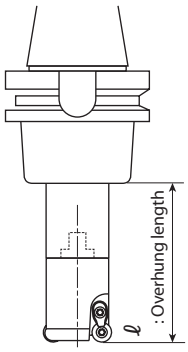
Work Materials	Insert Grades	Tool dia. (Insert size)							
		30 R5 /35 R6				30/32/35 R5			
		No. of teeth 3N				No. of teeth 4N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 Recommended to use without chipbreaker	100	0.3	3,300	2,900	100	0.3	3,300	4,000
		150	0.2	3,100	2,800	150	0.2	3,100	3,600
		210	0.1	2,600	2,150	210	0.1	2,600	3,000
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC		100	0.3	2,800	2,000	100	0.3	2,800	2,800
		150	0.2	2,700	1,800	150	0.2	2,700	2,500
		210	0.1	2,200	1,500	210	0.1	2,250	2,100
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB		100	0.3	2,800	2,000	100	0.3	2,800	2,800
		150	0.2	2,400	1,800	150	0.2	2,700	2,500
		210	0.1	2,200	1,500	210	0.1	2,250	2,100
Stainless steel SUS304 Below 250HB	JC8015 Recommended to use without chipbreaker	100	0.3	2,300	2,000	100	0.3	2,300	2,700
		150	0.2	2,200	1,800	150	0.2	2,200	2,400
		210	0.1	1,850	1,500	210	0.1	1,850	2,000
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	DH103	100	0.2	2,500	1,850	100	0.2	2,550	2,550
		150	0.15	2,450	1,650	150	0.15	2,400	2,250
		210	0.1	2,050	1,400	210	0.1	2,050	1,850
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	DH103	100	0.3	3,600	3,200	100	0.3	3,600	4,300
		150	0.2	3,400	2,900	150	0.2	3,400	3,900
		210	0.1	2,900	2,400	210	0.1	2,900	3,200
Aluminium alloy 50-110HB	FZ05	100	2	6,400	7,700	100	2	6,400	10,200
		150	1.5	6,400	7,700	150	1.5	6,400	10,200
		210	1	5,500	5,000	210	1	5,500	6,600

ℓ : Overhung length, a_p: Depth of cut, n: Spindle speed, V_f: Feed speed

※For over 50HRC, recommend to use JC8003 without chipbreaker

■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity o rwork rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed. 4 Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce a_p, n, V_f by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



Super Diemaster SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● SDH type + MSN Carbide Shank Holder

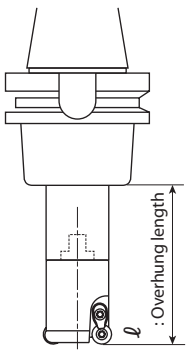
Work Materials	Insert Grades	Tool dia. (Insert size)							
		40 R6				42 R5			
		No. of teeth 4N				No. of teeth 5N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 Recommended to use without chipbreaker	100	0.3	2,900	3,400	100	0.3	2,800	4,200
		150	0.2	2,700	3,050	150	0.2	2,650	2,400
		210	0.1	2,300	2,550	210	0.1	2,250	3,150
Mold steel HPM7, PX5, NAK80, P20 (1.2311,P20) 30-43HRC		100	0.3	2,400	2,400	100	0.3	2,300	2,800
		150	0.2	2,300	2,150	150	0.2	2,200	2,500
		210	0.1	1,900	1,800	210	0.1	1,850	2,100
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB		100	0.3	2,400	2,400	100	0.3	2,300	2,800
		150	0.2	2,300	2,150	150	0.2	2,200	2,500
		210	0.1	1,900	1,800	210	0.1	1,850	2,100
Stainless steel SUS304 Below 250HB	JC8015 Recommended to use without chipbreaker	100	0.3	2,000	2,400	100	0.3	1,900	2,800
		150	0.2	1,900	2,150	150	0.2	1,800	2,500
		210	0.1	1,600	1,800	210	0.1	1,500	2,100
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	DH103	100	0.2	2,200	2,200	100	0.2	2,100	2,500
		150	0.15	2,100	2,000	150	0.15	2,000	2,250
		210	0.1	1,750	1,650	210	0.1	1,650	1,850
Grey & Nodular cast iron FC, FCD(GG, GGG) Below 300HB	DH103	100	0.3	3,200	4,000	100	0.3	3,000	3,600
		150	0.2	3,000	3,600	150	0.2	2,850	3,250
		210	0.1	2,550	3,000	210	0.1	2,400	2,700
Aluminium alloy 50-110HB	FZ05	100	2.5	5,600	9,000	100	2	5,300	10,600
		150	2	5,600	9,000	150	1.5	5,300	10,600
		210	1.3	4,800	5,800	210	1	4,500	6,800

ℓ : Overhung length, a_p: Depth of cut, n: Spindle speed, V_f: Feed speed

※For over 50HRC, recommend to use JC8003 without chipbreaker

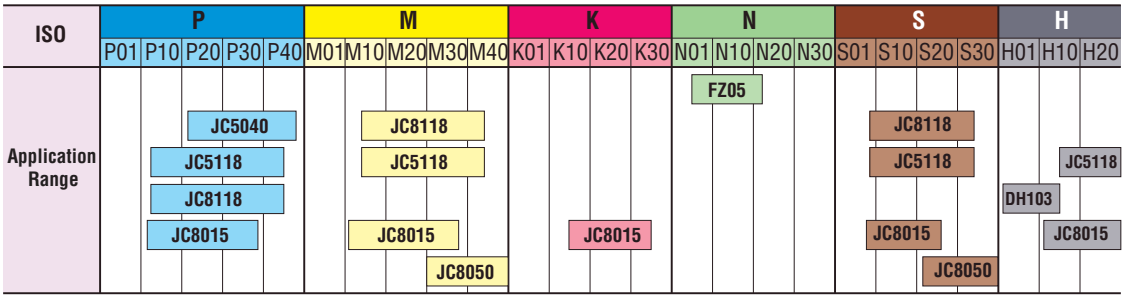
■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity o rwork rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed. 4 Use air blow to flush the chips out.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce a_p, n, V_f by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



Super Diemaster SDH TYPE

■ GRADE SELECTION GUIDE



■ GUIDE LINE FOR SELECTION OF INSERTS

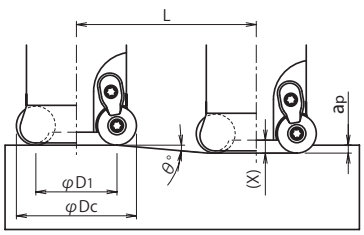
Work materials	Cast iron Cast steel	Carbon steel Die steel			Mold steel		High hardened steel	Titanium alloy Inconel		Stainless steel		Alumin-ium alloy
Insert grades / Cat. No.	JC8015 JC5118 JC8118	JC5040	JC5118 JC8118	JC8050	JC8015 JC5118 JC8118	JC8050	DH103 (Over 50HRC) JC8015 JC5118 JC8118	JC8015 JC5118	JC8050	JC8015 JC5118 JC8118	JC8050	FZ05
RDMW07T2MOT	◎	◎			◎		◎	○		○		
RD○T07T2MOE	☆		☆	●	○	●		◎	●	◎	●	
RDMW1004MOT	◎	◎			◎		◎	○		○		
RD○T1004MOT	☆		☆		○					◎		
RD○T1004MOE				●		●		◎	●		●	
RDMT1004MOE-ML									◎		◎	
RDMW1204MOT	◎	◎			◎		◎	○		○		
RD○T1204MOT	☆		☆		○					◎		
RD○T1204MOE				●		●		◎	●		●	
RDMT1204MOE-ML									◎		◎	
RDGT○○○○MOF-AL												◎

•RDMW type: without chipbreaker •RD○T type: with chipbreaker
◎~First choice, Good condition ○~Moderate condition ●~Unfavorable condition ☆~Light cutting

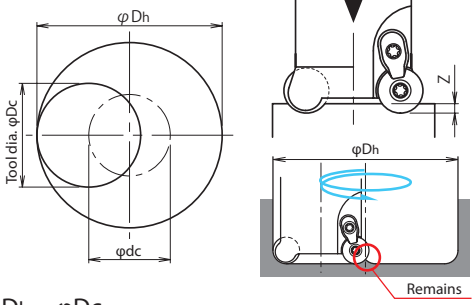
Super Diemaster SDH TYPE

■ Instructions for profile milling

● Ramping



● Helical Interpolation



● Calculation of tool pass dia. $\varphi dc = \varphi Dh - \varphi Dc$ (Tool pass dia. = Bore dia. − Tool dia.)

● Depth of cut per one circle should not exceed max. depth of cut ap.

● Down cutting is recommended, so tool pass rotation should be counterclockwise.

● Do not continue ramping after drilling.

● In case of helical interpolation, remove the core by traverse milling.

- In case of ramping and helical interpolation, apply 70% or less feed speed from standard cutting conditiontable.
- In case of drilling, apply50% or less Zaxis feed speed from standard cutting conditiontable.
- Long continous chips may come out in case of drilling, confirm the safe cutting conditions.

Tool dia. φDc (mm)	Insert dia. (mm) (R)	Effective cutting dia. φD1 (mm)	Min. bore dia. φDh min. (mm)	Max.bore dia. φDh max. (mm)	Max. ramping angle θ°	Max. depth of cut ap (mm)	Total cutting length L (mm)at max. ap	Max. drilling depth Z (mm)	Depth of holder face X (mm)
15	7 (R3.5)	8	20	28	3°00′	3.5	66.8	0.4	1.0
20	7 (R3.5)	13	30	38	5°30′	3.5	36.3	1.5	2.5
22	7 (R3.5)	15	34	42	4°35′	3.5	43.6	1.5	2.5
25	7 (R3.5)	18	40	48	3°40′	3.5	54.6	1.5	2.5
25	10 (R5)	15	34	48	10°45′	5.0	26.3	2.5	3.5
28	10 (R5)	18	40	54	8°20′	5.0	34.1	2.5	3.5
30	10 (R5)	20	44	58	7°15′	5.0	39.3	2.5	3.5
32	10 (R5)	22	48	62	6°25′	5.0	44.4	2.5	3.5
32	12 (R6)	20	44	62	7°35′	6.0	45.1	2.5	3.5
35	10 (R5)	25	54	68	5°30′	5.0	51.9	2.5	3.5
35	12 (R6)	23	50	68	6°15′	6.0	54.7	2.5	3.5
40	12 (R6)	28	60	78	4°55′	6.0	69.7	2.5	3.5
42	10 (R5)	32	68	82	4°05′	5.0	70.0	2.5	3.5

Blade-Chipper MTD TYPE

Series expansion, small diameter type for Blade-Chipper TDM / MTD type.

● End mill / modular type: 25 & 32mm dia.

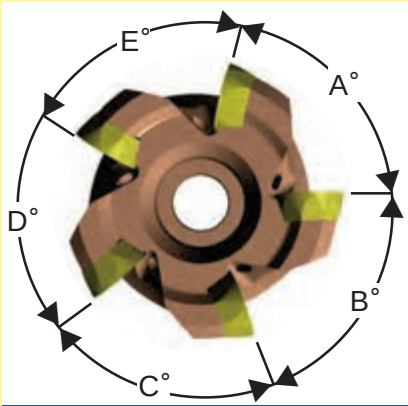
Aerospace Tooling

Face Milling | Copy Milling | Pocket Milling

■ INSERTS

1. Has extensive lineup of small diameter type for machining small to medium-sized turbine blade
2. Insert are arranged in an irregular pitch (except for 3 tooth type). Prevents chattering & vibration.
3. Available now medium or heavy type inserts.
4. Adoptied new PVD coated grade "JC7560P" improved heat-fracture resistance & impact strength.

■ Specification of TDM / MTD type



Irregular pitch prevents chattering & vibration (except for 3 tooth type).

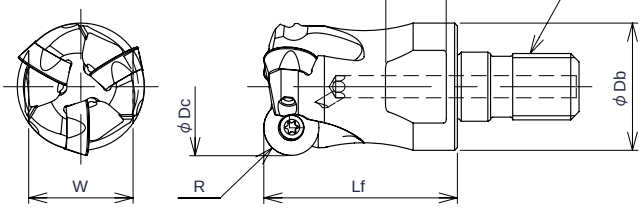
■ Insert shape of TDM / MTD small diameter type

Application	Medium	Heavy
Breaker	MM4	MH4
Appearance		
Breaker angle	15°	10°
No. of corners	4	4

Blade-Chipper MTD TYPE

MTD TYPE

■ Modualar head MTD type



Arbor B193

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	R	Lf	φDb	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
MTD-3025-10-M12	●	3	25	5	35	23	M12	11	19	RPMT10T3MOE-MM4	DSW-307H	A-10
MTD-4032-10-M16	●	4	32	5	43	29	M16	12	22	RPMT10T3MOE-MH4		

Note) 1. All cutters are supplied without inserts.
2. Please refer page B009 for recommended tightening torque.

Clamp Screw	Recommended Torque (N•m)
DSW307H	1.8

● Standard stock items □: Stock in Japan ○: Soon to be deleted

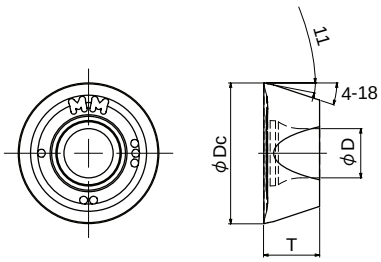
Blade-Chipper MTD TYPE

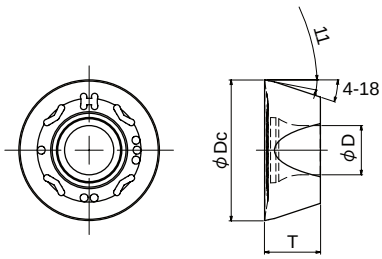
MTD TYPE

■ Inserts

Fig.1 RPMT10T3MOE-MM4

Fig.2 RPMT10T3MOE-MH4





Type	Corner	Cat. No.	Tolerance	PVD coated	Dimensions (mm)			Fig.
				NEW JC7560P	φDc	T	φD	
Medium	4	**RPMT10T3MOE-MM4**	M	●	10	3.97	3.5	1
Heavy	4	**RPMT10T3MOE-MH4**	M	●	10	3.97	3.5	2

10 inserts per case.

■ RECOMMENDED CUTTING CONDITIONS MTD

● MTD and MSN type

Work materials	Grades	Cutting speed Vc (m/min)	Breaker	Depth of cut		feed per tooth	Tool dia. øDc (mm) ø25 x 3N		ø32x 4N	
				ap range (mm)	ap (mm)	fz (mm/t)	n (mm⁻¹)	vf (mm/min)	n (mm⁻¹)	vf (mm/min)
Stainless steel (Martensitic)	JC7560P	190-240-290	MM4 MH4	0.5 – 2.5	0.5	0.35	3,056 (Vc=240)	3,209	2,387 (Vc=240)	3,342
					1.0	0.25		2,292		2,387
					1.5	0.21		1,925		2,006
					2.0	0.20		1,834		1,910
Stainless steel (Austenitic)	JC7560P	130-180-230	MM4 MH4	0.5 – 2.5	0.5	0.35	2,292 (Vc=180)	2,407	1,790 (Vc=180)	2,506
					1.0	0.25		1,719		1,790
					1.5	0.21		1,444		1,504
					2.0	0.20		1,375		1,432

ℓ : Overhung length, ap: Depth of cut, Vc:cutting speed,
n: Spindle speed, Vf: Feed speed, fz: feed per tooth

Medium type/4corners, Heavy type/4 corners

ℓ /Dc	Vc (m/min)	Vf (mm/min)
Or under 3DC	100%	100%
Over 3DC, up to 5 DC	70%	70%

■NOTE

1) The figure to be adjusted according to the machine rigidity or work rigidity.
2) In case of lengthening overhung length, cuttting speed and feed speed to be reduced according to the right table.
3) Should use breaker type properly according to the work shapes or conditions of chipping. Normally, recommend to use MM-breaker.
4) Use air blow.

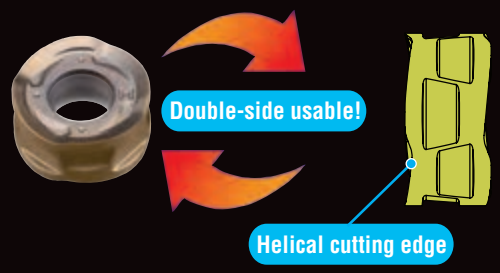
● Standard stock items □: Stock in Japan ○: Soon to be deleted

EXTREME DIEMASTER MTX TYPE

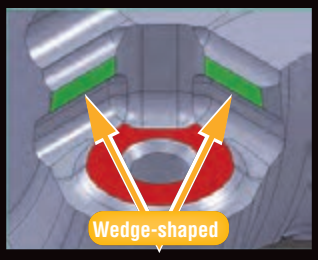
Features

"EXTREME DIEMATE" EXTDM / MTX type with edge sharpness and strength.

- Achieved edge sharpness and strength by unique helical cutting edge. Adopted radius insert suitable for turbine blade machining.
- Economical double-side insert (8 corners).



- Unique insert rotation preventing structure: Due to wedge-shaped binding face of insert prevents movement of inserts. Able to stable machining.



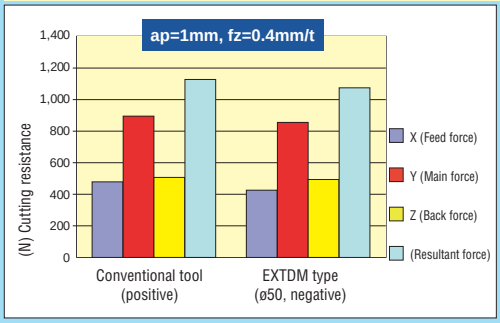
- New PVD coated grade "JC7560P" achieved longer tool life compared with conventional PVD coated grade "JC7560".
- Insert are arranged in an irregular pitch (except for 3 tooth type). Prevents chattering & vibration.

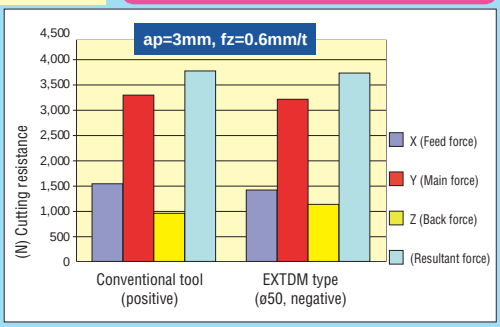
Cutting performance

Cutting force comparison

Material: S50C C50
Cutting conditions: Vc=180/min, n=1, 146min^{-1}, ae=30mm
Dow cut – Air blow, Test by 1 insert
Overhung length.: 120mm
Tool No.: EXTDM-5050R-12-22 (ø50) Holder No.: BT50
Insert No.: RNMU1205MOE-MM (JC7560P)

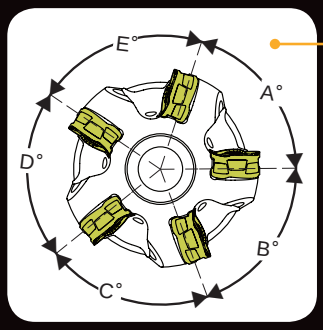
Cutting force of EXTDM is almost the same as the conventional positive cutter.



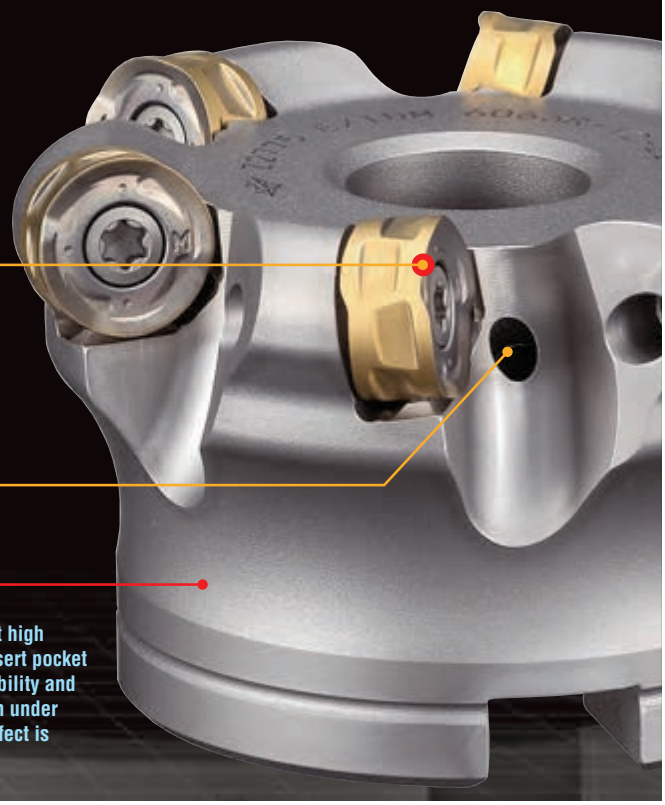


EXTREME DIEMASTER MTX TYPE

Indexable radius cutter for hard-to-cut material.



Irregular pitch prevents chattering & vibration (except for 3 tooth type).



Achieved edge sharpness & strength by helical cutting edge

Through coolant hole: surely coolant supply to cutting edge

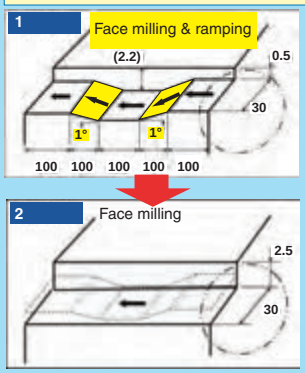
G-Body

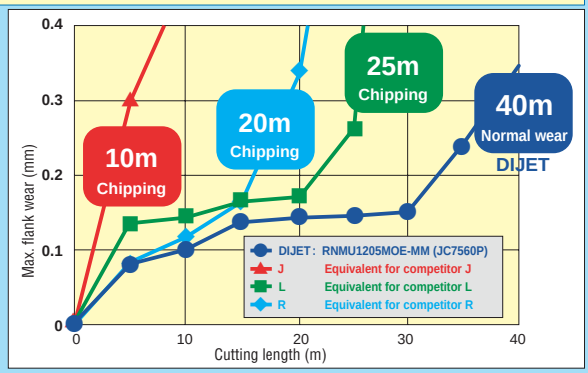
Adopted GN surface-hardening treatment on thermal resistant high strength steel gives high hardness over 65HRC and secure insert pocket and holder against thermal deformation, improved body durability and tool life by 30% or more. Make it difficult to be damaged even under severe cutting conditions. Also rust-proof and anti-welding effect is much improved.

Cutting performance

● Cutting force comparison

Material: Stainless steel (Martensitic)
Cutting conditions: Vc=260m/min, n=1,650min^{-1}, Vf=495mm/min, fz=0.3mm/t, ae=30mm, ap=0.5-2.5mm
Dow cut – Air blow, Test by 1 insert
Tool No.: EXTDM-5050R-12-22((ø50) Insert No.: RNMU1205MOE-MM (JC7560P)



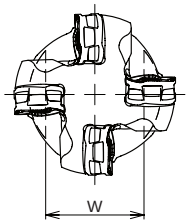


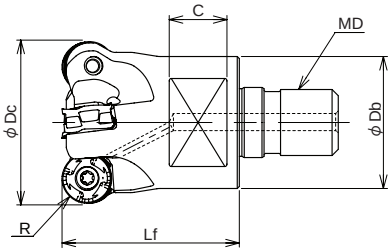
EXTREME DIEMASTER MTX TYPE

MTX TYPE

■ Modular head MTX type

G-Body





Cat. No.	Stock	No. of inserts	Dimensions (mm) φDc	R	Lf	φDb	MD	C	W	Applicable inserts	Parts: Clamp Screw	Parts: Wrench
MTX-3032-12-M16	●	3	32	6	43	28	M16	12	22	RNMU1205M0E-MM	TSW-410H	A-15T
MTX-4040-12-M16	●	4	40	6	43	32	M16	14	26			

Note) 1. All cutters are supplied without inserts.
2. Please see page B009 for recommended tightening torque.

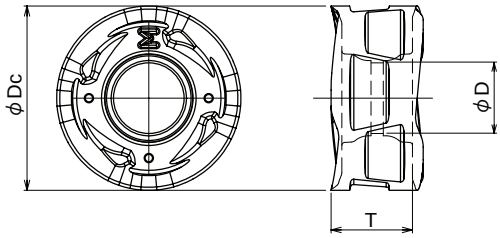
Arbor B193 Cutting conditions B134

Clamp Screw	Recommended Torque (N•m)
TSW-410H	3,5

EXTREME DIEMASTER MTX TYPE

MTX TYPE

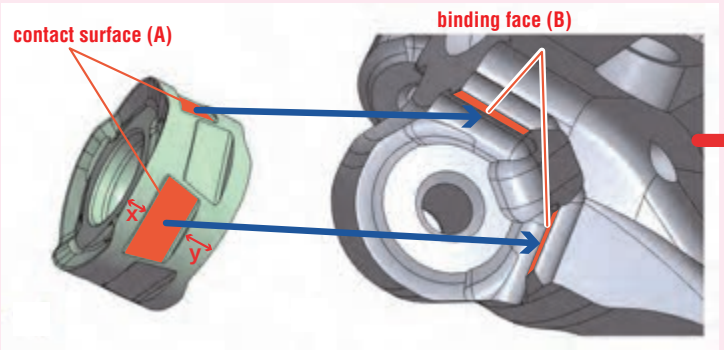
■ Inserts



Cat. No.	Tolerance	Total of corners (double-side)	PVD coated	Dimensions (mm)		
			NEW JC7560P	φDc	T	φD
RNMU1205M0E-MM	M	8	●	12	5.3	4.6

10 inserts per case.

Attention to mounting insert



Put insert so that contact surface of insert (A) can come into contact with wedge-shaped binding face (B).

■ Recommended cutting conditions for EXTDM and MTX

● MTX and MSN type

Work materials	Grades	Cutting speed Vc (m/min)	Breaker	Depth of cut		feed per tooth	Tool dia. øDc (mm)			
							ø32x 3N		ø40x 4N	
				ap range (mm)	ap (mm)	fz (mm/t)	n (mm^{-1})	vf (mm/min)	n (mm^{-1})	vf (mm/min)
Stainless steel (Martensitic)	JC7560P	170-220-270	MM	0.5 – 2.5	0.5	0.55	2,188 (Vc=220) (ø32)	3,610	1,751 (Vc=220) (ø40)	3,852
					1.0	0.40		2,626		2,802
					1.5	0.35		2,297		2,451
					2.0	0.30		1,969		2,101
					2.5	0.27		1,772		1,891
Stainless steel (Austenitic)	JC7560P	120-160-200	MM	0.5 – 2.5	0.5	0.55	1.591 (Vc=160) (ø32)	2,625	1,273 (Vc=160) (ø40)	2,801
					1.0	0.40		1,909		2,037
					1.5	0.35		1,671		1,782
					2.0	0.30		1,432		1,528
					2.5	0.27		1,289		1,375

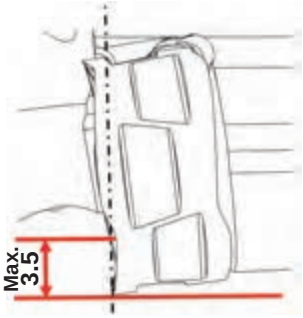
ℓ : Overhung length, ap: Depth of cut, Vc:cutting speed,
n: Spindle speed, Vf: Feed speed, fz: feed per tooth

ℓ /Dc	Vc (m/min)	Vf (mm/min)
Or under 3Dc	100%	100%
Over 3Dc, up to 5 Dc	70%	70%

■NOTE

1) The figure to be adjusted according to the machine rigidity or work rigidity.
2) In case of lengthening overhung length, cuttting speed and feed speed to be reduced according to the right table.
3) Use air blow.

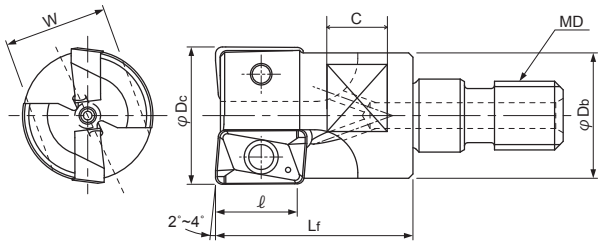
MM breaker insert has helical cutting edge, so recommend to use at ap=3mm or less.



Tool dia. (mm)	Max. ramping angle
32	0.7°
40	0.8°
50	1°
52	1°
63	0.8°
66	0.8°

Side Chipper MIC TYPE

Through Coolant Hole



■ BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) φ Dc	ℓ	Lf	φ Db	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
MIC-2016-M8	●	2	16	9	23	14.6	M8	8	12	ZCMT1003○○R○ JDA-ZCGT1003○○	ESW-206	A-08SD
MIC-2018-M8	●	2	18	9	23	15.5	M8	8	12			
MIC-2020-M10	●	2	20	9	30	18.4	M10	9	14	ZCMT1003○○R○ JDA-ZCGT1003○○	ESW-206	A-08SD
MIC-3020-M10	●	3	20	9	30	18.4	M10	9	14			
MIC-2025-M12	●	2	25	15	35	23	M12	10	17	ZPMT1604○○R○	TSW-408	A-15
MIC-3025-M12	●	3	25	12.5	35	23	M12	10	17	ZPMT13T3○○R○	DSW-307	A-10
MIC-3027-M12	□	3	27	12.5	35	24	M12	10	17	ZPMT13T3○○R○	DSW-307	A-10
MIC-2032-M16	●	2	32	15	43	29	M16	12	22	ZPMT1604○○R○	TSW-408	A-15
MIC-3032-M16	●	3	32	15	43	29	M16	12	22			
MIC-2035-M16	□	2	35	15	43	29	M16	12	22			
MIC-4040-M16	●	4	40	15	43	29	M16	12	22			
MIC-5040-M16	●	5	40	12.5	43	29	M16	12	22	ZPMT13T3○○R○	DSW-307	A-10

Note) 1. Please refer page B133-B136 for recommended cutting conditions.
2. All cutter are supplied without inserts.
3. Body must be modified to 1.5 radius or 1.2 chamfer at corner to use 3.0mm or 3.2mm corner radius insert.
4. Please refer page B009 for recommended tightening torque.

Arbor B193

Clamp Screw	Recommended torque (N•m)
ESW-206	0.9
DSW-307	1.4
TSW-408	3.1

● Standard stock items □: Stock in Japan ○: Soon to be deleted

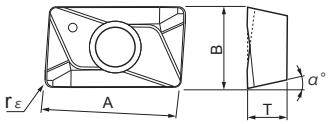
Side Chipper MIC TYPE

■ INSERTS

Z○MT-R type

Z○MT-RP type

Polished



Cat. No.	PVD coated			Uncoated	Dimensions (mm)				
	JC5015	JC5040	JC8050	FZ15	A	B	T	α°	rε
ZCMT100304R	●	●			10.4	6.35	3.4	7	0.4
ZCMT100308R	●	●			10.4	6.35	3.4	7	0.8
ZCMT100308RP				●	10.4	6.35	3.4	7	0.8
ZPMT13T308R	●	●			13.3	7.938	3.97	11	0.8
ZPMT13T308RP				●	13.3	7.938	3.97	11	0.8
ZPMT13T316R	●	●			13.3	7.938	3.97	11	1.6
ZPMT13T316RP				□	13.3	7.938	3.97	11	1.6
ZPMT13T320R	●	●			13.3	7.938	3.97	11	2.0
ZPMT13T320RP				●	13.3	7.938	3.97	11	2.0
ZPMT160404R	●	●			16	9.525	4.76	11	0.4
ZPMT160408R	●	●	●		16	9.525	4.76	11	0.8
ZPMT160408RP				●	16	9.525	4.76	11	0.8
ZPMT160416R	●	●			16	9.525	4.76	11	1.6
ZPMT160416RP				●	16	9.525	4.76	11	1.6
ZPMT160420R	●	●			16	9.525	4.76	11	2.0
ZPMT160420RP				●	16	9.525	4.76	11	2.0
ZPMT160430R	●	●			16	9.525	4.76	11	3.0
ZPMT160430RP				●	16	9.525	4.76	11	3.0
ZPMT160432R	●	●			16	9.525	4.76	11	3.2
ZPMT160432RP				□	16	9.525	4.76	11	3.2

10 Inserts per case.

Side Chipper MIC TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MIC type (ZCMT10…type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)											
		16/18				20				20/22			
		No. of teeth 2N				No. of teeth 2N				No. of teeth 3N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5040	70	0.6	3,580	2,150	70	0.7	2,860	1,300	70	0.7	2,860	1,860
		120	0.5	3,180	1,590	120	0.5	2,550	1,300	120	0.5	2,550	1,660
		160	0.3	2,980	1,490	190	0.2	2,390	1,100	190	0.2	2,390	1,550
Mold steel HPM7, PX5, NAK80, P20 (1.2311,P20) 30-43HRC	JC5040 JC5015 For over 40HRC	70	0.6	3,180	1,600	70	0.7	2,550	1,050	70	0.7	2,550	1,530
		120	0.5	3,180	1,600	120	0.5	2,550	1,050	120	0.5	2,550	1,530
		160	0.3	2,980	1,490	190	0.2	2,390	990	190	0.2	2,390	1,530
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040	70	0.6	3,180	1,600	70	0.7	2,550	1,050	70	0.7	2,550	1,530
		120	0.5	3,180	1,600	120	0.5	2,550	1,050	120	0.5	2,550	1,530
		160	0.3	2,980	1,490	190	0.2	2,390	990	190	0.2	2,390	1,530
Stainless steel SUS304 Below 250HB	JC5015	70	0.6	3,180	1,600	70	0.7	2,550	1,050	70	0.7	2,550	1,530
		120	0.5	2,980	1,490	120	0.5	2,390	990	120	0.5	2,390	1,400
		160	0.3	2,980	1,490	190	0.2	2,390	990	190	0.2	2,390	1,400
Hardened die steel SKD61, SKD11 (1.2344, 1.2379) 40-50HRC	JC5015	70	0.4	1,400	350	70	0.5	1,100	255	70	0.5	1,110	420
		120	0.3	1,200	300	120	0.3	950	220	120	0.3	950	330
		160	–	–	–	190	–	–	–	190	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5015	70	0.6	2,980	1,800	70	0.7	2,400	1,320	70	0.7	2,400	1,680
		120	0.5	2,980	1,650	120	0.5	2,400	1,320	120	0.5	2,400	1,580
		160	0.3	2,500	1,380	190	0.2	2,070	1,130	190	0.2	2,070	1,400
Aluminium alloy 50-110HB	FZ15	70	2.0	8,000	4,000	70	2.0	6,400	3,200	70	2.0	6,400	4,480
		120	1.5	8,000	3,600	120	1.5	6,400	3,200	120	1.5	6,400	4,160
		160	1.0	6,700	3,000	190	1.0	5,600	2,520	190	1.0	5,600	3,640
Aluminium alloy 50-110HB	JDA10	70	2.0	8,000	4,000	70	2.0	6,400	3,200	70	2.0	6,400	4,480
		120	1.5	8,000	3,600	120	1.5	6,400	3,200	120	1.5	6,400	4,160
		160	1.0	6,700	3,000	190	1.0	5,600	2,520	190	1.0	5,600	3,640

ℓ : Overhung length, ap: 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 occurrs, recommend to reduce depth of cut or feed speed.
3) In case of shoulder milling, width of cut up to 1/2 Dc is recommended.
4) In case of full slotting, recommend to reduce spindle speed and feed speed by 70% on above table. But do not recommended full slotting if overhung length is over 150mm.

Side Chipper MIC TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MIC type (ZPMT13…type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)											
		22				25/27				40			
		No. of teeth 2N				No. of teeth 3N				No. of teeth 5N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5040	70	0.7	2,600	1,300	90	1.0	2,290	1,500	100	1.5	1,430	1,070
		120	0.5	2,600	1,300	140	0.6	2,290	1,500	150	1.0	1,430	1,070
		190	0.3	2,200	1,100	210	0.3	1,900	1,230	210	0.4	1,430	860
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC5040 JC5015 For over 40HRC	70	0.7	2,320	1,050	90	1.0	2,040	1,230	100	1.5	1,300	975
		120	0.5	2,320	1,050	140	0.6	2,040	1,230	150	1.0	1,300	975
		190	0.3	2,200	990	210	0.3	1,900	1,140	210	0.4	1,300	780
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040	70	0.7	2,320	1,050	90	1.0	2,040	1,230	100	1.5	1,300	975
		120	0.5	2,320	1,050	140	0.6	2,040	1,230	150	1.0	1,300	975
		190	0.3	2,200	990	210	0.3	1,900	1,140	210	0.4	1,300	780
Stainless steel SUS304 Below 250HB	JC5015	70	0.7	2,320	1,050	90	1.0	2,040	1,230	100	1.5	1,300	975
		120	0.5	2,200	990	140	0.6	1,900	1,140	150	1.0	1,200	900
		190	0.3	2,200	990	210	0.3	1,900	1,140	210	0.4	1,200	720
Hardened die steel SKD61, SKD11 (1.2344, 1.2379) 40-50HRC	JC5015	70	0.5	1,010	255	90	0.7	890	340	100	0.8	560	330
		120	0.3	870	220	140	0.4	765	265	150	0.5	480	280
		190	–	–	–	210	–	–	–	210	0.3	480	280
Grey & Nodular cast iron FC, FCD (GG, GGG) Below300HB	JC5015	70	0.7	2,200	1,320	90	1.0	1,900	1,330	100	1.5	1,200	1,050
		120	0.5	2,200	1,320	140	0.6	1,900	1,250	150	1.0	1,200	1,050
		190	0.3	1,880	1,130	210	0.3	1,600	1,040	210	0.4	1,000	900
Aluminium alloy 50-110HB	FZ15	70	2.0	5,800	2,900	90	2.0	5,100	3,570	100	3.0	3,200	2,800
		120	1.5	5,800	2,900	140	1.5	5,100	3,320	150	2.0	3,200	2,800
		190	1.0	5,000	2,500	210	1.0	4,300	2,800	210	1.5	2,700	2,400

ℓ : Overhung length, ap: 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 occurrs, recommend to reduce depth of cut or feed speed.
3) In case of shoulder milling, width of cut up to 1/2 Dc is recommended.
4) In case of full slotting, recommend to reduce spindle speed and feed speed by 70% on above table. But do not recommended full slotting if overhung length is over 180mm.

Side Chipper MIC TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MIC type (ZPMT16…type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)							
		25/27				32/35			
		No. of teeth 2N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5040	90	1.0	2,120	1,070	100	1.5	1,790	900
		140	0.6	2,120	1,070	150	1.0	1,790	900
		210	0.3	1,770	890	210	0.6	1,490	745
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC5040 JC5015 For over 40HRC	90	1.0	1,890	850	100	1.5	1,600	720
		140	0.6	1,890	850	150	1.0	1,600	720
		210	0.3	1,770	800	210	0.6	1,490	670
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040	90	1.0	1,890	850	100	1.5	1,600	720
		140	0.6	1,890	850	150	1.0	1,600	720
		210	0.3	1,770	800	210	0.6	1,490	670
Stainless steel SUS304 Below 250HB	JC5015	90	1.0	1,890	850	100	1.5	1,600	720
		140	0.6	1,770	800	150	1.0	1,490	670
		210	0.3	1,770	800	210	0.6	1,490	670
Hardened die steel SKD61, SKD11 (1.2344, 1.2379) 40-50HRC	JC5015	90	0.7	825	250	100	0.8	700	210
		140	0.4	710	210	150	0.5	600	180
		210	–	–	–	210	0.3	600	180
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5015	90	1.0	1,770	1,060	100	1.5	1,500	900
		140	0.6	1,770	1,060	150	1.0	1,500	900
		210	0.3	1,590	950	210	0.6	1,250	750
Aluminium alloy 50-110HB	FZ15	90	2.5	5,100	2,550	100	3.0	4,000	2,000
		140	1.5	5,100	2,550	150	2.0	4,000	2,000
		210	1.0	4,300	2,150	210	1.5	3,350	1,500

ℓ : Overhung length, ap: 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 occurrs, recommend to reduce depth of cut or feed speed.
3) In case of shoulder milling, width of cut up to 1/2 Dc is recommended.
4) In case of full slotting, recommend to reduce spindle speed and feed speed by 70% on above table. But do not recommended full slotting if overhung length is over 180mm.

Side Chipper MIC TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MIC type (ZPMT16…type insert) + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)							
		30/32				40			
		No. of teeth 3N				No. of teeth 4N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5040	100	1.5	1,790	1,070	100	1.5	1,430	1,000
		150	1.0	1,790	1,070	150	1.0	1,430	1,000
		210	0.5	1,490	970	210	0.4	1,430	720
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC5040 JC5015 For over 40HRC	100	1.5	1,600	860	100	1.5	1,300	780
		150	1.0	1,600	860	150	1.0	1,300	780
		210	0.5	1,490	870	210	0.4	1,300	590
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040	100	1.5	1,600	860	100	1.5	1,300	780
		150	1.0	1,600	860	150	1.0	1,300	780
		210	0.5	1,490	870	210	0.4	1,300	590
Stainless steel SUS304 Below 250HB	JC5015	100	1.5	1,600	860	100	1.5	1,300	780
		150	1.0	1,490	870	150	1.0	1,200	720
		210	0.5	1,490	870	210	0.4	1,200	580
Hardened die steel SKD61, SKD11 (1.2344, 1.2379) 40-50HRC	JC5015	100	0.8	700	260	100	0.8	560	270
		150	0.5	600	225	150	0.5	480	230
		210	0.2	600	225	210	0.3	480	230
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5015	100	1.5	1,500	1,100	100	1.5	1,200	840
		150	1.0	1,500	1,100	150	1.0	1,200	840
		210	0.5	1,250	940	210	0.4	1,000	720
Aluminium alloy 50-110HB	FZ15	100	3.0	4,000	2,800	100	3.0	3,200	2,240
		150	2.0	4,000	2,800	150	2.0	3,200	2,240
		210	1.5	3,350	2,200	210	1.5	2,700	1,760

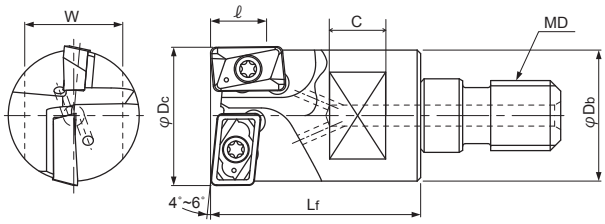
ℓ : Overhung length, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of shoulder milling, width of cut up to 1/2 Dc is recommended.
4) In case of full slotting, recommend to reduce spindle speed and feed speed by 70% on above table. But do not recommended full slotting if overhung length is over 180mm.

Super End Chipper MEC TYPE

Through Coolant Hole



■ BODY

Cat. No.	Stock	No. of flutes	Dimensions(mm) φ Dc	ℓ	Lf	φ Db	MD	C	W	Inserts	Parts: Clamp screw	Parts: Wrench
MEC-2016-M8	●	2	16	8	23	14.8	M8	8	12	ZDMT08T208L○ ZPMT09T208R○	TSW-2250	A-07SD
MEC-2020-M10	●	2	20	9	30	18.7	M10	8	14	ZDMT100308L○ ZCMT100308R○	ESW-206	A-08SD
MEC-2021-M10	□	2	21	9	30	19.6	M10	8	14		ESW-206	A-08SD
MEC-2025-M12	●	2	25	12.5	35	23.2	M12	10	17	ZDMT13T3○○L○ ZPMT13T3○○R○	DSW-307	A-10
MEC-2026-M12	□	2	26	12.5	35	24.1	M12	10	17		DSW-307	A-10
MEC-2030-M16	□	2	30	15	43	28.2	M16	12.5	22	ZPMT150408L○ ZPMT160408R○	TSW-408	A-15
MEC-2032-M16	●	2	32	15	43	30.2	M16	12.5	22	ZPMT1604○○L○ ZPMT1604○○R○	TSW-408	A-15
MEC-2033-M16	□	2	33	15	43	31	M16	12.5	22		TSW-408	A-15

Note) 1. Please refer page B139-B140 for recommended cutting conditions.
2. All cutters are supplied without inserts.
3. Body must be modified to1.5 radius or 1.2 chamfer at corner to use 3.0mm or 3.2mm corner radius insert.
4. Please refer page B009 for recommended tightening torque.

Arbor B193

Clamp Screw	Recommended torque (N•m)
TSW-2250	0.6
ESW-206	0.9
DSW-307	1.4
TSW-408	3.1
DSW-4510H	6.0

● Standard stock items □: Stock in Japan ○: Soon to be deleted

Super End Chipper MECTYPE

■ INSERTS

Z○MT-Ltype

Central Insert

Z○MT-LPtype

Central Insert (Polished)

Z○MT-Rtype

Peripheral Insert

Z○MT-RPtype

Peripheral Insert (Polished)

Fig.1 Central Insert

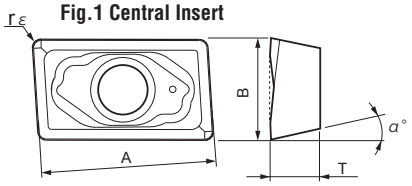
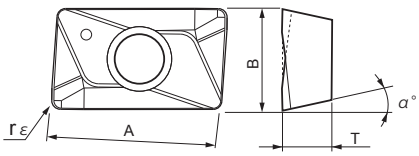


Fig.2 Peripheral Insert



Cat. No.	PVD coated		Uncoated	Dimensions (mm)					Fig.
	JC5015	JC5040	FZ15	A	B	T	α°	rε	
ZDMT08T208L	●	●		7.9	6	2.78	15	0.8	1
ZDMT08T208LP			●	7.9	6	2.78	15	0.8	1
ZPMT09T208R	●	●		9	5.4	2.78	11	0.8	2
ZPMT09T208RP			●	9	5.4	2.78	11	0.8	2
ZDMT100308L	●	●		10.4	6.35	3.4	15	0.8	1
ZDMT100308LP			●	10.4	6.35	3.4	15	0.8	1
ZCMT100308R	●	●		10.4	6.35	3.4	7	0.8	2
ZCMT100308RP			●	10.4	6.35	3.4	7	0.8	2
ZDMT13T308L	●	●		12.9	7.938	3.97	15	0.8	1
ZDMT13T308LP			●	12.9	7.938	3.97	15	0.8	1
ZPMT13T308R	●	●		13.3	7.938	3.97	11	0.8	2
ZPMT13T308RP			●	13.3	7.938	3.97	11	0.8	2
ZDMT13T320L	●	●		12.9	7.938	3.97	15	2.0	1
ZDMT13T320LP			□	12.9	7.938	3.97	15	2.0	1
ZPMT13T320R	●	●		13.3	7.938	3.97	11	2.0	2
ZPMT13T320RP			□	13.3	7.938	3.97	11	2.0	2
ZPMT150408L	●	●		15.45	9.525	4.76	11	0.8	1
ZPMT150408LP			●	15.45	9.525	4.76	11	0.8	1
ZPMT160408L	●	●		16.45	9.525	4.76	11	0.8	1
ZPMT160408LP			●	16.45	9.525	4.76	11	0.8	1
ZPMT160408R	●	●		16	9.525	4.76	11	0.8	2
ZPMT160408RP			●	16	9.525	4.76	11	0.8	2
ZPMT160416L	●	●		16.45	9.525	4.76	11	1.6	1
ZPMT160416LP			□	16.45	9.525	4.76	11	1.6	1
ZPMT160416R	●	●		16	9.525	4.76	11	1.6	2
ZPMT160416RP			●	16	9.525	4.76	11	1.6	2
ZPMT160420L	●	●		16.45	9.525	4.76	11	2.0	1
ZPMT160420LP			□	16.45	9.525	4.76	11	2.0	1
ZPMT160420R	●	●		16	9.525	4.76	11	2.0	2
ZPMT160420RP			●	16	9.525	4.76	11	2.0	2
ZPMT160430L	●	●		16.45	9.525	4.76	11	3.0	1
ZPMT160430LP			□	16.45	9.525	4.76	11	3.0	1
ZPMT160430R	●	●		16	9.525	4.76	11	3.0	2
ZPMT160430RP			●	16	9.525	4.76	11	3.0	2
ZPMT160432L	□	□		16.45	9.525	4.76	11	3.2	1
ZPMT160432LP			□	16.45	9.525	4.76	11	3.2	1
ZPMT160432R	●	●		16	9.525	4.76	11	3.2	2
ZPMT160432RP			●	16	9.525	4.76	11	3.2	2

10 Inserts per case.

Super End Chipper MECTYPE

■ RECOMMENDED CUTTING CONDITIONS

● MEC type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)							
		16				20/21			
		No. of teeth 2N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5040	70	0.6	3,580	2,140	70	0.7	2,860	1,430
		120	0.5	3.180	1,590	120	0.5	2,860	1,430
		160	0.3	2,980	1,490	190	0.3	2,400	1,200
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC5040 JC5015 For over 40HRC	70	0.6	3,180	1,590	70	0.7	2,550	1,150
		120	0.5	3,180	1,590	120	0.5	2,550	1,150
		160	0.3	2,980	1,490	190	0.3	2,400	1,080
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040	70	0.6	3,180	1,590	70	0.7	2,550	1,150
		120	0.5	3,180	1,590	120	0.5	2,550	1,150
		160	0.3	2,980	1,490	190	0.3	2,400	1,080
Stainless steel SUS304 Below 250HB	JC5015	70	0.6	3,180	1,590	90	0.7	2,550	1,150
		120	0.5	2,980	1,490	120	0.5	2,400	1,080
		160	0.3	2,980	1,490	190	0.3	2,400	1,080
Hardened die steel SKD61, SKD11 (1.2344, 1.2379) 40-50HRC	JC5015	70	0.4	1,400	350	70	0.5	1,110	280
		120	0.3	1,200	300	120	0.3	950	240
		160	–	–	–	190	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5015	70	0.6	2,980	1,800	70	0.7	2,400	1,440
		120	0.5	2,980	1,650	120	0.5	2,400	1,440
		160	0.3	2,500	1,380	190	0.3	2,070	1,240
Aluminium alloy 50-110HB	FZ15	70	2.0	8,000	4,000	70	2.0	6,400	3,200
		120	1.5	8,000	3,600	120	1.5	6,400	3,200
		160	1.0	6,700	3,000	190	1.0	5,600	2,520

ℓ : Overhung length, ap: 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 occurrs, recommend to reduce depth of cut or feed speed.
3) In case of ramping, ramping angle up to 3% is recommended.
4) In case of full slotting, recommend to reduce spindle speed and feed speed by 70% on above table.

Super End Chipper MEC TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MEC type ＋MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)							
		24/25/26				30/32/33			
		No. of teeth 2N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5040	90	1.0	2,290	1,150	100	1.5	1,790	900
		140	0.6	2,290	1,150	150	1.0	1,790	900
		210	0.3	1,900	950	210	0.6	1,490	745
Mold steel HPM7, PX5, NAK80, P20 (1.2311,P20) 30-43HRC	JC5040 JC5015 For over 40HRC	90	1.0	2,040	920	100	1.5	1,600	720
		140	0.6	2,040	920	150	1.0	1,600	720
		210	0.3	1,900	860	210	0.6	1,490	670
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040	90	1.0	2,040	920	100	1.5	1,600	720
		140	0.6	2,040	920	150	1.0	1,600	720
		210	0.3	1,900	860	210	0.6	1,490	670
Stainless steel SUS304 Below 250HB	JC5015	90	1.0	2,040	920	100	1.5	1,600	720
		140	0.6	1,900	860	150	1.0	1,490	670
		210	0.3	1,900	860	210	0.6	1,490	670
Hardened die steel SKD61, SKD11 (1.2344, 1.2379) 40-50HRC	JC5015	90	0.7	890	270	100	0.8	700	210
		140	0.4	765	230	150	0.5	600	180
		210	–	–	–	210	0.3	600	180
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5015	90	1.0	1,900	1,140	100	1.5	1,500	900
		140	0.6	1,900	1,140	150	1.0	1,500	900
		210	0.3	1,600	960	210	0.6	1,250	750
Aluminium alloy 50-110HB	FZ15	90	2.5	5,100	2,550	100	3.0	4,000	2,000
		140	1.5	5,100	2,550	150	2.0	4,000	2,000
		210	1.0	4,300	2,150	210	1.5	3,350	1,500

ℓ : Overhung length, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

■NOTE

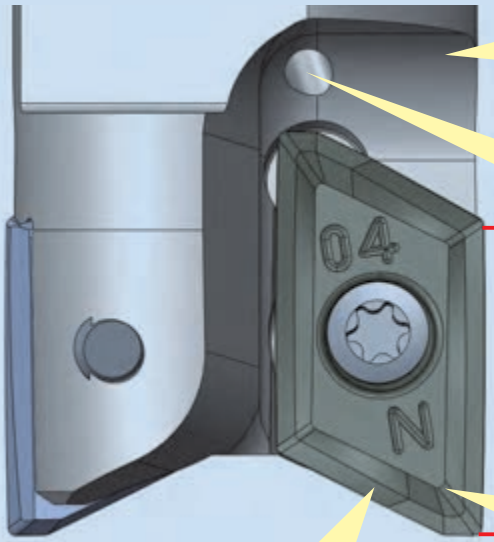
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of ramping, ramping angle up to 3% is recommended.
4) In case of full slotting, recommend to reduce spindle speed and feed speed by 70% on above table.

Aero Chipper MALTYPE

Possible for High Precision & High Efficient machining of Aluminium & Titanium alloys for Aerospace parts machining.

G-Body

Aerospace Tooling



G-Body Improved body durability by ultra-rigid “G Body”.

Internal Coolant Supply

High Precision

True 90 degrees shoulder milling up to 15mm D.O.C

High Efficiency

High metal removal rate (Aluminium alloy, Q=2,250cc/min by dia 50mm cutter.)
Key on the back side of insert is for rigidity & positional stability.

Multi-purpose

Ramping, Shoulder milling, Slotting, Pocket milling and Helical interpolation are possible.

G-Body

Special surface-hardening treatment on thermal heat resistant high speed steel gives high hardness over 65HRC and secure insert pocket and holder against thermal deformation. This G-body is anti-vibration & highly tough. This results into increased tool life by 30% or more compared with general cutter body. It is difficult to get damaged even under severe cutting conditions. Also rust-proof and anti-welding effect is much improved.

Aero Chipper MALTYPE

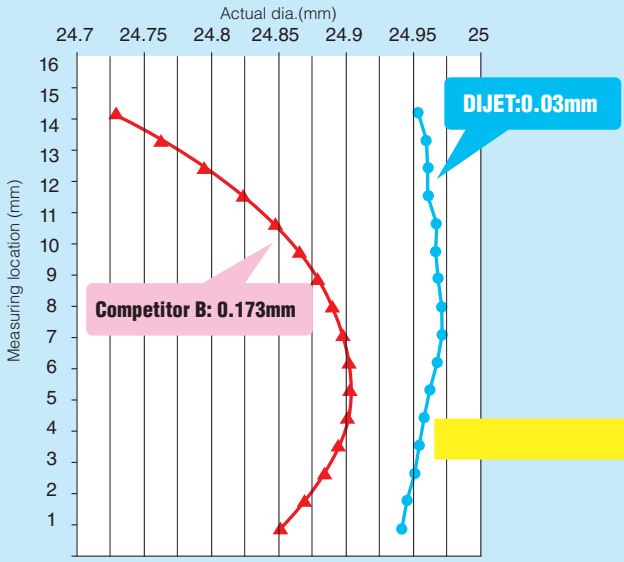
■ CUTTING PERFORMANCE of DIJET against competitor

Aerospace Tooling G-Body

Accuracy on cutting edge

HighPrecision

■ Accuracy comparison on cutting edge (Nominal dia.:φ25)

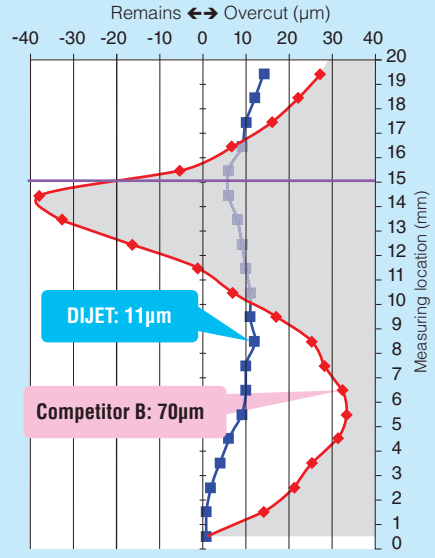


AERO CHIPPER showed much precise dimensions on insert than competitor B'sinsert.
Accuracy on cutting edge DIJET: 0.03mm, Competitor B: 0.173mm

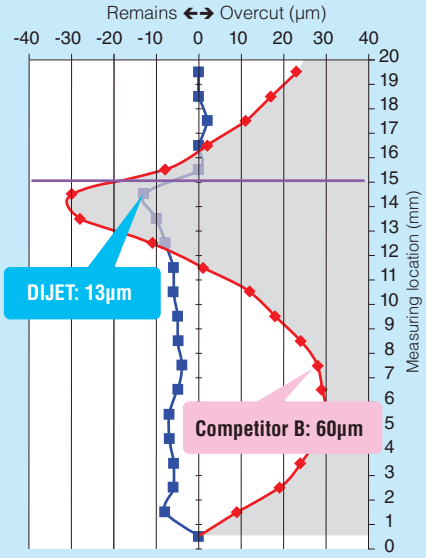
Machining accuracy

HighPrecision

■ Accuracy comparison on machined wall
(ap=15mm, fz=0.4mm/t)



■ Accuracycomparisononmachinedwall
(ap=15mm, fz=0.6mm/t)

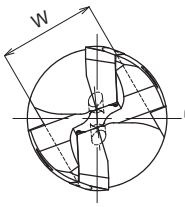


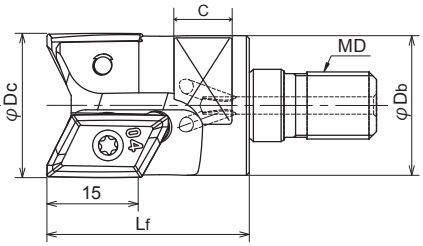
Tool dia.: φ25 (DIJET: Modular head MAL + MSN carbide shank holder)
Workmaterial: A5056 n=20,000 (min^{-1}), Vc=1,570 (m/min), ap=15 (mm) (2times), ae=3 (mm), Wet, Downcut

During 15mm cutting length, AERO CHIPPER showed 4 times better accuracy.

Aero Chipper MAL TYPE

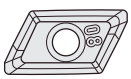
G-Body Through Coolant Hole





Arbor B193

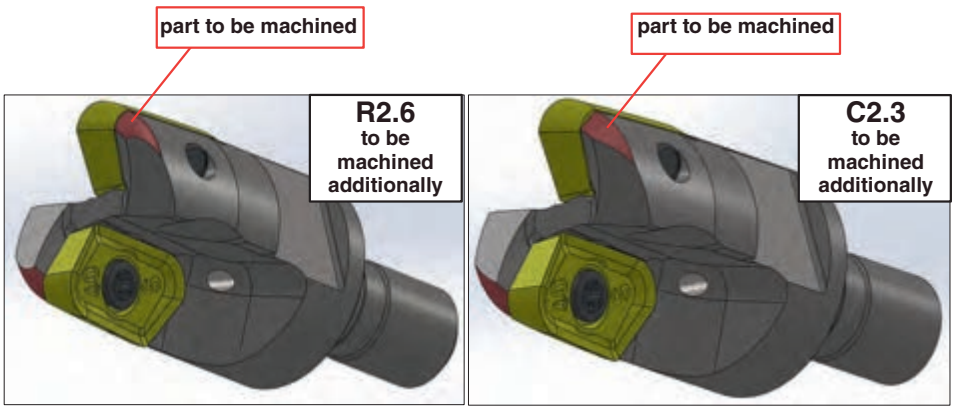
■ BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Max. spindle speed (min.-1)	Inserts	Parts: Clamp Screw	Parts: Wrench
												
MAL-1020-M10	●	1	**20**	35	19.5	M10	9	14	15,000	XOGT1605○○ PD○R	DSW-4075	A-15
MAL-2025-M12	●	2	**25**	35	24	M12	10	19	40,000			
MAL-2028-M12	●	2	**28**	35	24	M12	10	19	36,000			
MAL-2032-M16	●	2	**32**	43	29	M16	12	22	33,000		DSW-4085	
MAL-2035-M16	●	2	**35**	43	29	M16	12	22	31,000			
MAL-3040-M16	●	3	**40**	43	32	M16	14	26	28,000			

Note) 1. Please refer page B149-B152 for recommended cutting conditions.
2. All cutters are supplied without inserts.
3. Body must be modified to 1.5 radius or 1.2 chamfer at corner to use 3.0mm or 3.2mm corner radius insert.
4. Please refer page B009 for recommended tightening torque.
In case of cutting speed over 1,000m/min, please use arbor which is balanced for high RPM. (Recommended to use Grade G6.3 arbor)
5. Body must be modified to 2.6 radius or 2.3 chamfer at corner to use 4.0mm corner radius insert.

Clamp Screw	Recommended torque (N•m)
DSW-4075	3.6
DSW-4085	3.6

■ PART TO BE MODIFIED FOR MOUNTING XOGT160540PDFR TO ALX/MAL BODY



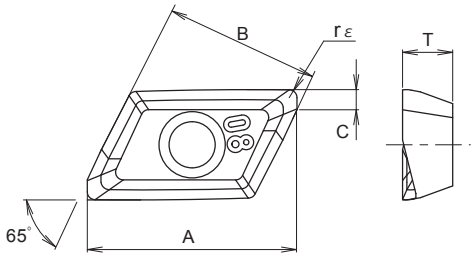
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

Aero Chipper MALTYPE

■ INSERTS

FZ05

JC5118



Cat.No.	Tole-rance	Dimensions (mm)					Uncoated	PVD coated
		A	B	C	T	rε	FZ05	JC5118
XOGT160502PDFR	G	20.8	16.35	2.5	5	0.2	●	
XOGT160504PDFR	G	21.0	16.35	2.4	5	0.4	●	
XOGT160508PDFR	G	21.0	16.35	2.4	5	0.8	●	
XOGT160512PDFR	G	20.9	16.35	2.5	5	1.2	●	
XOGT160516PDFR	G	20.7	16.35	2.6	5	1.6	●	
XOGT160520PDFR	G	20.6	16.35	2.8	5	2	●	
XOGT160525PDFR	G	20.3	16.35	3.0	5	2.5	●	
XOGT160530PDFR	G	20.1	16.35	3.3	5	3	●	
XOGT160532PDFR	G	19.9	16.35	3.5	5	3.2	●	
NEW XOGT160540PDFR	G	19.1	16.35	4.3	5	4.0	●	
XOGT160502PDER	G	20.8	16.35	2.5	5	4.0		●
XOGT160504PDER	G	21.0	16.35	2.4	5	0.4		●
XOGT160508PDER	G	21.0	16.35	2.4	5	0.8		●
XOGT160512PDER	G	20.9	16.35	2.5	5	1.2		●
XOGT160516PDER	G	20.7	16.35	2.6	5	1.6		●
XOGT160520PDER	G	20.6	16.35	2.8	5	2		●
XOGT160530PDER	G	20.1	16.35	3.3	5	3		●
XOGT160532PDER	G	19.9	16.35	3.5	5	3.2		

10 Inserts per case.

Aero Chipper MALTYPE

■ RECOMMENDED CUTTING CONDITIONS / WIDE SHOULDER MILLING

● MAL type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		20					25					28				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	75	4	14	14,000	1,120	90	8	18	12,000	4,800	90	7	20	11,000	2,640
		125	2	14	14,000	700	140	5	18	12,000	2,400	140	4	20	11,000	1,540
		175	0.5	14	10,000	500	190	2	18	9,000	1,200	190	2	20	9,000	900
Stainless steel Below 250HB	JC5118	60	2	14	2,400	240	60	3	18	1,900	380	90	2	20	1,700	272
		90	1	14	1,900	95	90	2	18	1,540	154	110	1	20	1,350	108
Titanium alloy 35-43HRC	JC5118	60	6	14	950	76	60	10	18	764	122	90	7	20	685	110
		90	3	14	950	48	90	6	18	764	76	110	3	20	685	69

Work Materials	Insert Grades	Tool dia. (mm)														
		32					35					40				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	100	7	22	9,500	2,850	100	8	25	9,000	3,600	100	8	28	7,800	5,850
		150	4	22	9,500	1,520	150	5	25	9,000	1,800	150	6	28	7,800	2,800
		200	2	22	8,000	800	200	3	25	7,200	1,000	200	4	28	6,400	1,500
Stainless steel Below 250HB	JC5118	90	3	22	1,500	240	100	2	25	1,355	217	100	2	28	1,200	288
		120	1	22	1,200	120	150	1	25	1,100	110	150	1	28	950	114
Titanium alloy 35-43HRC	JC5118	90	7	22	600	96	100	8	25	545	87	100	8	28	480	115
		120	3	22	600	60	150	4	25	545	55	150	3	28	480	72

ℓ :Overhung length, ap: Depth of cut, ae: width 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 occurrs, recommend to reduce depth of cut or feed speed.

Aero Chipper MAL TYPE

■ RECOMMENDED CUTTING CONDITIONS / NARROW SHOULDER MILLING

● MAL type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		20					25					28				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	75	10	4	14,000	840	90	15	5	12,000	4,800	90	12	5.6	11,000	2,640
		125	3	4	14,000	700	140	8	5	12,000	2,400	140	6	5.6	11,000	1,540
		175	1	4	10,000	500	190	3	5	9,000	1,200	190	3	5.6	9,000	900
Stainless steel Below 250HB	JC5118	60	4	4	2,400	240	60	7	5	1,900	380	90	4	5.6	1,700	340
		90	2	4	1,900	95	90	4	5	1,540	154	110	3	5.6	1,350	135
Titanium alloy 35-43HRC	JC5118	60	10	4	950	57	60	15	5	764	153	90	10	5.6	685	110
		90	5	4	950	38	90	8	5	764	92	110	6	5.6	685	69

Work Materials	Insert Grades	Tool dia. (mm)														
		32					35					40				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	100	10	6.4	9,500	2,850	100	10	7	9,000	4,500	100	12	8	7,800	5,850
		150	6	6.4	9,500	1,520	150	5	7	9,000	2,700	150	8	8	7,800	3,510
		200	4	6.4	8,000	800	200	4	7	7,200	1,152	200	5	8	6,400	1,920
Stainless steel Below 250HB	JC5118	90	5	6.4	1,500	300	100	4	7	1,355	270	100	4	8	1,200	360
		120	3	6.4	1,200	120	150	3	7	1,100	110	150	2	8	950	143
Titanium alloy 35-43HRC	JC5118	90	10	6.4	600	120	100	10	7	545	109	100	12	8	480	144
		120	6	6.4	600	96	150	6	7	545	76	150	6	8	480	101

ℓ :Overhung length, ap: Depth of cut, ae: width 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 occurrs, recommend to reduce depth of cut or feed speed.

Aero Chipper MAL TYPE

■ RECOMMENDED CUTTING CONDITIONS / SLOTTING

● MAL type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 20				25				28			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	75	2.5	14,000	2,100	90	8	12,000	4,800	90	6	11,000	4,400
		125	1	14,000	980	140	6	12,000	2,400	140	3	11,000	2,200
		175	0.5	10,000	500	190	2	9,000	1,200	190	2	9,000	900
Stainless steel Below 250HB	JC5118	60	2	2,400	240	60	2	1,900	380	90	2	1,700	272
		90	1	1,900	95	90	1	1,540	154	110	1	1,350	108
Titanium alloy 35-43HRC	JC5118	60	6	800	64	60	8	640	102	90	6	570	91
		90	3	800	40	90	4	640	77	120	3	570	68

Work Materials	Insert Grades	Tool dia. (mm) 32				35				40			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	100	6	9,500	3,800	100	6	9,000	3,600	100	8	7,800	4,680
		150	3	9,500	1,900	150	4	9,000	1,800	150	5	7,800	3,510
		200	2	8,000	1,280	200	2	7,200	1,150	200	3	6,400	1,920
Stainless steel Below 250HB	JC5118	90	2	1,500	240	100	2	1,355	217	100	2	1,200	288
		120	1	1,200	120	120	1	1,100	110	150	1	950	114
Titanium alloy 35-43HRC	JC5118	90	8	500	80	100	8	450	72	100	8	400	96
		120	4	500	60	120	4	450	54	150	4	400	72

ℓ :Overhung length, ap: Depth of cut, ae: width of cut, n: Spindle speed, Vf: Feed speed

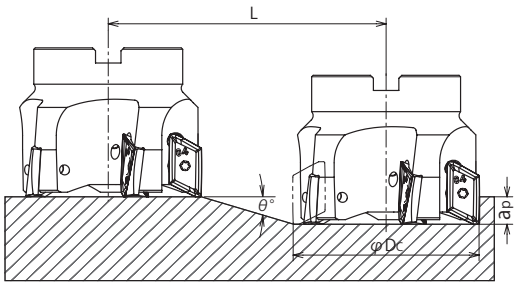
■NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.

Aero Chipper MALTYPE

■ INSTRUCTIONS FOR PROFILE MILLING

Ramping

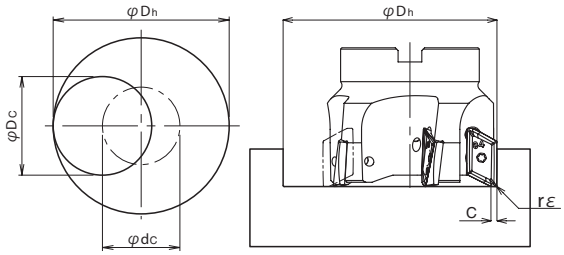


Tooldia. (mm)	Aluminium alloy		Stainless steel		Titanium alloy		Max. depth of cut (mm)
	Max. ramping angle(°)	Total cutting length(mm)	Max. ramping angle(°)	Total cutting length(mm)	Max. ramping angle(°)	Total cutting length(mm)	
φDc	θ°	L	θ°	L	θ°	L	ap
20	16	28	10	45	10	45	8
25	11 9	41	9	51	9	51	8
28		51	7	65	7	65	8
32	7	65	6	76	6	76	8
35	6	76	6	76	6	76	8
40	5	91	5	91	5	91	8

■NOTE

1) In case of ramping, apply 70% or less feed per tooth from slotting application. (Page B132)
2) In case of Titanium alloy and Stainless steel, feed per tooth up to 0.05 mm is recommended.
3) In case of Titanium alloy and Stainless steel, recommend wet cutting.

Helical Interpolation



- Calculation of tool pass dia.

$$\varphi dc = \varphi Dh - \varphi Dc$$

(Tool pass dia. = Bore dia. − Tool dia.)

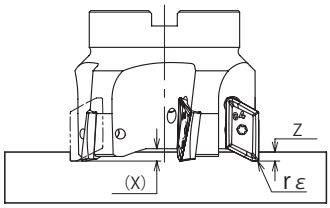
- Max. bore dia.
  φDh (φDc−rε −0.3)×2
- Min.boredia.
  φDh (φDc−C 0.3)×2
- Depth of cut per one circuit should not exceed max. depth of cut ap
- Down cutting isrecommended, so tool pass rotation should be counterclockwise.

Tool dia. (mm)	Min. bore dia. (mm)	Max. bore dia. (mm)	Helical interpolation depth / tool path rev.(mm)		
φDc	φDhmin.	φDhmax.	Aluminium alloy	Stainless steel	Titanium alloy
20	36.8	38.6	15	9	9
25	46.8	48.6	13	11	11
28	52.8	54.6	12	10	10
32	60.8	62.6	11	10	10
35	66.8	68.6	11	11	11
40	76.8	78.6	10	10	10

■NOTE

1) Min. & Max. bore dia. at this table is for insert corner radius R0.4, so in case of the other corner radius, please calculate Min. & Max. bore dia. according to the above table for “Calculation of tool pass dia.“
2) In case of helical interpolation, apply 70% or less feed per tooth from slotting application (page B132).
3) In case of Titanium alloy and Stainless steel, feed per tooth up to 0.05 mm is recommended.
4) In case of Titanium alloy and Stainless steel, recommend wet cutting

Drilling



Insert corner radius (mm)	Max. drilling depth (mm)
rε	Z
Up to R2.5	3
R3/R3.2	2

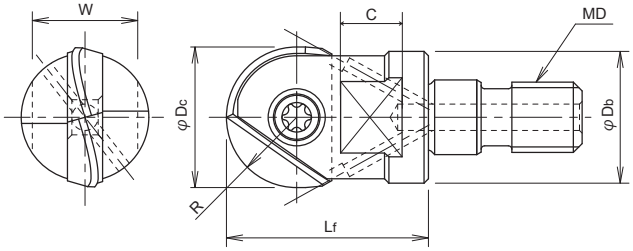
■NOTE

1) Do not continue ramping after drilling.
2) In case of drilling, apply 50% or less Zaxis feed speed from standard cutting condition table.
3) Long consecutive chips may come out in case of drilling, confirm the safe condition sufficiently.

Mirror Ball MBX TYPE

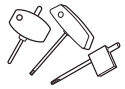
Through Coolant Hole

Accuracy of MBX type modul ar head mounted on MSN carbide shank holder: O.D. run out below 15μm (Target below 10μm)



■ BODY

Arbor B193

Cat. No.	Stock	Dimensions (mm) R	φ Dc	Lf	φ Db	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
											
MBX-100-M6	●	5	**10**	18	9.7	M6	6.5	8	BNM-100.../BNM-110	FSW-3007H	A-08
MBX-120-M6	●	6	**12**	20	11.5	M6	6.5	8	BNM-120...	FSW-3509H	A-10
MBX-160-M8	●	8	**16**	23	15	M8	8	12	BNM-160...	FSW-4013H	A-15
MBX-200-M10	●	10	**20**	30	18.5	M10	8	14	BNM-200...	FSW-5016H	A-20W
MBX-250-M12	●	12.5	**25**	35	24	M12	10	17	BNM-250...	FSW-6020	A-30
MBX-300-M16	●	15	**30**	43	29	M16	12.5	22	BNM-300...	FSW-8025	A-40
MBX-320-M16	●	16	**32**	43	29	M16	12.5	22	BNM-320...	FSW-8025	A-40

Note) 1. Please refer page B157-B162 for recommended cutting conditions.
2. All cutters are supplied without inserts and wrench.
3. Please refer page B009 for recommended tightening torque.

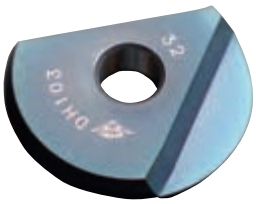
Clamp Screw	Recommended Torque (N•m)
FSW-3007H	1.2
FSW-3509H	2.0
FSW-4013H	3.0
FSW-5016H	4.0
FSW-6020	5.0
FSW-8025	6.0

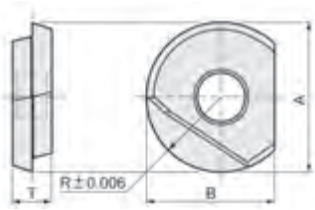
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

Mirror Ball MBX TYPE

Mirror Ball Insert

■ INSERTS





Radius form accuracy of inserts:
within ±0.006mm

Cat. No.	PVD coated		Diamond coated	Uncoated	Dimensions (mm)				
	JC5015 (Z10~20)	DH103 (Z05)	JC10000	KT9 (K10)	R	A	B	C (JBN245)	T
BNM-100	●	●	□	●	5	10	8.5	-	2.6
BNM-120	●	●	●	●	6	12	10	-	3
BNM-160	●	●	□	●	8	16	12	0.8	4
BNM-200	●	●	●	●	10	20	15	1	5
BNM-250	●	●		□	12.5	25	18.5	1	6
BNM-300	●	●		□	15	30	22.5	1	7
BNM-320	●	●		●	16	32	23.5	-	7

2 Inserts per case, but in case of grade JC10000: 1 piece per case.

BNM-S Type

Cat. No.	Uncoated	Dimensions (mm)				
	FZ05 (Z01)	R	A	B	C	T
BNM-100-S	●	5	10	8.5	1	2.6
BNM-120-S	●	6	12	10	1	3
BNM-160-S	●	8	16	12	1	4
BNM-200-S	●	10	20	15	1	5
BNM-250-S	●	12.5	25	18.5	1	6
BNM-300-S	●	15	30	22.5	1	7

2 inserts per case.

★ Instructions for 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.
4. Do not tighten the clamp screw too hard. Recommend to use Torque control wrenches.
   See the right table for recommended tightening torque.

Dimensions (mm) φDc	Recommended Torque N· m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

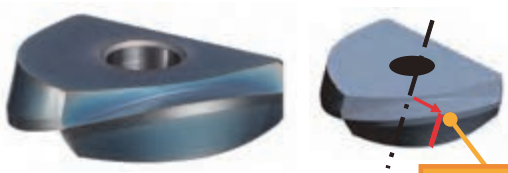
● Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted

Mirror Ball MBX TYPE

■ INSERT (S type, TG type) Mirror S

BNM-S: Standard type

BNM-TG: Stronger cutting edge type



BNM-SS Type

Fig. 1 Below R8
(Tool dia. Below 16mm)

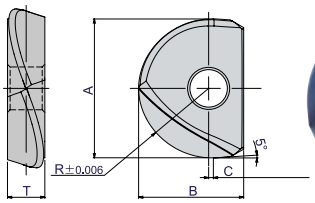
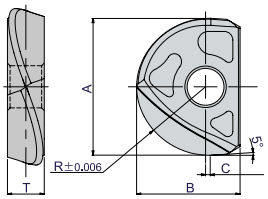


Fig. 2 Above R10
(Tool dia. Above 20mm)



Radius form accuracy of inserts: within ±0.006mm

Cat. No.	PVD coated NEW DH108 (Z10)	Dimensions (mm) R	A	B	C	T	Fig.
BNM-100-SS	●	5	10	8.5	1	2.6	1
BNM-120-SS	●	6	12	10	1	3	1
BNM-160-SS	●	8	16	12	1	4	1
BNM-200-SS	●	10	20	15	1	5	2
BNM-250-SS	●	12.5	25	18.5	1	6	2
BNM-300-SS	●	15	30	22.5	1	7	2

2 Inserts per case.

Cat. No.	PVD coated DH102 (Z01)	Dimensions (mm) R	A	B	C	T
BNM-100-TG	●	5	10	8.5	1	2.6
BNM-120-TG	●	6	12	10	1.5	3
BNM-160-TG	●	8	16	12	1.5	4
BNM-200-TG	●	10	20	15	2	5
BNM-250-TG	●	12.5	25	18.5	2	6
BNM-300-TG	●	15	30	22.5	2	7
BNM-320-TG	●	16	32	23.5	2	7

2 Inserts per case.

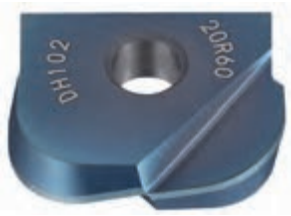
Note) "Mirror S, Mirror TG" inserts are exclusive use of MIRROR BALL.
Please use only in MIRROR BALL body and modular head.

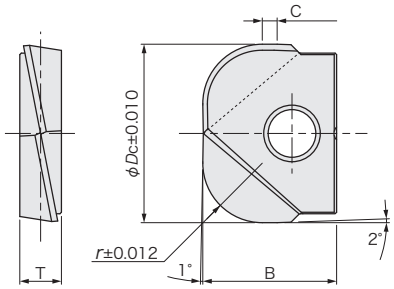
Please refer page B157 for "Instructions for mounting insert"

● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

Mirror Ball MBX TYPE

■ INSERTS GRM type





Corner radius accuracy of inserts:
below ±0.012mm

Cat. No.	PVD coated		Dimensions (mm)				
	JC8015 (Z10-20)	NEW DH102 (Z01)	φDc	r	B	C	T
GRM-160-R50	●	●	16	5	12	1.1	4
GRM-200-R60	●	●	20	6	15	1.7	5
GRM-250-R80	●	●	25	6	18.5	2	6
GRM-300-R100	●	●	30	10	22.5	2.5	7

2 Inserts per case.

Note) 1. GRM type insert is exclusive use of MIRROR BALL. Please use only MIRROR BALL carbide shank bodies (page C174 – C175) or modular head MBX type (B149).

Mirror Ball — MBX TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● MBX type + MSN Carbide Shank Holder

Work Materials	Insert Grades		Cutting speed Vc (m/min)	Tool dia. (mm)						Max. Depth of cut ap (mm)	Max. Pick feed ae (mm)
				10		12		16			
	BNM	BNM-S BNM-TG		n (min-1)	Vf (mm/min)	n (min-1)	Vf (mm/min)	n (min-1)	Vf (mm/min)		
Grey cast iron 160-260 HB	DH103	DH102 DH108	750	24,000	9,600	20,000	10,000	15,000	10,000	0.1-0.3	0.02Dc
Nodular cast iron 170-300 HB		DH102 DH108	600	19,000	7,000	16,000	7,000	12,000	7,000	0.1-0.3	0.02Dc
Carbon steel 180-280 HB	DH103	DH108	600	19,000	7,000	16,000	7,000	12,000	7,000	0.1-0.3	0.02Dc
Low alloy steel 180-280 HB		DH108	600	19,000	7,000	16,000	7,000	12,000	7,000	0.1-0.2	0.015Dc
Tool & Die steel 180-255 HB		DH108	600	19,000	7,000	16,000	7,000	12,000	7,000	0.1-0.2	0.015Dc
Hardened die steel 40-55 HRC	DH103	DH102 DH108	450	14,500	4,300	12,000	4,800	9,000	4,500	0.1-0.2	0.015Dc
Hardened die steel 56-63 HRC		DH102 DH108	300	9,500	2,800	8,000	3,200	6,000	3,000	0.05-0.1	0.015Dc
Stainless steel 150-250 HB	DH103	DH108	500	16,000	6,000	13,500	6,000	10,000	6,000	0.1-0.2	0.015Dc
Copper alloy 80-150 HB	KT9	FZ05	600	19,000	9,000	16,000	9,600	12,000	8,400	0.1-0.3	0.02Dc
Aluminium alloy 30-100 HB			800	25,000	12,500	21,000	12,600	16,000	11,200	0.1-0.5	0.02Dc

n: Spindlespeed, Vf: Feedspeed

★Instruction for 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.
4. Do not tighten the clamp screw too hard.

Recommend to use Torque control wrenches (Page C180)
Refer the right table for recommended tightening torque.

Dimensions	Recommended Torque
φDc	N~m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

Mirror Ball MBX TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● **MBX type** + **MSN Carbide Shank Holder**

Work Materials	Insert Grades		Cutting speed Vc (m/min)	Tool dia. (mm)						Max. Depth of cut ap (mm)	Max. Pick feed ae (mm)
				20		25		30/32			
	BNM	BNM-S BNM-TG		n (min-1)	Vf (mm/min)	n (min-1)	Vf (mm/min)	n (min-1)	Vf (mm/min)		
Grey cast iron 160-260 HB	DH103	DH102 DH108	750	12,000	9,000	9,600	8,000	8,000	8,000	0.1-0.3	0.02Dc
Nodular cast iron 170-300 HB		DH102 DH108	600	9,600	6,700	7,700	6,000	6,500	6,000	0.1-0.3	0.02Dc
Carbon steel 180-280 HB	DH103	DH108	600	9,600	6,700	7,700	6,000	6,500	6,000	0.1-0.3	0.02Dc
Low alloy steel 180-280 HB		DH108	600	9,600	6,700	7,700	6,000	6,500	6,000	0.1-0.2	0.015Dc
Tool & Die steel 180-255 HB		DH108	600	9,600	6,700	7,700	6,000	6,500	6,000	0.1-0.2	0.015Dc
Hardened die steel 40-55 HRC	DH103	DH102 DH108	450	7,200	3,600	5,750	3,450	4,800	3,360	0.1-0.2	0.015Dc
Hardened die steel 56-63 HRC		DH102 DH108	300	4,800	2,400	3,850	2,300	3,200	2,200	0.05-0.1	0.015Dc
Stainless steel 150-250 HB	DH103	DH108	500	8,000	4,800	6,400	4,500	5,300	4,200	0.1-0.2	0.015Dc
Copper alloy 80-150 HB	KT9	FZ05	600	9,600	7,600	7,700	6,200	6,500	6,500	0.1-0.3	0.02Dc
Aluminium alloy 30-100 HB			800	12,700	10,000	10,200	8,200	8,500	8,500	0.1-0.5	0.02Dc

n: Spindle speed, Vf: Feed speed

★Instruction for 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.
4. Do not tighten the clamp screw too hard.

Recommend to use Torque control wrenches (Page C180)
Refer the right table for recommended tightening torque.

Dimensions	Recommended Torque
φDc	N~m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

Mirror Ball — MBX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MBX type + MSN Carbide Shank Holder

Work Materials	Insert Grades		Cutting speed Vc (m/min)	Tool dia. (mm)						Max. Depth of cut ap (mm)	Max. Pick feed ae (mm)
				10		12		16			
	BNM	BNM-S BNM-TG		n (min-1)	Vf (mm/min)	n (min-1)	Vf (mm/min)	n (min-1)	Vf (mm/min)		
Grey cast iron 160-260 HB	DH103	DH102 DH108	450	14,500	4,400	12,000	4,800	9,000	4,500	0.02Dc	0.025Dc
Nodular cast iron 170-300 HB		DH102 DH108	350	11,000	3,300	9,200	3,700	7,000	3,500	0.02Dc	0.025Dc
Carbonsteel 180-280HB	DH103	DH108	350	11,000	3,300	9,200	3,700	7,000	3,500	0.02Dc	0.02Dc
Low alloy steel 180-280 HB		DH108	350	11,000	3,300	9,200	3,700	7,000	3,500	0.02Dc	0.02Dc
Tool & Die steel 180-255 HB		JC8008	350	11,000	3,300	9,200	3,700	7,000	3,500	0.02Dc	0.02Dc
Hardened die steel 40-55 HRC	DH103	DH102 DH108	250	8,000	2,000	6,700	2,000	5,000	2,000	0.015Dc	0.02Dc
Hardened die steel 56-63 HRC		DH102 DH108	200	6,400	1,300	5,300	1,500	4,000	1,400	0.01Dc	0.02Dc
Stainless steel 150-250HB	DH103	DH108	300	9,600	3,000	8,000	3,200	6,000	3,000	0.02Dc	0.02Dc
Copperalloy 80-150HB	KT9	FZ05	350	11,000	3,800	9,200	4,000	7,000	3,850	0.02Dc	0.025Dc
Aluminium alloy 30-100 HB			500	16,000	6,400	13,500	6,800	10,000	6,000	0.03Dc	0.03Dc

n: Spindle speed, Vf: Feed speed

★Instruction for 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.
4. Do not tighten the clamp screw too hard.

Recommend to use Torque control wrenches (Page C180)
Refer the right table for recommended tightening torque.

Dimensions	Recommended Torque
φDc	N~m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

Mirror Ball MBX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MBX type + MSN Carbide Shank Holder

Work Materials	Insert Grades		Cutting speed Vc (m/min)	Tool dia. (mm)						Max. Depth of cut ap (mm)	Max. Pick feed ae (mm)
				20		25		30/32			
	BNM	BNM-S BNM-TG		n (min-1)	Vf (mm/min)	n (min-1)	Vf (mm/min)	n (min-1)	Vf (mm/min)		
Grey cast iron 160-260 HB	DH103	DH102 DH108	450	7,200	4,300	6,000	4,000	5,000	4,000	0.02Dc	0.025Dc
Nodular cast iron 170-300 HB		DH102 DH108	350	5,600	3,000	4,500	2,700	4,000	2,800	0.02Dc	0.025Dc
Carbon steel 180-280 HB	DH103	DH108	350	5,600	3,000	4,500	2,700	4,000	2,800	0.02Dc	0.02Dc
Low alloy steel 180-280 HB		DH108	350	5,600	3,000	4,500	2,700	4,000	2,800	0.02Dc	0.02Dc
Tool & Die steel 180-255 HB		DH108	350	5,600	3,000	4,500	2,700	4,000	2,800	0.02Dc	0.02Dc
Hardened die steel 40-55HRC	DH103	DH102 DH108	250	4,000	1,800	3,200	1,600	2,700	1,400	0.015Dc	0.02Dc
Hardened die steel 56-63 HRC		DH102 DH108	200	3,200	1,300	2,600	1,300	2,000	1,000	0.01Dc	0.02Dc
Stainless steel 150-250 HB	DH103	DH108	300	4,800	2,400	3,850	2,100	3,200	2,000	0.02Dc	0.02Dc
Copper alloy 80-150 HB	KT9	FZ05	350	5,600	3,400	4,500	3,150	4,000	3,200	0.02Dc	0.025Dc
Aluminium alloy 30-100 HB			500	8,000	5,600	6,400	4,500	5,300	4,800	0.03Dc	0.03Dc

n: Spindle speed, Vf: Feed speed

★Instruction for 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.
4. Do not tighten the clamp screw too hard.

Recommend to use Torque control wrenches (Page C180)
Refer the right table for recommended tightening torque.

Dimensions	Recommended Torque
φDc	N~m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

Mirror Ball GRM TYPE

■ H.S.C. RECOMMENDED CUTTING CONDITIONS

● MBX and MSN with GRM insert

Work Materials	Grades	Cutting speed Vc (m/min)	Tool dia. (mm) Ø16 x R5 n (min⁻¹)	Ø16 x R5 Vf (mm/min)	Ø 25 x R6 n (min⁻¹)	Ø 25 x R6 Vf (mm/min)	Depth of cut ap (mm)	Profile milling Max. Pick ae (mm)	Face milling Pick ae (mm)
Grey cast iron 160-260 HB	DH102	750	15,000	10,000	12,000	9,000	0.05-0.15	0.02*D*	~0.20*D*
Nodular cast iron 170-300 HB	DH102 (JC8015)	600	12,000	7,000	9,600	6,700	0.05-0.15	0.02*D*	~0.20*D*
Carbon steel 180-280 HB	DH102 (JC8015)	600	12,000	7,000	9,600	6,700	0.05-0.15	0.02*D*	~0.15*D*
Low alloy steel 180-280 HB	DH102 (JC8015)	600	12,000	7,000	9,600	6,700	0.05-0.15	0.02*D*	~0.15*D*
Tool & Die steel 180-255 HB	DH102 (JC8015)	600	12,000	7,000	9,600	6,700	0.05-0.15	0.02*D*	~0.15*D*
Mold steel 30-36 HRC	DH102	550	11,000	5,500	8,800	4,400	0.05-0.15	0.02*D*	~0.15*D*
Mold steel 38-43 HRC	DH102	500	10,000	5,000	8,000	4,000	0.05-0.15	0.02*D*	~0.15*D*
Hardened die steel 40-55 HRC	DH102	450	9,000	4,500	7,200	3,600	0.05-0.15	0.02*D*	~0.10*D*
Hardened die steel 56-63 HRC	DH102	300	6,000	3,000	4,800	2,400	0.05-0.15	0.02*D*	~0.10*D*
Stainless steel 150-250 HB	DH102 (JC8015)	400	8,000	4,800	6,400	3,800	0.05-0.15	0.02*D*	~0.15*D*

Work Materials	Grades	Cutting speed Vc (m/min)	Tool dia. (mm) Ø256 x R8 n (min⁻¹)	Ø256 x R8 Vf (mm/min)	Ø 30 x R10 n (min⁻¹)	Ø 30 x R10 Vf (mm/min)	Depth of cut ap (mm)	Profile milling Max. Pick ae (mm)	Face milling Pick ae (mm)
Grey cast iron 160-260 HB	DH102	750	9,600	8,000	8,000	8,000	0.05-0.15	0.02*D*	~0.20*D*
Nodular cast iron 170-300 HB	DH102 (JC8015)	600	7,700	6,000	6,500	6,000	0.05-0.15	0.02*D*	~0.20*D*
Carbon steel 180-280 HB	DH102 (JC8015)	600	7,700	6,000	6,500	6,000	0.05-0.15	0.02*D*	~0.15*D*
Low alloy steel 180-280 HB	DH102 (JC8015)	600	7,700	6,000	6,500	6,000	0.05-0.15	0.02*D*	~0.15*D*
Tool & Die steel 180-255 HB	DH102 (JC8015)	600	7,700	6,000	6,500	6,000	0.05-0.15	0.02*D*	~0.15*D*
Mold steel 30-36 HRC	DH102	550	7,000	4,200	5,800	4,000	0.05-0.15	0.015*D*	~0.15*D*
Mold steel 38-43 HRC	DH102	500	6,400	3,800	5,300	3,700	0.05-0.15	0.015*D*	~0.15*D*
Hardened die steel 40-55 HRC	DH102	450	5,750	3,450	4,800	3,360	0.05-0.15	0.015*D*	~0.10*D*
Hardened die steel 56-63 HRC	DH102	300	3,850	2,300	3,200	2,200	0.05-0.1	0.015*D*	~0.10*D*
Stainless steel 150-250 HB	DH102 (JC8015)	400	5,100	3,600	4,200	3,300	0.05-0.15	0.02*D*	~0.15*D*

n: Spindle speed, Vf: Feed speed

NOTE When machining both profile and flat surface simultaneously, use the profile milling conditions.

★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.
4. Do not tightened the clamp screw too hard.
   Recommend to use Torque control wrenches. (Page C180)
   See the right table for recommended tightening torque.
   (See table)

Dimensions φDc	Recommended Torque N~m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

Mirror Ball GRM TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MBX and MSN with GRM insert

Work Materials	Grades	Cutting speed Vc (m/min)	Tool dia. (mm) Ø16 x R5 n (min⁻¹)	Ø16 x R5 Vf (mm/min)	Ø 20 x R6 n (min⁻¹)	Ø 20 x R6 Vf (mm/min)	Depth of cut ap (mm)	Profile milling Max. Pick ae (mm)	Face milling Pick ae (mm)
Grey cast iron 160-260 HB	DH102 (JC8015)	450	9,000	4,500	7,200	4,300	0.1-0.3	0.02*D*	~0.25*D*
Nodular cast iron 170-300 HB	DH102 (JC8015)	350	7,000	3,500	5,600	3,000	0.1-0.2	0.02*D*	~0.25*D*
Carbon steel 180-280 HB	JC8015	350	7,000	3,500	5,600	3,000	0.1-0.2	0.02*D*	~0.20*D*
Low alloy steel 180-280 HB	JC8015	350	7,000	3,500	5,600	3,000	0.1-0.2	0.02*D*	~0.20*D*
Tool & Die steel 180-255 HB	JC8015	350	7,000	3,500	5,600	3,000	0.1-0.2	0.02*D*	~0.20*D*
Mold steel 30-36 HRC	DH102 (JC8015)	300	6,000	2,400	4,800	2,200	0.1-0.2	0.015*D*	~0.20*D*
Mold steel 38-43 HRC	DH102 (JC8015)	280	5,600	2,200	4,500	2,000	0.1-0.2	0.015*D*	~0.20*D*
Hardened die steel 40-55 HRC	DH102	250	5,000	2,000	4,000	1,800	0.05-0.15	0.015*D*	~0.15*D*
Hardened die steel 56-63 HRC	DH102	200	4,000	1,400	3,200	1,300	0.05-0.1	0.015*D*	~0.15*D*
Stainless steel 150-250 HB	JC8015	300	6,000	3,000	4,800	2,400	0.1-0.2	0.02*D*	~0.20*D*

Work Materials	Grades	Cutting speed Vc (m/min)	Tool dia. (mm) Ø25 x R8 n (min⁻¹)	Ø25 x R8 Vf (mm/min)	Ø 30 x R10 n (min⁻¹)	Ø 30 x R10 Vf (mm/min)	Depth of cut ap (mm)	Profile milling Max. Pick ae (mm)	Face milling Pick ae (mm)
Grey cast iron 160-260 HB	DH102 (JC8015)	450	6,000	4,000	5,000	4,000	0.1-0.3	0.02*D*	~0.25*D*
Nodular cast iron 170-300 HB	DH102 (JC8015)	350	4,500	2,700	4,000	2,800	0.1-0.2	0.02*D*	~0.25*D*
Carbon steel 180-280 HB	JC8015	350	4,500	2,700	4,000	2,800	0.1-0.2	0.02*D*	~0.20*D*
Low alloy steel 180-280 HB	JC8015	350	4,500	2,700	4,000	2,800	0.1-0.2	0.02*D*	~0.20*D*
Tool & Die steel 180-255 HB	JC8015	350	4,500	2,700	4,000	2,800	0.1-0.2	0.02*D*	~0.20*D*
Mold steel 30-36 HRC	DH102 (JC8015)	300	3,800	1,900	3,200	1,800	0.1-0.2	0.015*D*	~0.20*D*
Mold steel 38-43 HRC	DH102 (JC8015)	280	3,600	1,800	3,000	1,700	0.1-0.2	0.015*D*	~0.20*D*
Hardened die steel 40-55 HRC	DH102	250	3,200	1,600	2,700	1,400	0.05-0.15	0.015*D*	~0.15*D*
Hardened die steel 56-63 HRC	DH102	200	2,600	1,300	2,000	1,000	0.05-0.1	0.015*D*	~0.15*D*
Stainless steel 150-250 HB	JC8015	300	3,850	2,100	3,200	2,000	0.1-0.2	0.02*D*	~0.20*D*

n: Spindle speed, Vf: Feed speed

NOTE When machining both profile and flat surface simultaneously, use the profile milling conditions.

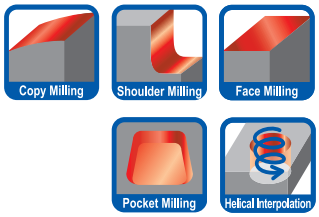
★Attention to mounting insert

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.
4. Do not tightened the clamp screw too hard.
   Recommend to use Torque control wrenches. (Page C180)
   See the right table for recommended tightening torque.
   (See table)

Dimensions φDc	Recommended Torque N~m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

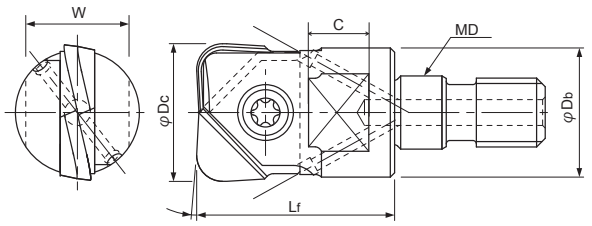
Mirror Radius MRX TYPE

Through Coolant Hole



Accuracy of MRX type modular head mounted on MSN carbide shank holder:

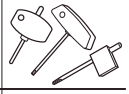
- ☆ **HRM type: O.D. run out: below 15μm (Target below 10μm)**
  Corner radius accuracy: within ±0.015mm
- ☆ **RNM type: O.D. run out: below 15μm (Target below 10μm)**
  Face run out: below 5μm
  Corner radius accuracy: within ±0.010mm



3° (HRM type insert)
1° (RNM type insert)

Arbor B193

■ BODY

Cat. No.	Stock	Dimensions (mm) φ Dc	Lf	φ Db	MD	C	W	Inserts	Parts: Clamp screw	Parts: Wrench
										
MRX-100-M6	●	**10**	18	9.7	M6	6.5	8	RNM-100-...,HRM-100/110-...	FSW-3007H	A-08
MRX-120-M6	●	**12**	20	11.5	M6	6.5	8	RNM-120-/130-...,HRM-120/130-...	FSW-3509H	A-10
MRX-160-M8	●	**16**	23	15	M8	8	12	RNM-160-/170-...,HRM-160/170-...	FSW-4013H	A-15
MRX-200-M10	●	**20**	30	19	M10	8	14	RNM-200-/210-...,HRM-200/220-...	FSW-5016H	A-20W
MRX-250-M12	●	**25**	35	24	M12	10	17	RNM-250-/260-...	FSW-6020	A-30
MRX-300-M16	□	**30**	43	29	M16	12.5	22	RNM-300-...	FSW-8025	A-40
MRX-320-M16	●	**32**	43	30	M16	12.5	22	RNM-320-...	FSW-8025	A-40

Note) 1. Please referpage B167-B177 for recommended cutting conditions.
2. All cutters are supplied without inserts and wrench.
3. Please refer page B009 for recommended tightening torque.

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

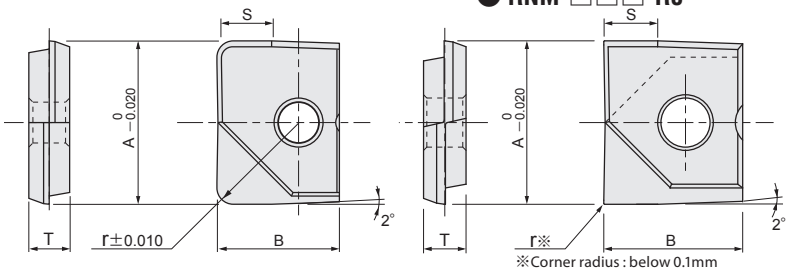
● Standard stock items □: Stock in Japan ○: Soon to be deleted

Mirror Radius — MRX TYPE

■ INSERTS

Radius form accuracy of insert: within ±0.010mm

● RNM-□□□-R0



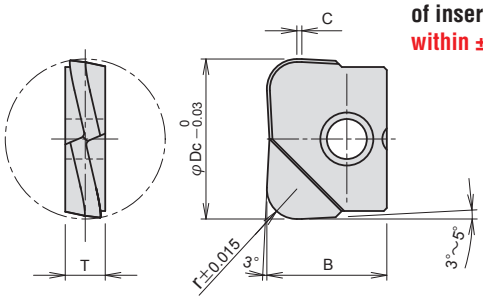
Cat. No.	PVD coated JC8015 (Z10~20)	PVD coated DH103 (Z05)	Diamond coated JC10000	Uncoated KT9 (K10)	Dimensions (mm) r	S	A	B	T
RNM-100-R0	●				※	3.3	10	8.5	2.6
RNM-100-R03	●	●		□	0.3				
RNM-100-R05	●	●	●	●	0.5				
RNM-100-R10	●	●	□	●	1				
RNM-100-R15	□			□	1.5				
RNM-100-R20	●	●		●	2				
RNM-120-R0	●				※	4	12	10	3
RNM-120-R03	●	●		□	0.3				
RNM-120-R05	●	●	□	●	0.5				
RNM-120-R10	●	●	□	●	1				
RNM-120-R15	●	●		●	1.5				
RNM-120-R20	●	●		●	2				
RNM-160-R0	●				※	5.3	16	12	4
RNM-160-R03	●	●		●	0.3				
RNM-160-R05	●	●		●	0.5				
RNM-160-R10	●	●		●	1				
RNM-160-R15	●	●		□	1.5				
RNM-160-R20	●	●		●	2				
RNM-200-R0	●				※	6.7	20	15	5
RNM-200-R03	●	●		●	0.3				
RNM-200-R05	●	●		●	0.5				
RNM-200-R10	●	●		●	1				
RNM-200-R15	●	●		□	1.5				
RNM-200-R20	●	●		□	2				
RNM-200-R30	●				3				
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-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				

2 inserts per case, but JC10000: 1 piece per case.

Please refer page B167 for "Instructions for mounting insert"

Mirror Radius MRX TYPE

■ INSERTS



Radius form accuracy of insert:
within ±0.015mm

Cat. No.	PVD coated	Dimensions (mm)				
	JC8015 (Z10~20)	φDc	r	B	C	T
HRM-100-R20	●	**10**	2	8.5	0.3	2.6
HRM-110-R20	●	**11**	2	8.5	0.3	2.6
HRM-120-R20	●	**12**	2	10	0.5	3
HRM-130-R20	●	**13**	2	10	0.5	3
HRM-160-R20	●	**16**	2	12	0.5	4
HRM-160-R30	●	**16**	3	12	0.5	4
HRM-170-R30	●	**17**	3	12	0.5	4
HRM-200-R20	●	**20**	2	15	0.5	5
HRM-200-R30	●	**20**	3	12	0.5	5
HRM-220-R30	●	**22**	3	15	0.5	5

2 inserts per case.

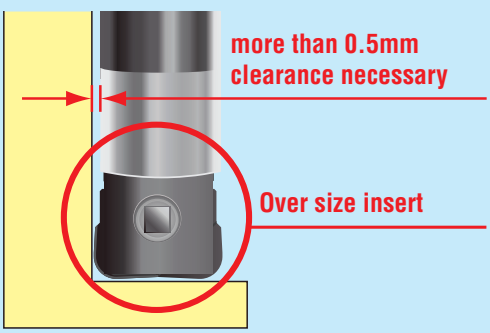
Note)"HRM" insert is exclusive use of MIRROR RADIUS carbide shank body.
Please use only in MIRROR RADIUS carbide shank body and modular head.

Please refer page B167 for "Instructions for mounting insert"

Features of "MIRROR RADIUS" Over size inserts

In case of using HRM insert, recommend to use over size insert for increasing side clearance to prevent the damage of shank by sticking chips.

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

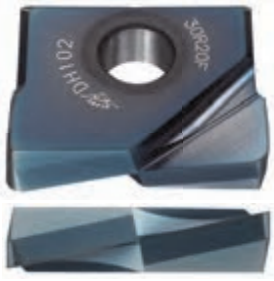


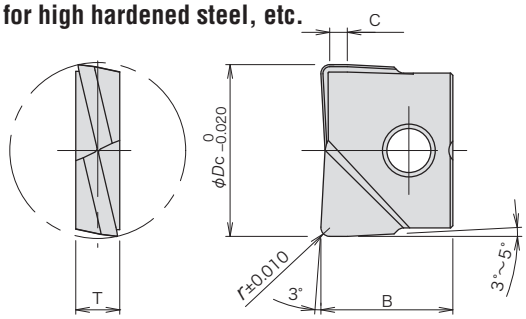
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

Mirror Radius MRX TYPE

■ INSERTS

Side & bottom face finishing for high hardened steel, etc.





Corner radius accuracy of inserts: within ±0.010mm

Longer periphery straight edge achieved longer tool life, better surface roughness and deflection on vertical wall application.

Cat. No.	PVD coated		Dimensions (mm)				
	JC 8015 (Z10~20)	DH102 (Z01)	φDc	r	B	C	T
FRM-100-R05	●	●	10	0,5	8,5	1.5	2.6
FRM-100-R10	●	●		1			
FRM-100-R20		●		2			
FRM-120-R05	●	●	12	0,5	10	1.5	3
FRM-120-R10	●	●		1			
FRM-120-R20	●	●		2			
FRM-120-R30		●		3			
FRM-160-R05	●	●	16	0,5	12	2	4
FRM-160-R10	●	●		1			
FRM-160-R15		●		1,5			
FRM-160-R20	●	●		2			
FRM-160-R30		●		3			
FRM-170-R10	●	●	17	1	12	2	4
FRM-200-R05	●	●	20	0,5	15	2	5
FRM-200-R10	●	●		1			
FRM-200-R15		●		1,5			
FRM-200-R20	●	●		2			
FRM-200-R30		●		3			
FRM-210-R10	●	●	21	1	15	2	5
FRM-250-R05		●	25	0,5	18,5	2.5	6
FRM-250-R10	●	●		1			
FRM-250-R20	●	●		2			
FRM-250-R30		●		3			
FRM-300-R05		□	30	0,5	22,5	3	7
FRM-300-R10	●	●		1			
FRM-300-R20	●	●		2			
FRM-300-R30		□		3			
FRM-320-R05		●	32	0,5	23,5	3	7
FRM-320-R10	●	●		1			
FRM-320-R20	●	●		2			
FRM-320-R30		●		3			

2 inserts per case.

Note) Recommend to use FRM inserts combined with Mirror Radius End Mill carbide shank body (page C193 – C194) or Mirror Radius modular heads (page B159).

Please refer page B167 for "Instructions for mounting insert"

● Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted

Mirror Radius MRX TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● **MRX type with RNM insert + MSN Carbide Shank Holder**

Work Materials	Insert Grades	Cutting speed Vc (m/min)	Tool dia. (mm)					
			10		12/13		16/17	
			n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
			Max. D.O.C. & Max. Pick feed (mm)					
Grey cast iron 160-260 HB	DH103	500	16,000	6,400	13,500	6,100	10,000	5,000
			Max.ap=0.3,Max. ae=0.1×Dc					
Nodular cast iron 170-300 HB	DH103	400	12,700	4,400	10,600	3,700	8,000	3,200
			Max.ap=0.3,Max. ae=0.1×Dc					
Carbon steel 180-280 HB	DH103	400	12,700	4,400	10,600	3,700	8,000	3,200
			Max.ap=0.3,Max. ae=0.1×Dc					
Low alloy steel 180-280 HB	DH103	350	11,000	3,500	9,200	2,900	7,000	2,660
			Max.ap=0.3,Max. ae=0.1×Dc					
Mold steel 280-400 HB	DH103	350	11,000	3,100	9,200	2,600	7,000	2,300
			Max.ap=0.3,Max. ae=0.1×Dc					
Tool & Die steel 180-255 HB	DH103	350	11,000	3,100	9,200	2,600	7,000	2,300
			Max.ap=0.25,Max. ae=0.1×Dc					
Hardened die steel 40-55 HRC	DH103	200	6,400	1,500	5,300	1,200	4,000	1,000
			Max.ap=0.2,Max. ae=0.05×Dc					
Hardened die steel 56-63 HRC	DH103	100	3,200	600	2,700	500	2,000	400
			Max.ap=0.15,Max. ae=0.02×Dc					
Stainless steel 150-250 HB	DH103	350	11,000	2,500	9,200	2,100	7,000	1,750
			Max.ap=0.25,Max. ae=0.1×Dc					
Inconel Titanium alloy 30-40 HRC	DH103	90	2,900	700	2,400	600	1,790	450
			Max.ap=0.2,Max. ae=0.05×Dc					
Copper alloy 80-150 HB	DH103	350	11,000	4,400	9,200	3,700	7,000	3,500
			Max.ap=0.3,Max. ae=0.1×Dc					
Aluminium alloy 30-100HB	DH103 KT9	600	19,000	7,600	16,000	6,400	12,000	6,000
			Max.ap=0.4,Max. ae=0.1×Dc					
Graphite	DH103 JC10000	600	19,000	7,600	16,000	6,400	12,000	6,000
			Max.ap=0.4,Max. ae=0.1×Dc					

n: Spindle speed, Vf: Feed speed

★Instruction for 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.
4. Do not tighten the clamp screw too hard.

Recommend to useTorque control wrenches (Page C180)
Refer the right table for recommended tightening torque.

Dimensions	Recommended Torque
φDc	N~m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

Mirror Radius MRX TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● MRX type with RNM insert + MSN Carbide Shank Holder

Work Materials	Insert Grades	Cutting speed Vc (m/min)	Tool dia. (mm)					
			20/21		25/26		30/32	
			n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
			Max. D.O.C. & Max. Pick feed (mm)					
Grey cast iron 160-260 HB	DH103	500	8,000	4,000	6,400	3,200	5,300	2,650
			Max.ap=0.3,Max. ae=0.1×Dc					
Nodular cast iron 170-300 HB	DH103	400	6,400	2,560	5,100	2,040	4,200	1,700
			Max.ap=0.3,Max. ae=0.1×Dc					
Carbon steel 180-280 HB	DH103	400	6,400	2,560	5,100	2,040	4,200	1,700
			Max.ap=0.3,Max. ae=0.1×Dc					
Low alloy steel 180-280 HB	DH103	350	5,600	2,130	4,500	1,710	3,700	1,400
			Max.ap=0.3,Max. ae=0.1×Dc					
Mold steel 280-400 HB	DH103	350	5,600	1,850	4,500	1,490	3,700	1,220
			Max.ap=0.3,Max. ae=0.1×Dc					
Tool & Die steel 180-255 HB	DH103	350	5,600	1,850	4,500	1,490	3,700	1,220
			Max.ap=0.25,Max. ae=0.1×Dc					
Hardened die steel 40-55 HRC	DH103	200	3,180	800	2,550	640	2,100	525
			Max.ap=0.2,Max. ae=0.05×Dc					
Hardened die steel 56-63 HRC	DH103	100	1,590	320	1,270	250	1,060	210
			Max.ap=0.15,Max. ae=0.02×Dc					
Stainless steel 150-250 HB	DH103	350	5,600	1,400	4,500	1,130	3,700	925
			Max.ap=0.25,Max. ae=0.1×Dc					
Inconel Titanium alloy 30-40 HRC	DH103	90	1,430	360	1,150	290	955	240
			Max.ap=0.2,Max. ae=0.05×Dc					
Copper alloy 80-150 HB	DH103	350	5,600	2,800	4,500	2,250	3,700	1,850
			Max.ap=0.3,Max. ae=0.1×Dc					
Aluminium alloy 30-100HB	DH103 KT9	600	9,600	4,800	7,650	3,800	6,350	3,200
			Max.ap=0.4,Max. ae=0.1×Dc					
Graphite	DH103 JC10000	600	9,600	4,800	7,650	3,800	6,350	3,200
			Max.ap=0.4,Max. ae=0.1×Dc					

n: Spindle speed, Vf: Feed speed

★Instruction for 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.
4. Do not tighten the clamp screw too hard.

Recommend to useTorque control wrenches (Page C180)

Refer the right table for recommended tightening torque.

Dimensions	Recommended Torque
φDc	N~m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

Mirror Radius MRX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MRX type with RNM insert + MSN Carbide Shank Holder

Work Materials	Insert Grades	Cutting speed Vc (m/min)	Tool dia. (mm) 10 n (min⁻¹)	10 Vf (mm/min)	12/13 n (min⁻¹)	12/13 Vf (mm/min)	16/17 n (min⁻¹)	16/17 Vf (mm/min)
			Max. D.O.C. & Max. Pick feed (mm)					
Grey cast iron 160-260 HB	DH103	300	9,500	3,800	8,000	3,600	6,000	3,000
			0.3		0.4		0.5	
Nodular cast iron 170-300 HB	DH103	250	8,000	2,800	6,700	2,300	5,000	2,000
			0.3		0.3		0.4	
Carbon steel 180-280 HB	DH103 JC8015	250	8,000	2,800	6,700	2,300	5,000	2,000
			0.3		0.3		0.4	
Low alloy steel 180-280 HB	DH103 JC8015	250	8,000	2,600	6,700	2,100	5,000	1,900
			0.3		0.3		0.4	
Mold steel 280-400 HB	DH103 JC8015	250	8,000	2,200	6,700	1,900	5,000	1,650
			0.3		0.3		0.4	
Tool & Die steel 180-255 HB	DH103 JC8015	250	8,000	2,200	6,700	1,900	5,000	1,650
			0.3		0.3		0.4	
Hardened die steel 40-55 HRC	DH103	135	4,300	1,000	3,600	800	2,700	675
			0.3		0.3		0.3	
Hardened die steel 56-63 HRC	DH103	75	2,400	500	2,000	400	1,500	300
			0.15		0.15		0.18	
Stainless steel 150-250 HB	DH103 JC8015	250	8,000	1,800	6,700	1,500	5,000	1250
			0.3		0.3		0.4	
Inconel Titanium alloy 30-40 HRC	DH103 JC8015	55	1,700	400	1,500	300	1,100	275
			0.25		0.25		0.25	
Copper alloy 80-150 HB	DH103 KT9	250	8,000	3,200	6,700	2,700	5,000	2,500
			0.3		0.4		0.5	
Aluminium alloy 30-100HB	DH103 KT9	350	11,000	4,400	9,200	3,700	7,000	3,500
			0.5		0.6		0.8	
Graphite	DH103 JC10000	350	11,000	4,400	9,200	3,700	7,000	3,500
			0.5		0.6		0.8	

n: Spindle speed, Vf: Feed speed

★Instruction for 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.
4. Do not tighten the clamp screw too hard.

Recommend to useTorque control wrenches (Page C180)

Refer the right table for recommended tightening torque.

Dimensions φDc	Recommended Torque N~m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

Mirror Radius MRX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● **MRX type with RNM insert + MSN Carbide Shank Holder**

Work Materials	Insert Grades	Cutting speed Vc (m/min)	Tool dia. (mm) 20/21 n (min⁻¹)	20/21 Vf (mm/min)	25/26 n (min⁻¹)	25/26 Vf (mm/min)	30/32 n (min⁻¹)	30/32 Vf (mm/min)
			Max. D.O.C. & Max. Pick feed (mm)					
Grey cast iron 160-260 HB	DH103	300	4,800	2,400	3,800	1,900	3,180	1,590
			0.7		0.8		1.0	
Nodular cast iron 170-300 HB	DH103	250	4,000	1,600	3,200	1,280	2,650	1,060
			0.5		0.6		0.8	
Carbon steel 180-280 HB	DH103 JC8015	250	4,000	1,600	3,200	1,280	2,650	1,060
			0.5		0.6		0.8	
Low alloy steel 180-280 HB	DH103 JC8015	250	4,000	1,520	3,200	1,210	2,650	1,000
			0.5		0.6		0.8	
Mold steel 280-400 HB	DH103 JC8015	250	4,000	1,320	3,200	1,060	2,650	880
			0.5		0.6		0.8	
Tool & Die steel 180-255 HB	DH103 JC8015	250	4,000	1,320	3,200	1,060	2,650	880
			0.5		0.6		0.8	
Hardened die steel 40-55 HRC	DH103	135	2,150	540	1,720	430	1,430	360
			0.4		0.5		0.6	
Hardened die steel 56-63 HRC	DH103	75	1,200	240	950	190	800	160
			0.2		0.25		0.3	
Stainless steel 150-250 HB	DH103 JC8015	250	4,000	1,000	3,200	800	2,650	660
			0.5		0.6		0.8	
Inconel Titanium alloy 30-40 HRC	DH103 JC8015	55	875	220	700	175	580	145
			0.3		0.35		0.4	
Copper alloy 80-150 HB	DH103 KT9	250	4,000	2,000	3,200	1,600	2,650	1,325
			0.7		0.8		1.0	
Aluminium alloy 30-100HB	DH103 KT9	350	5,600	2,800	4,500	2,250	3,700	1,850
			1.0		1.2		1.6	
Graphite	DH103 JC10000	350	5,600	2,800	4,500	2,250	3,700	1,850
			1.0		1.2		1.6	

n: Spindle speed, Vf: Feed speed

★Instruction for 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.
4. Do not tighten the clamp screw too hard.

Recommend to useTorque control wrenches (Page C180)

Refer the right table for recommended tightening torque.

Dimensions φDc	Recommended Torque N~m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

Mirror Radius MRX TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH FEED MACHINING

● **MRX type with HRM/FRM insert** + **MSN Carbide Shank Holder**

※Recommended to reduce depth of cut ap by corner radius with keeping feed speed Vf. (Refer the below table)

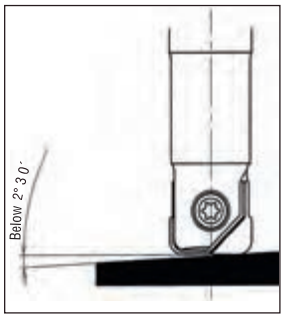
Work Materials	Insert Grades	Tool dia. (mm)									
		φ10×R2/φ11×R2					φ12×R2/φ13×R2				
		ℓ (mm)	ae (mm)	ap (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ae (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	50	4.2	0.40	6,000	6,000	60	5.6	0.40	5,000	5,000
		75	4.2	0.25	6,000	6,000	80	5.6	0.25	5,000	5,000
		100	4.2	0.20	6,000	6,000	110	5.6	0.20	5,000	5,000
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8015	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	80	5.6	0.25	4,700	4,700
		100	4.2	0.20	5,700	5,700	110	5.6	0.20	4,700	4,700
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	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	80	5.6	0.25	4,700	4,700
		100	4.2	0.20	5,700	5,700	110	5.6	0.20	4,700	4,700
Stainless steel SUS304 Below 250HB	JC8015	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	80	5.6	0.25	4,500	4,500
		100	4.2	0.20	5,400	5,400	110	5.6	0.20	4,500	4,500
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8015	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	80	5.6	0.15	4,000	4,000
		100	4.2	0.10	4,700	4,700	110	5.6	0.10	4,000	4,000
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	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	80	5.6	0.25	4,200	4,200
		100	4.2	0.20	5,100	5,100	110	5.6	0.20	4,200	4,200

Depth of cut adjustment by corner radius (ap×ratio)						
	Corner radius	R0.5	ap×0.60	Corner radius	R0.5	ap×0.60
		R1	ap×0.70		R1	ap×0.70
		R2	ap×1.0		R1.5	ap×0.85
					R2	ap×1.0
	※Recommend to reduce depth of cut ap according to above table with keeping feed speed					

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) In case of 50-55 HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of good surface requirement, recommend to reduce feed speed.
7) In case of ramping, ramping angle up to 2° 30' is recommended.
8) In case of ramping and helical interpolation, apply 70% or less feed speed from above table.



★Instruction for 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.
4. Do not tighten the clamp screw too hard.

Recommend to use Torque control wrenches (Page C180)
Refer the right table for recommended tightening torque.

Dimensions	Recommended Torque
φDc	N~m
10	1.2
12	2.0
16	3.0
20	4.0

Mirror Radius MRX TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH FEED MACHINING

● **MRX type with HRM/FRM insert ＋MSN Carbide Shank Holder**

※Recommended to reduce depth of cut ap by corner radius with keeping feed speed Vf. (Refer the below table)

Work Materials	Insert Grades	Tool dia. (mm) φ16×R3/φ17×R3 ℓ (mm)	ae (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	φ20×R3/φ22×R3 ℓ (mm)	ae (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (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 HPM7, PX5, NAK80, P20 (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 SKD61, SKD11 (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 SUS304 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 SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8015	80	7.0	0.60	3,000	3,000	100	9.8	0.60	2,400	2,400
		120	7.0	0.40	3,000	3,000	150	9.8	0.40	2,400	2,400
		160	7.0	0.30	3,000	3,000	200	9.8	0.30	2,400	2,400
Grey & Nodular cast iron FC, FCD (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

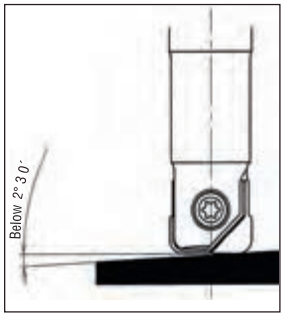
Depth of cut adjustment by corner radius (ap×ratio)	Corner radius		Corner radius	
	R1	ap×0.50	R1	ap×0.50
	R1.5	ap×0.60	R1.5	ap×0.60
	R2	ap×0.75	R2	ap×0.75
	R3	ap×1.0	R3	ap×1.0

※Recommend to reduce depth of cut ap according to above table with keeping feed speed

ℓ : Overhung length, 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 occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air blow to flush the chips out.
5) In case of 50-55 HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of good surface requirement, recommend to reduce feed speed.
7) In case of ramping, ramping angle up to 2° 30' is recommended.
8) In case of ramping and helical interpolation, apply 70% or less feed speed from above table.



★Instruction for 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.
4. Do not tighten the clamp screw too hard.

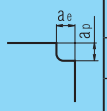
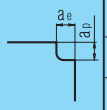
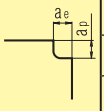
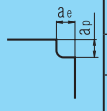
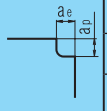
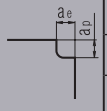
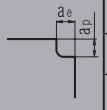
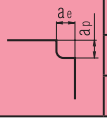
Recommend to use Torque control wrenches (Page C180)
Refer the right table for recommended tightening torque.

Dimensions	Recommended Torque
φDc	N~m
10	1.2
12	2.0
16	3.0
20	4.0

Mirror Radius MRX TYPE

■ 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) φ10 n (min⁻¹)	φ10 Vf (mm/min)	φ12 n (min⁻¹)	φ12 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

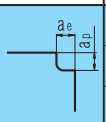
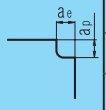
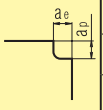
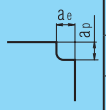
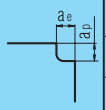
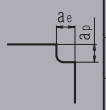
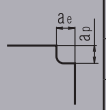
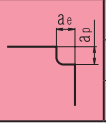
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung lengt hover 3 x Dc, cuting speed and feed speed to be reduced according to the right table.
4) Use air blow to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

■ 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) φ16 n (min⁻¹)	φ16 Vf (mm/min)	φ20 n (min⁻¹)	φ20 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

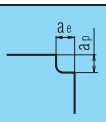
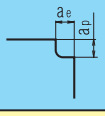
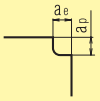
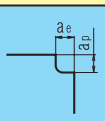
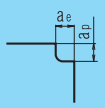
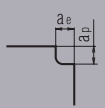
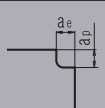
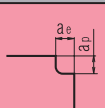
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung lengt hover 3 x Dc, cuting speed and feed speed to be reduced according to the right table.
4) Use air blow to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

■ 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) φ21 n (min⁻¹)	φ21 Vf (mm/min)	φ25 n (min⁻¹)	φ25 Vf (mm/min)	φ30 n (min⁻¹)	φ30 Vf (mm/min)	φ32 n (min⁻¹)	φ32 Vf (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
			ap(mm)	0.50		0.80		1.0		1.2	
			ae(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
			ap(mm)	0.50		0.80		1.0		1.2	
			ae(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
			ap(mm)	0.50		0.80		1.0		1.2	
			ae(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
			ap(mm)	0.50		0.80		1.0		1.2	
			ae(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
			ap(mm)	0.50		0.80		1.0		1.2	
			ae(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
			ap(mm)	0.50		0.80		1.0		1.2	
			ae(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
			ap(mm)	0.50		0.80		1.0		1.2	
			ae(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
			ap(mm)	0.50		0.80		1.0		1.2	
			ae(mm)	0.10		0.10		0.10		0.10	

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

■NOTE

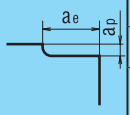
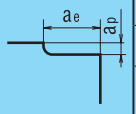
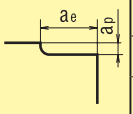
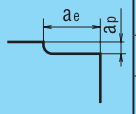
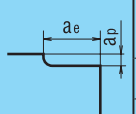
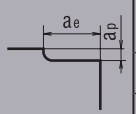
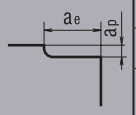
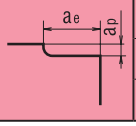
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung lengt hover 3 x Dc, cuting speed and feed speed to be reduced according to the right table.
4) Use air blow to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

Mirror Radius — MRX TYPE

■ 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)							
				φ10		φ12		φ16		φ20	
				n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	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, SLD, 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

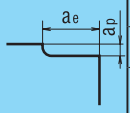
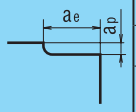
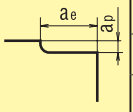
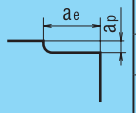
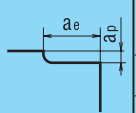
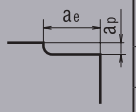
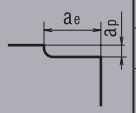
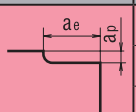
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung lengt hover 3 x Dc, cuting speed and feed speed to be reduced according to the right table.
4) Use air blow to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

■ 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⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	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 occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung lengt hover 3 x Dc, cuting speed and feed speed to be reduced according to the right table.
4) Use air blow to flush the chips out.

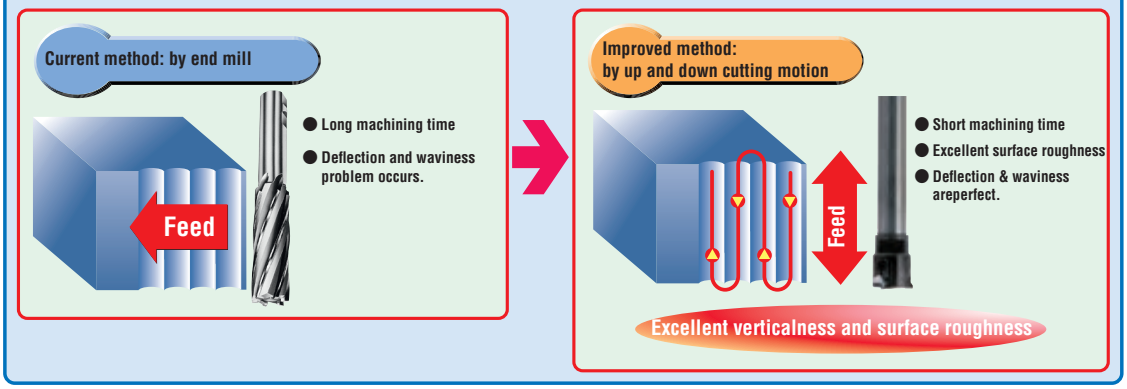
ℓ /Dc	Vc (m/min)	Vf (mm/min)
3Dc or less	100%	100%
Over 3Dc, up to 5Dc	70%	70%
Over 5Dc, up to 10Dc	50%	50%

Back & Forth Cutter MPF TYPE

High speed up and down two way cutting can improve the efficiency and accuracy.

1 High speed & high accuracy can be achieved. ➡ Surface roughness and Parallelism/Perpendicularity: 0.01mm or less (feed & pick direction).

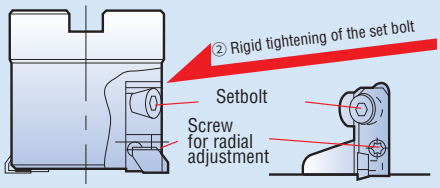
Improvement of machining method



2 Easy to adjust the O.D.run out.

Instructions for adjusting the O.D. run out

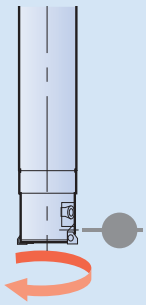
STEP1



① Loosen all the screws for radial adjustment.
② Tighten the set bolt as pushing the cartridge to axial direction
Tighten the set bolt firmly.
③ Set the cutter body to arbor.

STEP2 On the machine

④ Measure the O.D. run out on the machine.
⑤ Adjust the lower inserts to reach the same height as highest insert by tightening the screw for radial adjustment.
Never loosen set bolt while the adjustment.
● Adjust O.D. run out 0.01mm or less
Target 0.005mm.



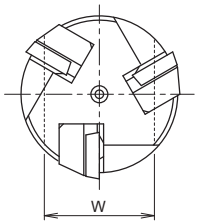
3 CBN insert and DV-coated insert are available as standard stock.

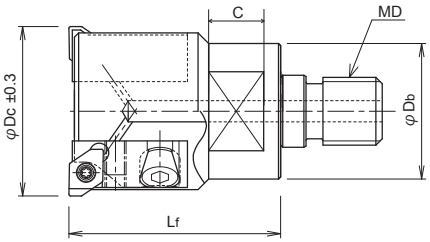
CBN: JBN500 is the best grade for high speed machining and accuracy finishing and longer tool life.
DV coated: JC8003 is suitable for semi-finishing to finishing.

4 Consolidating of parts.

Easy setting by using same wrench for insert clamp screw and screw for radial adjustment. And the same parts are used from smallest diameter to biggest diameter.

Back & Forth Cutter MPF TYPE





Arbor B193

■ BODY

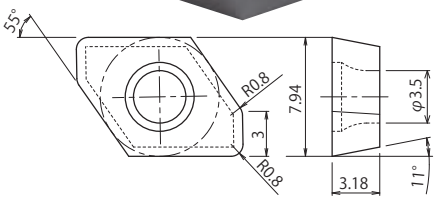
Cat. No.	Stock	No. of flutes	With/Without Coolant hole	Dimensions (mm) φDc	Lf	φDb	MD	C	W
MPF-2030-M16	□	2	--	**30**	50	28	M16	12.5	22
MPF-2033-M16	□	2	--	**33**	50	32	M16	12.5	22
MPF-3040-M16	□	3	●	**40**	50	32	M16	13	26

Note) 1. Please refer page B177 for recommended cutting conditions.
2. All cutters are supplied without inserts.
3. Please refer page B009 for recommended tightening torque.

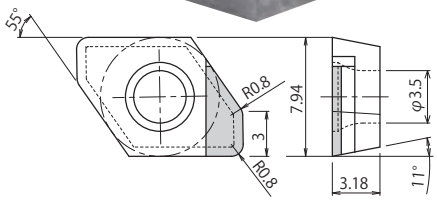
Clamp Screw	Recommended Torque (N•m)
DSW-307H	1.8

■ INSERTS

DPGT0903-W3
JC8003



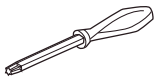
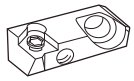
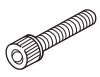
DPGT0903-W3
JBN500



Cat. No.	Tolerance	PVD coated	CBN
		JC8003 (Semi-finishing to Finishing)	JBN500 (Superfinishing)
DPGT0903-W3	G	●	□

10 inserts per case, but JBN500: 1 piece per case.

■ PARTS

Clamp screw (A)	Wrench for (A) & (B)	Cartridge	Screw for radial adjustment (B)	Set bolt	Wrench for setbolt
					
DSW-307H	A-10SD	SDGPR09CA-PFC	RSW-05008	HCS5-10	LW-040

● Standard stock items □: Stock in Japan ○: Soon to be deleted

Back & Forth cutter MPF TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MPF type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Depth of cut ap (mm)
Cast iron 160-260HB (FC250)	JBN500	1,200 (800~2,000)	0.1 (0.05~0.15)	0.05~0.1
	JC8003	400 (300~500)	0.1 (0.05~0.15)	0.05~0.5
Nodular cast iron 170-200HB (FCD600)	JBN500	1,000 (600~1,500)	0.1 (0.05~0.15)	0.05~0.1
	JC8003	300 (200~400)	0.1 (0.05~0.15)	0.05~0.5
Carbon & Alloy steel (S50C, SCM440)	JC8003	200 (100~300)	0.1 (0.05~0.15)	0.05~0.2

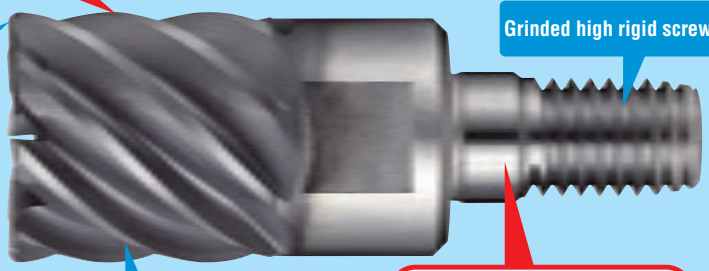
■NOTE

1) In case of chattering and rough surface roughness, recommended to reduce feed per tooth.
2) In case of using as face mill, recommend to reduce feed per tooth up to 0.05 mm.

S-Head SMSA TYPE

- Solid carbide modular head with multi cutting edges.
- For general steel and difficult to cut materials such as heat resistant alloy and Titanium alloy.
- Possible to finish heel cutting of Turbine blades.
- Suitable for finishing vertical wall of Mold base.

Reduced cutting heat generation and achieved H.S.C. and long tool life on difficult to cut materials such as heat resistant alloy and Ti alloy.



Excellent cutting by positive geometry

Original radius shape

Adopted helical lead gash form R1 or more.
Radius form accuracy: Within ±0.02mm

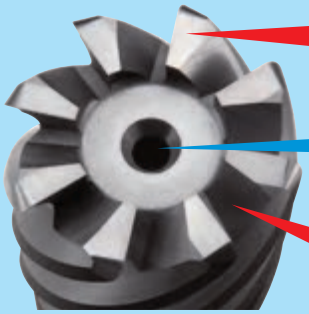
Grinded high rigid screw (Patented)

Adopted high thermal resistance DV coating

Excellent thermal and wear resistance against heat resistant alloy and Titanium alloy.

High repeatability on mounting

O.D. Runout: Below 0.015mm
Repeatability: Below 0.010mm



High efficient machining by multi cutting edges.

High accurate and efficient finishing can be done on bottom and side face machining.

Long tool life by internal coolant supply

Long tool life is achieved by through coolant hole at center in case of using end cutting edges.

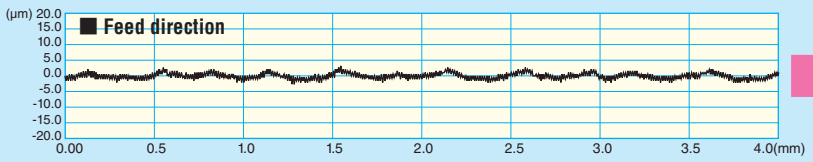
Excellent chip evacuation by wider end gash pocket

Chips can be smoothly evacuated from end cutting edges and it is possible to work with simultaneous multi axis such as ramping.

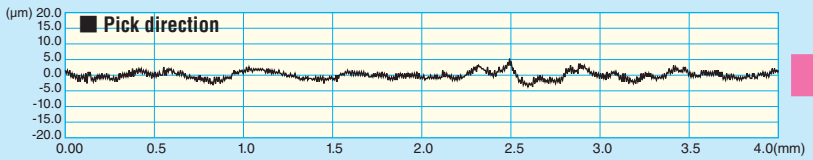
■ Cutting performance of S-HEAD

Surface roughness results (Side face finishing)

Material: S50C (C50, 1049)
Cuttingconditions: Dc=16mm, n=6,000min^{-1}, Vc=300m/min, Vf=2,000mm/min, fz=0.04mm/t,ap=8mm, ae=0.05mm
Overhunglength: ℓ=70mm, Down Cut with air blow



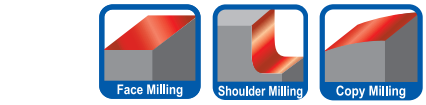
Ra:0.72μm
Rz:4.64μm

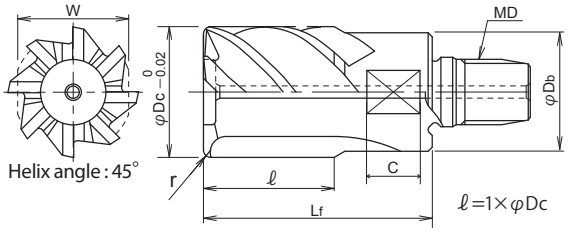


Ra:1.00μm
Rz:5.97μm

S-Head SMSA TYPE

Through Coolant Hole





■ BODY

Cat. No.	Stock	Grade	No. of flutes	Dimensions (mm) r	φDc	ℓ	Lf	φDb	MD	C	W
SMSA-8160R05-M8	□	JC8015	8	0.5	16	16	30	15	M8	8	14
SMSA-8160R10-M8	□			1							
SMSA-6160R20-M8	□		6	2							
SMSA-6160R30-M8	□			3							
SMSA-8200R05-M10	□		8	0.5	20	20	35	19	M10	9	17
SMSA-8200R10-M10	□			1							
SMSA-8200R20-M10	□			2							
SMSA-6200R30-M10	□		6	3							
SMSA-8250R10-M12	□		8	1	25	25	43	24	M12	11	22
SMSA-8250R20-M12	□			2							
SMSA-6250R30-M12	□		6	3							
SMSA-8300R10-M16	□		8	1	30	30	56	29	M16	14	27
SMSA-8300R20-M16	□			2							
SMSA-6300R30-M16	□		6	3							
SMSA-8320R10-M16	□		8	1	32	32	56	30			
SMSA-8320R20-M16	□			2							
SMSA-6320R30-M16	□		6	3							

Note) Please refer page B180-B183 for recommended cutting conditions.

Arbor B193

Instructions for mounting S-Head on MSN carbide shank holder

Please refer the following table for tightening torque to mount S-Head on MSN carbide shank.

Recommended tightening torque for S-Head

Tool dia. φDc(mm)	Spanner size W (mm)	Spanner wrench	Tightening torque
φ16	14	DS-14	10 ~ 11N·m
φ20	17	DS-17	10 ~ 16N·m
φ25	22	DS-22	15 ~ 20N·m
φ30	27	DS-27	20 ~ 25N·m
φ32	27	DS-27	20 ~ 25N·m

※ S-Head are supplied without spanner wrench.
※ Prease refer page B009 for details.

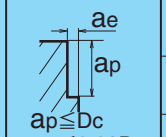
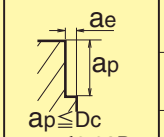
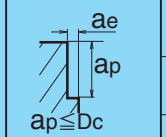
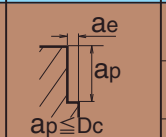
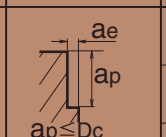
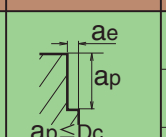
● Standard stock items □: Stock in Japan ○: Soon to be deleted

S-Head SMSA TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SMSA type + MSN Carbide Shank Holder

(1) Shoulder Milling

Work Materials	Type of Machining	Tool dia. (mm)					
		16			20		
		ℓ (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	n (min^{-1})	Vf (mm/min)
Carbon & Alloy steel S50C, SCM440 (C50, 1.7223) Below 250HB		70	2,000	500	75	1,600	400
		110	1,800	400	125	1,400	300
		150	1,600	300	175	1,200	250
Stainless steel SUS304 Below 250HB		70	2,000	500	75	1,600	400
		110	1,800	400	125	1,400	300
		150	1,600	300	175	1,200	250
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC		70	1,400	300	75	1,100	280
		110	1,200	240	125	950	200
		150	1,000	180	175	800	150
Heat resistant alloy Inco718 35-43HRC		70	800	200	75	600	150
		110	700	150	125	550	120
		150	600	120	175	500	100
Titanium alloy Ti-6AL-4V 35-43HRC		70	1,400	300	75	1,100	280
		110	1,200	240	125	950	200
		150	1,000	180	175	800	150
Aluminium alloy A5052, A7075 50-110HB		70	4,000	900	75	3,200	800
		110	3,600	800	125	2,800	600
		150	3,200	700	175	2,500	500

ℓ : Overhung length, ap: Depth of cut, ae: width of cut, n: Spindle speed, Vf: Feed speed

■NOTE

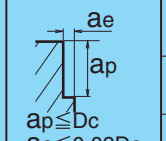
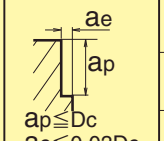
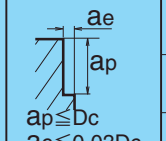
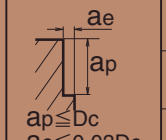
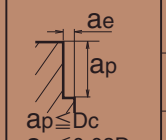
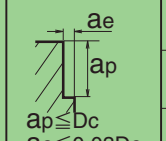
1) In case of side face finishing for improved productivity & efficiency, please increase ap and reduce ae. This will also help to reduce the heat generation.
2) In case of bottom face finishing for improved productivity & efficiency, recommended to use lower (shallow) depth of cut and increase feed speed.
3) Recommend to use internal coolant supply to reduce cutting heat and built up edge problem.

S-Head SMSA TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SMSA type + MSN Carbide Shank Holder

(1) Shoulder Milling

Work Materials	Type of Machining	Tool dia. (mm)					
		25			30/32		
		ℓ (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	(min^{-1})	Vf (mm/min)
Carbon & Alloy steel S50C, SCM440 (C50, 1.7223) Below 250HB		100	1,300	300	110	1,000	240
		150	1,150	250	160	900	200
		200	1,000	200	210	800	160
Stainless steel SUS304 Below 250HB		100	1,300	300	110	1,000	240
		150	1,150	250	160	900	200
		200	1,000	200	210	800	160
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC		100	900	240	110	700	180
		150	800	180	160	600	130
		200	600	120	210	500	100
Heat resistant alloy Inco718 35-43HRC		100	500	120	110	400	100
		150	450	100	160	380	90
		200	400	80	210	350	80
Titanium alloy Ti-6AL-4V 35-43HRC		100	900	240	110	700	180
		150	800	180	160	600	130
		200	600	120	210	500	100
Aluminium alloy A5052, A7075 50-110HB		100	2,600	650	110	2,000	500
		150	2,300	500	160	1,800	400
		200	2,000	400	210	1,600	300

ℓ : Overhung length, ap: Depth of cut, ae: width of cut, n: Spindle speed, Vf: Feed speed

■NOTE

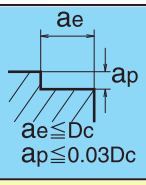
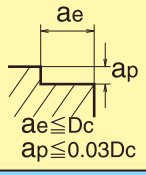
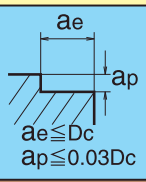
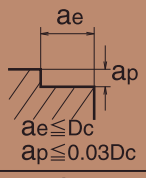
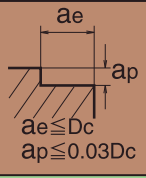
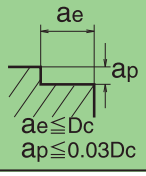
1) In case of side face finishing for improved productivity & efficiency, please increase ap and reduce ae. This will also help to reduce the heat generation.
2) In case of bottom face finishing for improved productivity & efficiency, recommended to use lower (shallow) depth of cut and increase feed speed.
3) Recommend to use internal coolant supply to reduce cutting heat and built up edge problem.

S-Head SMSA TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SMSA type + MSN Carbide Shank Holder

(2) Bottom Face Milling

Work Materials	Type of Machining	Tool dia. (mm)					
		16			20		
		ℓ (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	n (min⁻¹)	Vf (mm/min)
Carbon & Alloy steel S50C, SCM440 (C50, 1.7223) Below 250HB		70	2,000	1,600	75	1,600	1,300
		110	1,800	1,400	125	1,400	1,100
		150	1,600	1,200	175	1,200	950
Stainless steel SUS304 Below 250HB		70	2,000	1,600	75	1,600	1,300
		110	1,800	1,400	125	1,400	1,100
		150	1,600	1,200	175	1,200	950
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC		70	1,400	1,100	75	1,100	900
		110	1,200	950	125	950	800
		150	1,000	800	175	800	600
Heat resistant alloy Inco718 35-43HRC		70	800	650	75	600	500
		110	700	550	125	550	450
		150	600	500	175	500	400
Titanium alloy Ti-6AL-4V 35-43HRC		70	1,400	1,100	75	1,100	900
		110	1,200	950	125	950	800
		150	1,000	800	175	800	600
Aluminium alloy A5052, A7075 50-110HB		70	4,000	3,200	75	3,200	2,500
		110	3,600	2,800	125	2,800	2,200
		150	3,200	2,500	175	2,500	2,000

ℓ : Overhung length, ap: Depth of cut, ae: width of cut, n: Spindle speed, Vf: Feed speed

■NOTE

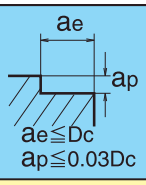
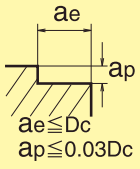
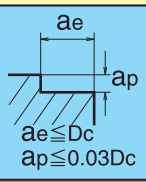
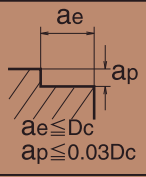
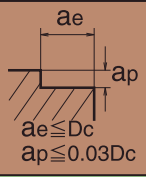
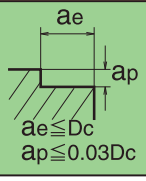
1) In case of side face finishing for improved productivity & efficiency, please increase ap and reduce ae. This will also help to reduce the heat generation.
2) In case of bottom face finishing for improved productivity & efficiency, recommended to use lower (shallow) depth of cut and increase feed speed.
3) Recommend to use internal coolant supply to reduce cutting heat and built up edge problem.

S-Head SMSA TYPE

■ RECOMMENDED CUTTING CONDITIONS

● **SMSA type** + **MSN Carbide Shank Holder**

(2) Bottom Face Milling

Work Materials	Type of Machining	Tool dia. (mm)					
		25			30/32		
		ℓ (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	(min^{-1})	Vf (mm/min)
Carbon & Alloy steel S50C, SCM440 (C50, 1.7223) Below 250HB		100	1,300	1,000	110	1,000	800
		150	1,150	900	160	900	700
		200	1,000	800	210	800	600
Stainless steel SUS304 Below 250HB		100	1,300	1,000	110	1,000	800
		150	1,150	900	160	900	700
		200	1,000	800	210	800	600
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC		100	900	700	110	700	550
		150	800	600	160	600	500
		200	600	500	210	500	400
Heat resistant alloy Inco718 35-43HRC		100	500	400	110	400	320
		150	450	360	160	380	300
		200	400	320	210	360	280
Titanium alloy Ti-6AL-4V 35-43HRC		100	900	700	110	700	550
		150	800	600	160	600	500
		200	600	500	210	500	400
Aluminium alloy A5052, A7075 50-110HB		100	2,600	2,000	110	2,000	1,600
		150	2,300	1,800	160	1,800	1,400
		200	2,000	1,600	210	1,600	1,200

ℓ : Overhung length, ap: Depth of cut, ae: width of cut, n: Spindle speed, Vf: Feed speed

■NOTE

1) In case of side face finishing for improved productivity & efficiency, please increase ap and reduce ae. This will also help to reduce the heat generation.
2) In case of bottom face finishing for improved productivity & efficiency, recommended to use lower (shallow) depth of cut and increase feed speed.
3) Recommend to use internal coolant supply to reduce cutting heat and built up edge problem.

S-Head SMAL TYPE

Solid modular head “S-Head for aluminum alloy” SMAL type

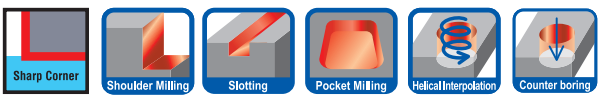
Features

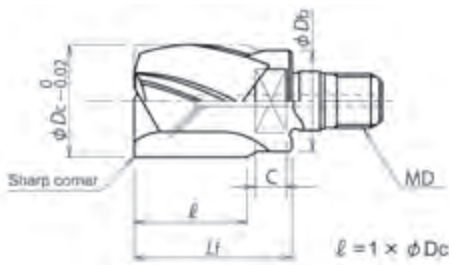
1. Solid modular head SMAL type showed the same performance as the solid end mill, by the combination with carbide shank MSN type. And, overhung length is of wide range, due to many variation in carbide shank MSN type.
2. Adopted the cutting edge geometry suitable for aluminum alloy machining. Positive geometry with helix angle 45° & rake angle 20° achieved sharpness and high precision machining.
3. Achieved both good chip ejection and high efficient machining due to 3 flutes.
4. Adopting coolant hole can be possible surely coolant supply to cutting edge, so prevented welding and improved chip ejection.
5. Adding over size (Dc>Ds)type also enables machining at corner wall.

SMAL TYPE

■ Solid modular head “S-Head for aluminum alloy“ SMAL type

- For aluminum alloy
- 3 flutes / Helix angle 45°
- Flute length 1D





Cat. No.	Stock	Grade	No. of inserts	Dimensions (mm)						
				φDc	ℓ	Lf	φDb	MD	C	W
SMAL-3180-M8	●	FZ15	3	18	18	26	15	M8	5.5	14
SMAL-3200-M10	●		3	20	20	28	18	M10	5.5	14
SMAL-3220-M10	●		3	22	22	31	19	M10	6.5	17
SMAL-3250-M12	●		3	25	25	35	23	M12	5.5	19
SMAL-3280-M12	●		3	28	28	38	24	M12	5.5	22

Arbor B193

Note) 1. When mounting head to shank, tighten with recommended tightening torque value not to be over-tightening. (See the right table “Attention to mounting S-Head SMAL type”.)
2. Only use torque control spanner wrench or DIJET DS type spanner wrench.
3. Spindle speed shall not exceed recommended cutting conditions.

● Standard stock items □: Stock in Japan ○: Soon to be deleted

S-Head SMAL TYPE

Attention to mounting "S-Head for aluminum alloy" SMAL type

When mounting head to shank, tighten with recommended tightening torque value not to be over-tightening.

Tool dia φDc (mm)	Thread	Spanner size of SMAL W (mm)	Cat. No. of spanner wrench	Recommended tightening torque
18	M8	14	DS-14	10 ~ 11N·m
20	M10	14	DS-14	10 ~ 16N·m
22	M10	17	DS-17	10 ~ 16N·m
25	M12	19	DS-19	15 ~ 20N·m
28	M12	22	DS-22	15 ~ 20N·m

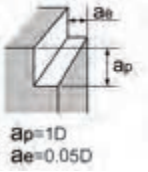
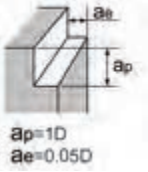
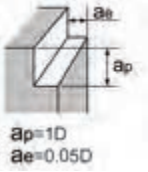
■NOTE

1) 1. S-Head are supplied without spanner wrench.
2) Only use torque control spanner wrench or DIJET DS type spanner wrench.

SMAL TYPE

Recommended cutting conditions for SMAL

■ Shoulder cutting

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to 13% Si)		Copper alloy (C1100)	
Type of Machining	 ap=1D ae=0.05D		 ap=1D ae=0.05D		 ap=1D ae=0.05D		 ap=1D ae=0.05D	
Tool dia. φDc (mm)	Spindle speed n (min-1)	Feed speed Vf (mm/min)	Spindle speed n (min-1)	Feed speed Vf (mm/min)	Spindle speed n (min-1)	Feed speed Vf (mm/min)	Spindle speed n (min-1)	Feed speed Vf (mm/min)
18	3,200	800	2,600	650	3,200	800	1,800	450
20	2,800	700	2,400	600	2,800	700	1,600	400
22	2,600	650	2,100	520	2,600	650	1,400	350
25	2,300	570	1,900	470	2,300	570	1,300	320
28	2,050	510	1,700	420	2,050	510	1,150	280

■NOTE

1) Use water soluble oil.
2) It is important for grasping the shank to defend and keep proper grasping length.
3) In case of ramping, reduce 30-60% of above data.
4) The figures to be adjusted according to machining shape, rigidity of machine and work clamping.
5) If machine does not have enough spindle speed, recommend to reduce the feed speed to the same ratio.
6) Spindle speed shall not exceed recommended cutting conditions.

S-Head SMALTYPE

The reduction rate for SMAL type In case of lengthening overhung length, the figures above need to be reduced according to the reduction rate. And, in case of slotting, recommend to be used under 4D overhung length.

1. Shoulder cutting

L／D	Spindle speed n (min-1)	Feed speed Vf (mm/min)	Note
～4D	0%	0%	—
5～6D	25% reduction	30% reduction	—
7～8D	40% reduction	50% reduction	In case of tool dia. ø22 or more, not recommended.

2. Slotting

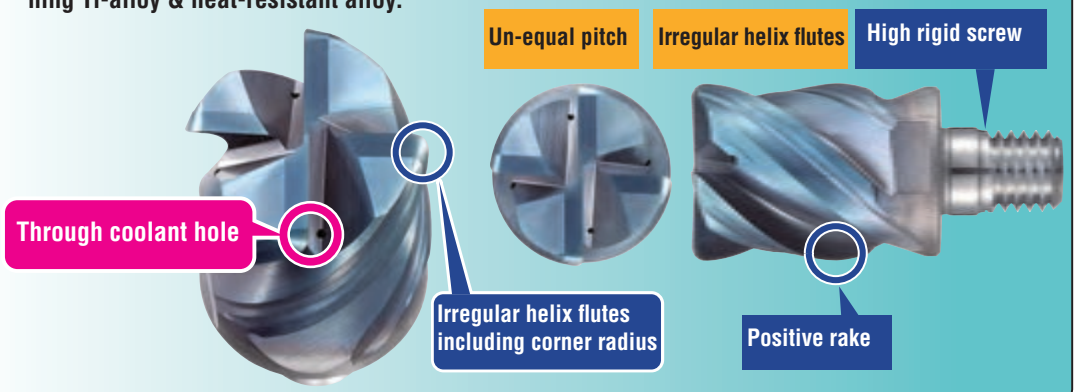
L／D	Spindle speed n (min-1)	Feed speed Vf (mm/min)	ap
～4D	0%	0%	Up to 0.15D
5～6D	Not recommended.		
7～8D	Not recommended.		

S-Head SMSR TYPE

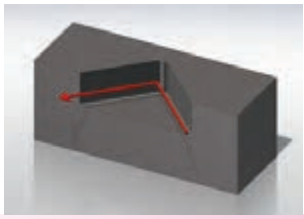
Solid modular head “Anti-vibration S-Head” SMSR type

Features

1. 1Adopted **new PVD coated grade “DH115”** consisting of the combination of DH COAT & micro-grained carbide.
   Widely applied from carbon & mold steel to stainless steel & Ti-alloy.
2. **Un-equal pitch & irregular helix flutes** are excellent in **anti-vibration** and possible to stable machining. And, achieved good surface roughness in case of machining very thin plate & corners of pockets, by the combination with carbide shank MSN type.
3. **Positive rake & coolant hole** prevented welding and improved chip ejection. Suitable for machining Ti-alloy & heat-resistant alloy.



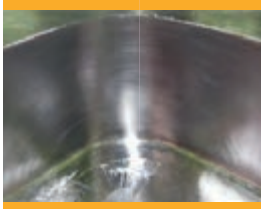
Cutting performance



V-shaped machining
Overhung length: 80mm
Shoulder milling, Down cut

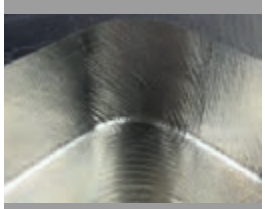
Work	Partname	Test piece
	Material	Ti-6Al-4V
	Hardness	36HRC
Tool	Tool No.	SMSR-4160R10-M8 (ø16-R1)+ MSN-M8-70-S16C
	Insert No.	–
Cutting conditions	n, (Vc)	Vc=100m/min
	Vf,(f)	f=0.20mm/rev
	ap	16mm
	ae	0.8mm
	Coolant	Internal coolant
	Machine	Vertical MC
Result	Achieved no chatter machining and improved surface roughness compared with conventional tool. Control vibration!	

No chatter



SMSR Type

Chatter



Conventional tool

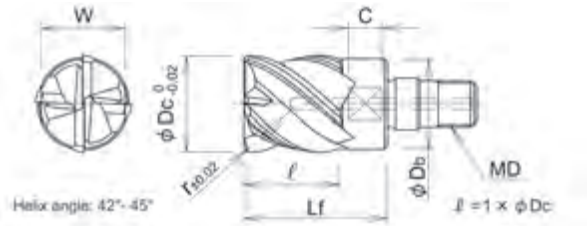
S-Head SMSR TYPE

Solid modular head „Anti-vibration S-Head“ SMSR type

Through Coolant Hole

DH Coating | Corner Radius | Shoulder Milling | Copy Milling | Pocket Milling | Helical Interpolation

- 4 flutes / Helix angle 42°– 45°
- Flute length 1D



Cat. No.	Stock	Grade	No. of inserts	Dimensions (mm)							
				r	φDc	ℓ	Lf	φDb	MD	C	W
SMSR-4160R05-M8	●			0.5							
SMSR-4160R10-M8	●			1	16	16	24	15	M8	5.5	14
SMSR-4160R20-M8	●			2							
SMSR-4160R30-M8	●			3							
SMSR-4200R05-M10	●			0.5							
SMSR-4200R10-M10	●			1	20	20	29	19	M10	5.5	17
SMSR-4200R20-M10	●			2							
SMSR-4200R30-M10	●	DH115	4	3							
SMSR-4250R10-M12	●			1							
SMSR-4250R20-M12	●			2	25	25	35	24	M12	5.5	22
SMSR-4250R30-M12	●			3							
SMSR-4300R10-M16	□			1							
SMSR-4300R20-M16	□			2	30	30	44	29	M16	5.5	27
SMSR-4300R20-M16	□			3							
SMSR-4320R10-M16	●			1							
SMSR-4320R20-M16	●			2	32	32	46	30	M16	5.5	27
SMSR-4320R30-M16	●			3							

Note) 1. When mounting head to shank, tighten with recommended tightening torque value not to be over-tightening. (See the right table “Attention to mounting S-Head.)
2. Only use torque control spanner wrench or DIJET DS type spanner wrench.

Arbor B193

Attention to mounting S-Head – Recommended tightening torque for S-Head

Please tighten the tightening torque by the power of about usual 1/5 to become uniting carbide head & shank.

Tool dia φDc (mm)	Spanner size	Spanner wrench	Tightening torque
φ16	14	DS-14	10 ～ 11N·m
φ20	17	DS-17	10 ～ 16N·m
φ25	22	DS-22	15 ～ 20N·m
φ30	27	DS-27	20 ～ 25N·m
φ32	27	DS-27	20 ～ 25N·m

※ S-Head are supplied without spanner wrench.

● Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted

S-Head SMSR TYPE

SMSR TYPE

Recommended cutting conditions for SMSR

■ Shoulder cutting

Work Materials	Carbon steel (C50, C55) below 250HB				Mold steel (1.2311,P20), 30-43HRC			
Tool dia. φDc (mm)	n (min-1)	Vf (mm/min)	ap	ae	n (min-1)	Vf (mm/min)	ap	ae
16	2,980	1,430	～0.8Dc	～0.1Dc	2,390	1,150	～0.8Dc	～0.1Dc
20	2,390	1,150	～0.8Dc	～0.1Dc	1,910	920	～0.8Dc	～0.1Dc
22	1,910	920	～0.8Dc	～0.1Dc	1,530	730	～0.8Dc	～0.1Dc
25	1,590	760	～0.8Dc	～0.1Dc	1,270	610	～0.8Dc	～0.1Dc
28	1,490	720	～0.8Dc	～0.1Dc	1,190	610	～0.8Dc	～0.1Dc

Work Materials	Hardened die steel (1.2344,1.2379), 42-52HRC				Stainless steel, Below 250HB			
Tool dia. φDc (mm)	n (min-1)	Vf (mm/min)	ap	ae	n (min-1)	Vf (mm/min)	ap	ae
16	1,390	670	～0.8Dc	～0.05Dc	1,990	960	～0.8Dc	～0.1Dc
20	1,110	540	～0.8Dc	～0.05Dc	1,590	760	～0.8Dc	～0.1Dc
25	890	430	～0.8Dc	～0.05Dc	1,270	610	～0.8Dc	～0.1Dc
30	740	360	～0.8Dc	～0.05Dc	1,060	510	～0.8Dc	～0.1Dc
32	700	330	～0.8Dc	～0.05Dc	1,000	480	～0.8Dc	～0.1Dc

Work Materials	Titanium alloy (Ti-6Al-4V)				Inconel (Inco718)			
Tool dia. φDc (mm)	n (min-1)	Vf (mm/min)	ap	ae	n (min-1)	Vf (mm/min)	ap	ae
16	1,590	640	～0.8Dc	～0.05Dc	1,000	200	～0.8Dc	～0.1Dc
20	1,270	510	～0.8Dc	～0.05Dc	800	160	～0.8Dc	～0.1Dc
25	1,020	410	～0.8Dc	～0.05Dc	640	130	～0.8Dc	～0.1Dc
30	850	340	～0.8Dc	～0.05Dc	530	110	～0.8Dc	～0.1Dc
32	800	320	～0.8Dc	～0.05Dc	500	100	～0.8Dc	～0.1Dc

Vc: Cutting speed, Vf: Feed speed, ap: Depth of cut, ae: width of cut, n: Spindle speed,

The reduction rate for SMSR type.
In case of lengthening overhung length, the figures above need to be reduced according to the reduction rate.

L／D	n (min-1)	Vf (mm/min)	ap(mm)	ae(mm)
L≦4D	0%	0%	0%	0%
4D＜L≦6D	20% reduction	30% reduction	0%	～0.05Dc
6D＜L	30% reduction	50% reduction	～0.5Dc	～0.025Dc

■NOTE
1) Slotting is not recommended.

Carbide Shank Modular Head Holder MSN TYPE

Through Coolant Hole

Fig.1

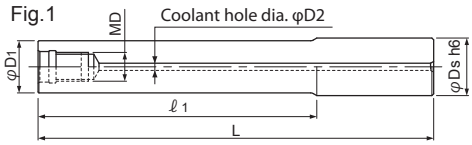
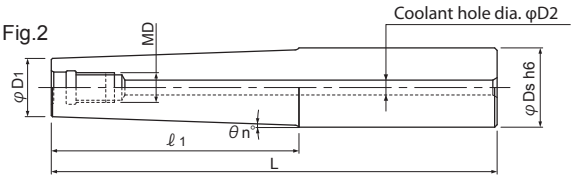


Fig.2



■ END MILL SHANK TYPE

Cat. No.	Stock	Dimensions (mm)							Weight (kg)	Fig.
		φDs	ℓ1	L	φD1	θ n°	MD	φD2		
MSN-M6-12-S10C	●	10	12	60	9.7	–			0.06	1
MSN-M6-15-S12C	●	12	15	60	11.5	–			0.08	1
MSN-M6-30-S10C	●	10	30	80	9.7	–			0.07	1
MSN-M6-30-S12C	●	12	30	80	11.5	–			0.11	1
MSN-M6-35T-S12C	□	12	35	92	9.5	1°30′			0.12	2
MSN-M6-50-S10C	●	10	50	100	9.7	–	M6	3	0.09	1
MSN-M6-50-S12C	●	12	50	100	11.5	–			0.13	1
MSN-M6-57T-S12C	●	12	57	114	9.5	1°			0.14	2
MSN-M6-65T-S16C	●	16	65	125	11.2	1°45′			0.28	2
MSN-M6-80-S10C	●	10	80	130	9.7	–			0.12	1
MSN-M6-80-S12C	●	12	80	130	11.5	–			0.18	1
MSN-M8-20-S16C	●	16	20	75	15.5	–			0.17	1
MSN-M8-40-S16C	●	16	40	95	15.5	–			0.22	1
MSN-M8-40T-S20C	□	20	40	100	14.5	3°30′			0.36	2
MSN-M8-77T-S20C	●	20	77	143	14.5	1°45′	M8	4	0.49	2
MSN-M8-80-S16C	●	16	80	135	15.5	–			0.32	1
MSN-M8-120-S16C	●	16	120	175	15.5	–			0.42	1
MSN-M8-152-S16C	●	16	152	207	15.5	–			0.51	1
MSN-M10-20-S20C	●	20	20	80	19.5	–		6	0.29	1
MSN-M10-40-S20C	●	20	40	100	19.5	–			0.39	1
MSN-M10-40T-S20C	●	20	40	100	18.5	0°43′			0.39	2
MSN-M10-70-S20C	●	20	70	130	19.5	–			0.50	1
MSN-M10-85T-S25C	●	25	85	161	18.5	2°			0.90	2
MSN-M10-90-S20C	●	20	90	150	19.5	–	M10	4	0.60	1
MSN-M10-90T-S20C	●	20	90	150	18.5	0°19′			0.58	2
MSN-M10-140-S20C	●	20	140	200	19.5	–			0.80	1
MSN-M10-140T-S20C	●	20	140	200	18.5	0°12′			0.77	2
MSN-M10-160-S20C	●	20	160	220	19.5	–			0.87	1
MSN-M10-210-S20C	●	20	210	270	19.5	–			1.07	1

Note) Please refer page B007 fo recommended tightening torque.

● Standard stock items □: Stock in Japan ○: Soon to be deleted

Carbide Shank Modular Head Holder MSN TYPE

Through Coolant Hole

Fig.1

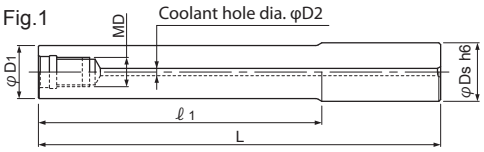
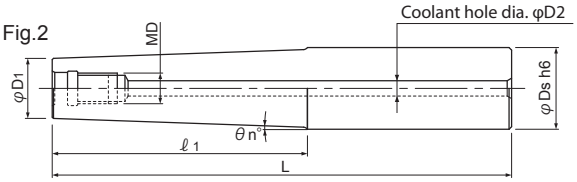


Fig.2



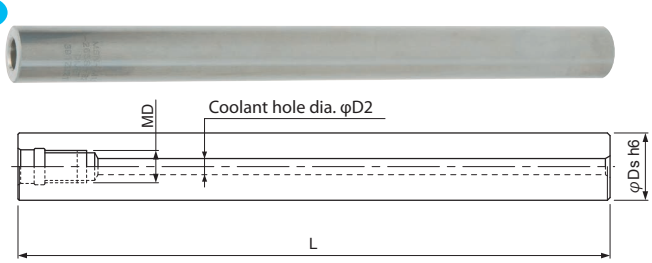
■ END MILL SHANK TYPE

Cat. No.	Stock	Dimensions (mm)							Weight (kg)	Fig.
		φDs	ℓ1	L	φD1	θn°	MD	φD2		
MSN-M12-25-S25C	●	25	25	90	24	–			0.53	1
MSN-M12-55-S25C	●	25	55	120	24	–			0.72	1
MSN-M12-100T-S32C	●	32	100	180	23.5	2°			1.61	2
MSN-M12-105-S25C	□	25	105	170	24	–	M12	6	1.03	1
MSN-M12-135-S25C	●	25	135	215	24	–			1.30	1
MSN-M12-155-S25C	●	25	155	220	24	–			1.34	1
MSN-M12-200-S25C	●	25	200	265	24	–			1.58	1
MSN-M16-25-S32C	●	32	25	90	29	–			0.85	1
MSN-M16-55-S32C	●	32	55	120	29	–			1.13	1
MSN-M16-77-S32C	●	32	77	157	29	–			1.47	1
MSN-M16-97-S32C	●	32	97	177	29	–			1.64	1
MSN-M16-105-S32C	●	32	105	170	29	–			1.59	1
MSN-M16-117T-S32C	●	32	117	197	29	0°38′			1.88	2
MSN-M16-127-S32C	●	32	127	207	29	–			1.89	1
MSN-M16-127T-S32C	□	32	127	207	29	0°30′	M16	8	2.23	2
MSN-M16-155-S32C	●	32	155	220	29	–			2.04	1
MSN-M16-177-S32C	●	32	177	257	29	–			2.32	1
MSN-M16-177T-S32C	●	32	177	257	29	0°23′			2.78	2
MSN-M16-195-S32C	●	32	195	260	29	–			2.40	1
MSN-M16-197T-S32C	●	32	197	277	29	0°23′			3.00	2
MSN-M16-225-S32C	●	32	225	290	29	–			2.57	1
MSN-M16-245-S32C	●	32	245	310	29	–			2.74	1
MSN-M16-295-S32C	●	32	295	360	29	–			3.17	1

Note) Please refer page B007 for recommended tightening torque.

Carbide Shank Modular Head Holder MSN TYPE

Through Coolant Hole



■ STRAIGHT ARBOR TYPE

Cat. No.	Stock	Dimensions (mm)				Weight (kg)
		φDs	L	MD	φD2	
MSN-M6-67S-S9.8C	●	9.8	67	M6	3	0.06
MSN-M6-107S-S9.8C	●		107			0.10
MSN-M6-82S-S10C	●	10	82	M6	3	0.08
MSN-M6-122S-S10C	●		122			0.12
MSN-M6-80S-S11.8C	●	11.8	80	M6	3	0.11
MSN-M6-120S-S11.8C	●		120			0.17
MSN-M6-90S-S12C	●	12	90	M6	3	0.13
MSN-M6-130S-S12C	●		130			0.19
MSN-M8-97S-S15C	●	15	97	M8	4	0.21
MSN-M8-147S-S15C	●		147			0.33
MSN-M8-197S-S15C	●		197			0.44
MSN-M8-107S-S16C	●	16	107	M8	4	0.27
MSN-M8-157S-S16C	●		157			0.40
MSN-M10-130S-S18C	●	18	130	M10	4	0.42
MSN-M10-190S-S18C	●		190			0.62
MSN-M10-240S-S18C	●		240			0.89
MSN-M10-130S-S20C	●	20	130	M10	4	0.53
MSN-M10-190S-S20C	●		190			0.78
MSN-M10-250S-S20C	●		250			1.02
MSN-M12-185S-S23C	●	23	185	M12	6	0.98
MSN-M12-265S-S23C	●		265			1.42
MSN-M12-185S-S24C	●	24	185	M12	6	1.07
MSN-M12-265S-S24C	●		265			1.54
MSN-M12-145S-S25C	●	25	145	M12	6	0.91
MSN-M12-215S-S25C	●		215			1.36
MSN-M12-285S-S25C	●		285			1.80
MSN-M16-160S-S28C	●	28	160	M16	8	1.22
MSN-M16-230S-S28C	●		230			1.77
MSN-M16-310S-S28C	●		310			2.41
MSN-M16-157S-S32C	●	32	157	M16	8	1.61
MSN-M16-217S-S32C	●		217			2.22
MSN-M16-287S-S32C	●		287			2.94
MSN-M16-357S-S32C	●		357			3.66

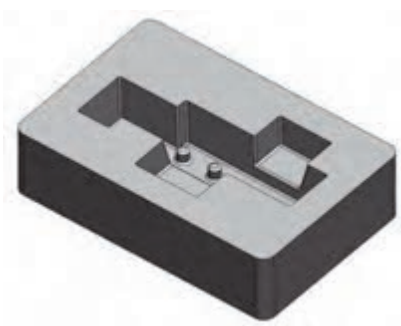
Note) Please refer page B007 for recommended tightening torque.

● Standard stock items □: Stock in Japan ○: Soon to be deleted

Tuff Modular Head System

■ CASE STUDIES

1. Replacement from solid carbide ball nose endmill to indexable tool.

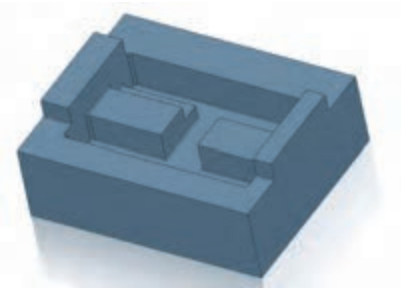


Result

We recommend High feed mirror radius instead of solid carbide ball nose end mill of competitor. HRM can machine from roughing to semi-finishing on hardened steel without chattering and machine efficiency has been highly improved and also chip clogging problem solved because of coolant was flushed through coolant hole.

Work	Partname	Die casting mold
	Material	DH21: Hardened die steel (1.2344MD)
	Hardness	48HRC
Tool	Tool No.	Head: MRN-120-M6-H (Through coolant hole) Holder: MSN-M6-50-S12C
	Insert No. Grade	HRM-120-R20 (JC8015)
Cutting conditions	n, (Vc)	n=4,000min^{-1},Vc=150m/min
	Vf,(f)	Vf=4,000mm/min,f=1mm/rev
	a_p	0.25mm
	a_e	5mm
	Coolant	Wet cu t(Coolant through)
	Machine	Vertical MC

2. Replacement to coolant through modular head.



Result

At 50mm deep cavity milling, competitor's tool without through coolant hole was damaged due to unable to flush the chips in the cavity and it was replaced with MRN Head+MSN Shank with through coolant hole. It was observed the tool life at high feed cavity milling was more than 2 hours without any damage.

Work	Partname	Injection mold
	Material	P20 Mold steel (PX5)
	Hardness	28-32HRC
Tool	Tool No.	Head: MRN-120-M6-H (Through coolant hole) Holder: MSN-M6-90S-S12C
	Insert No. Grade	HRM-120-R20 (JC8015)
Cutting conditions	n, (Vc)	n=3,000min^{-1},Vc=113m/min
	Vf, (f)	Vf=1,500mm/min, f=0.5 mm/rev
	a_p	0.5mm
	a_e	4mm
	Coolant	Internal air blow
	Machine	Vertical MC