Tooling by DIJET®

Milling & Drilling

Vol.3

(English Ver.)

Carbide Grades
Modular Head Series
Indexable Tools
Solid Carbide End Mills
Drills
Technical Information

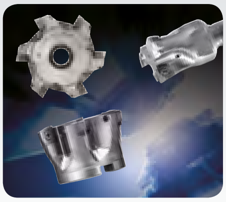
Tooling by
DIJET

Milling & Drilling
Vol.3

Break Through

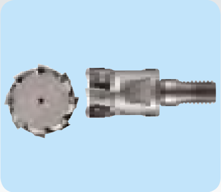
YOUR SEARCH FOR WORLD CLASS TOOLS ENDS HERE.

Modular Head Series
B007


SKS GII
B022, C012


QM MAX
B027, C055


QM MAX GII
B078, C050


QM Mill
B088, C092


High Feed Diemaster
B012, C033

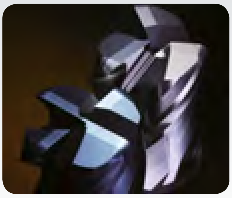
SKS Extreme
C025

Hepta Mill
C106

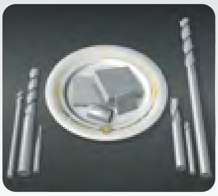

Mirror Series
B153, C172

Super Diemaster
B111, C140

Aero Chipper
B145, C220


SMSR
B186


Solide Carbide E/M for Heat Resistant Alloy
D006


Solide Carbide E/M for Aluminium
D011


TA-EZ Drill
E004

Sigma Drill Hard
E010

CONTENTS

Tooling by **DIJET**

Milling & Drilling

About Safety When Using Cutting Tool Products

1. When Using cutting tool products

In accordance with the Product Liability Law (PL law) enforced on July 1st 1995, our company has attached warning labels and caution labels to the packaging of our applicable products. However, there are no specific caution notes displayed on the tools themselves. Before handling or using any cutting tool or cutting tool material, please read the sections “About safety when using cutting tool products” in this catalogue. In addition, please teach the information stated in these sections to all workers as part of the safety education at your company.

⚠ **Warning**	You can be killed or seriously injured if you don’t follow instructions.
⚠ **Caution**	You can be exposed to potential hazardous situation which, if not avoided,may result in minor or moderate injury.

🚫	PROHIBITION - “Do Not”
	COMPULSION - “Do By All Means”

2. Basic Characteristics of Cutting Material.

2-1. Meanings of words used in this catalogue

2-1-1. Cutting tool materials:
General terms such as carbide alloy, cermet, ceramics, sintered CBN, sintered diamond, cermetal etc

2-2. Physical Characteristics

2-2-1. Appearance:
Varies depending on material properties and material type. Example: Gray, black, gold, etc.

2-2-2. Odor:
Odorless

2-2-3. Hardness, Specific Gravity

Material	Hardness (HV)	Gravity
Carbide alloy	500~3000	9~16
Cermet	500~3000	5~9
Ceramic	1000~4000	2~7
Sintered CBN	2000~5000	3~5
Sintered Diamond	8000~12000	3~5
New composite material not including W & Co (Cermetal)	500~3000	5~9
HSS	200~1200	7~9
Alloy steel	200~1200	7~9

2-2-4. Composition:
Including carbides, nitrides and sulfides of W, Ti, Al, Si, Ta, Nb, B, V, etc. as well as metal components of Fe, Co, Ni, Cr, Mo, etc.

About Safety When Using Cutting Tool Products

3. Cautions regarding the handling of tool materials

⚠	**Warning**
!	① Cutting tool materials have the characteristics of being extremely hard yet brittle. Therefore may be broken by impact or by overtightening.
	② Since carbide tool materials have high specific gravities, be carefull to handle large products or large quantities as heavy materials.
	③ If a laser or electric pen, etc. is used to mark carbide material or products, crack may form. Do not mark sections which may be subject to stress.
	④ The thermal expansion of carbide tool materials is different from that of metal materials. Because of this, for shrink-fit or cooling-fit products, if the usage temperature is slightly higher (lower) than the specified temperature, cracking may occure.
	⑤ When brazing hard tool materials, if the temperature is too high or too low from the melting point of the brazing material, loosening and breakage may occur.
🚫	⑥ Please note that products in this catalogue are continously under study and are improved. The products therefore may be changed in the future and thus become different from the catalogue. Stock status is mentioned for the products in this catalogue. However, please note that the products here may be replaced by the new grades and products in the future.
!	⑦ When cutting tool materials are grounded or heated, dust or mist (smoke) occurs. If a lot of it is inhaled, swallowed or comes in contact with eyes or skin, it could result injury to the body. When machining, be careful to avoid exposing your body to the dust or mist; it is recommended that localized ventilation equipment to be used and that a protective mask, protective goggles, and protective gloves be worn. In addition, if the dust, etc. comes in contact with hands, wash them thoroughly with soap and water. Do not drink or eat in the work area, and wash your hands before drinking or eating. Dust on clothes should not be shaken out, use a vaccum, etc. to remove the dust or wash the clothes in a washing machine. If the cobalt contain in the cutting tool material is touched repeatedly or over a long period of time, it has been reported that it may affect skin, respiratory organs, or heart, etc. For detailed information refer to the MSDS = Material Safety Data Sheet for each material.
⚠	**Caution**
🚫	⑧ If cutting tool materials become corroded due to cutting fluid, lubricating agents, or other moisture, their strength will be reduced. Care should be taken regarding storage conditions
!	⑨ For carbide tool materials, the strength may be slightly reduced due to the surface conditions. For finishing, always use diamond grinder.
	⑩ Machining hard tool materials on EDM may cause cracks on the surface due to electrons remaining after the EDM operation, resulting in lowering of the toughness. Eliminate these cracks by grinding,etc.

4. Precaution for using cutting tools

General Cutting Tools		⚠ **Caution**	❗ **Counter plan**
	①	Misuse or mismatch of working conditions may cause tool breakage or dispersion of broken pieces.	1. Please equip safety items, such as safety glasses and protective gloves. 2. Please use them in the area of our recommended cutting condition (See our catalogue or instruction)
	②	Excess impact or heavy wear will increase cutting resistanceand may cause tool breakage and dispersion of broken pieces.	1. Please equip safety items, such as safety glasses and protective gloves. 2. Please change tools a bit early for its tool life.
	③	Lack of dynamic balance in high-speed revolution cause vibration and tool-broken.	1. Please equip safety items, such as safety glasses and protective gloves. 2. Please operate test-run before cutting, and confirm that there is no vibration or unusual sound.
	④	Sparks, generation of heat or chips in high temperature duringoperation may cause fire.	🚫 **Counter plan**
			1. Please don't operate around "Danger Zone", in which area there is some fear of fire or explosion. 2. When oil-coolant is used, please be sure to be enough system for fire-prevention around there.
		⚠ **Caution**	❗ **Counter plan**
	⑤	Direct touch to the sharp cutting edge may cause injury.	When you set up them to the machine or take them out of the case, please wear protective gloves.
	⑥	Dispersion of hearted or prolonged chips may cause injury or burn.	1. Please equip safety items, such as safety glasses and protective gloves. 2. When you get rid of chips, please stop machining at first, and equip protective items before doing it.
	⑦	During cutting operation, cutting tools get very hot. Directtouch to tools immediately after operation may cause burn.	Please equip safety items, such as safety glasses and protective gloves.
	⑧	Direct contact to the rough surface on the work may cause inury.	Please don't touch work materials with bear hands.
Indexable Cutting Tools		⚠ **Warning**	❗ **Counter plan**
	⑨	When inserts or parts are not clamped well, falling off or dispersion may occur and cause injury.	1. Please clean up the insert pocket or fastening parts before setting insert. 2. Please set up the inserts with supplied wrench only, and confirm that the inserts or parts are clamped completely.
	⑩	When indexable tools are used in high-speed revolution orparts may burst out of the body due to centrifugal force.	🚫 **Counter plan**
			Please use them in the area of our recommended cutting condition. (see our catalogue or instruction)
	⑪	When clamped too tight by supplementary tools like pipe etc,inserts or body may be broken.	❗ **Counter plan**
			Please set up them with supplied wrench only.

About Safety When Using Cutting Tool Products

Milling Cutters and Other Milling tools	**Warning**	**Counter plan**
	If cutter lacks dynamic balance, tool breakage or dispersion of broken pieces may occur by vibration.	1. Please use them in the area of recommended cutting condition. (See our catalogue or instruction) 2. Rotating portion and dynamic balancing should be periodically checked to prevent from eccentric rotation or run out due to wear of bearing portion.
	Caution	**Counter plan**
	Since milling cutter have sharp edges, direct contact with bare hands may cause injury.	Please equip safety items such as safety glasses and protective gloves.
Drills	**Warning**	**Counter plan**
	When drilling through hole with turning work, a kind of disk (reminder parts) sometimes flies out from the end of frilling very fast. It's very dangerous since the disc has sharp edge.	Please equip safety items such as safety glasses, protective gloves, andcovers at the chucking.
	Caution	**Counter plan**
	Some micro drills have sharp edge with the top. Direct touch to tools may cause injury.	Please equip safety items such as safety glasses and protective gloves.
Brazed Tools	**Warning**	**Counter plan**
	When brazing is carried out again and again, the strength of carbide insert is deteriorated and becomes easy to be broken during cutting.	Carbide tools which is brazed several times should not be used because its strength has deteriorated.
	Caution	**Counter plan**
	Dispersion of broken inserts by tools breakage or falling off body may cause injury.	1. Please confirm they are firmly brazed. 2. Please don't use brazed tools in the condition that requires high cutting temperature.
Others	**Warning**	**Counter plan**
	It is dangerous to use tools except for the fixed application. It may cause damdage of tool and machine.	Please use them in the area of our recommended cutting condition. (see our catalogue or instruction)

How To Use This Catalogue

- Please note that products in this catalogue are continuously under study and are improved.
- The products therefore may be changed in the future and thus become different from the catalogue. Stock status is mentioned for the products in this catalogue. However, please note that the products here may be replaced by the new grades and products in the future.

REGARDING STOCK STATUS

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

APPLICATION ICONS

Face Milling
Shoulder Milling
Shoulder Milling
Slotting
Slotting
Copy Milling
Pocket Milling
Under Milling
Chamfering
Helical Interpolation

Shoulder Milling
Shoulder Milling
Slotting
Slotting
Copy Milling
Chamfering
Spot Facing

Side Milling
T - Slotting
Drilling

Up & Down Milling
V - Slotting
Plunge Milling

Reciprocating Milling
Counter boring

GRADE ICONS

DIA Coating
CBN
DLC
DH Coating
DV Coating
DD Coating
DZ TiAlN
TiAlN
JC TiN

CORNER R ICONS

Sharp Corner
Corner Radius

OTHERS

G-Body Ultra-rigid "G-body" improved body durability and tool life by 30% or more

Coolant Hole Internal coolant hole

Environment-Conscious Products

JCTMA 2008-005
ECO PRODUCT ★★★

“Environment-Conscious Products” is authorized Japan Cemented Carbide Tool manufacturer’s Association (JCTMA). JCTMA established the standard for Environment-Conscious Products for the purpose of the global environmental preservation. Dijet has been promoting many “Environment-Conscious Products” since we had joined this program. And also, Dijet has continously developed this kind of products.

Evaluation Item

New product development concept (60 points)	Tool life (Improve 20%)	15
	Environment road reduction of customer	15
	Energy-saving at the manufacturing	5
	Waste at the manufacturing	5
	Harmful materials at the manufacturing	5
	Weight reduction	5
	Harmful material of the product	5
	Rare metal of the product	5
Environmental activity (40 points)	Purchasing (Green product, environmetal education, etc)	10
	Manufacturing (Energy-Saving, Waste, etc)	15
	Packaging material (Improvement of the recycling rate)	5
	Distribution (Low-emission vehicles, ISO 14001)	5
	Waste & Recycling (Collection of used tools & package, etc)	5
	Total	**100**

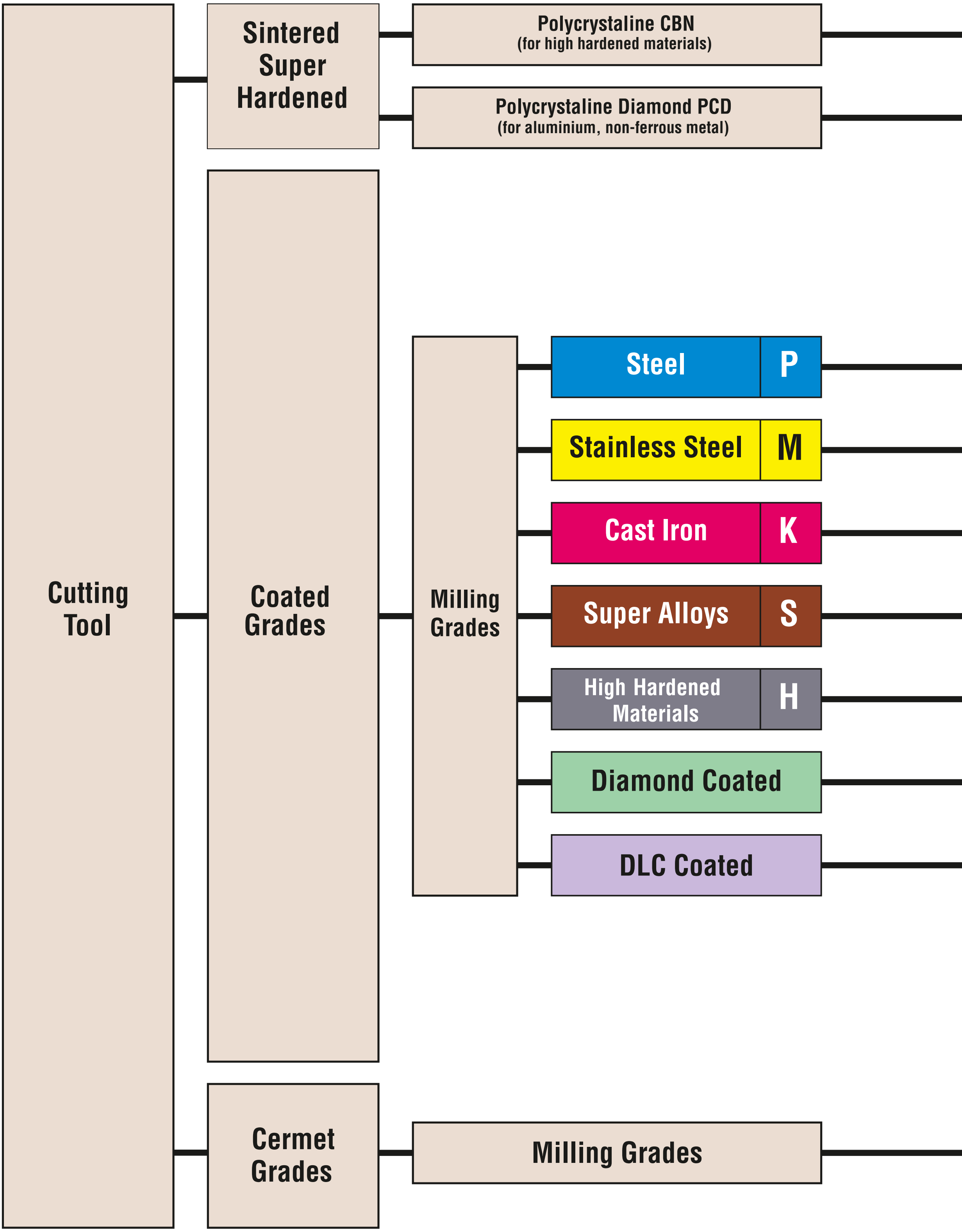
Evaluation Criteria

Environment-conscious products	Over 80	★★★
	79~60	★★
	59~40	★

Tooling by DIJET®

Carbide Grades

DIJET Grades for Cutting Tools



JBN795 JBN500 JBN300 JBN245

JDA30 JDA735 JDA10 JDA715

DH103 JC8015 JC8118 JC5015 JC5118 JC5040 JC8050 JC7550 JC7560

JC8015 JC8118 JC5015 JC5118 JC8050 JC7550 JC7560

DH103 JC605W JC608X JC8015 JC8118 JC5015

DH103 JC8015 JC8118 JC5015 JC5118 JC8050 JC7550 JC7560

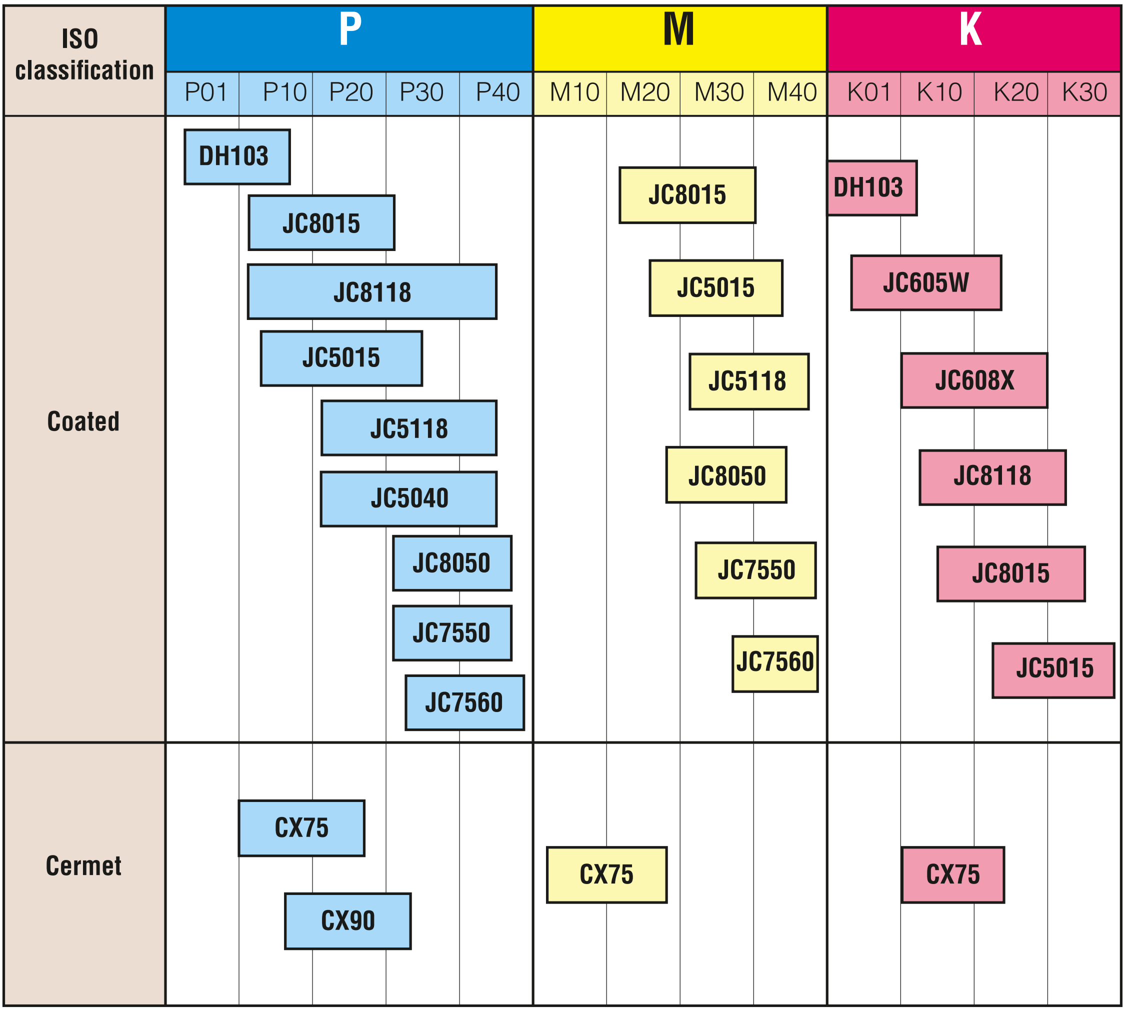
DH102 DH103 DH108 JC8015 JC8118 JC5118

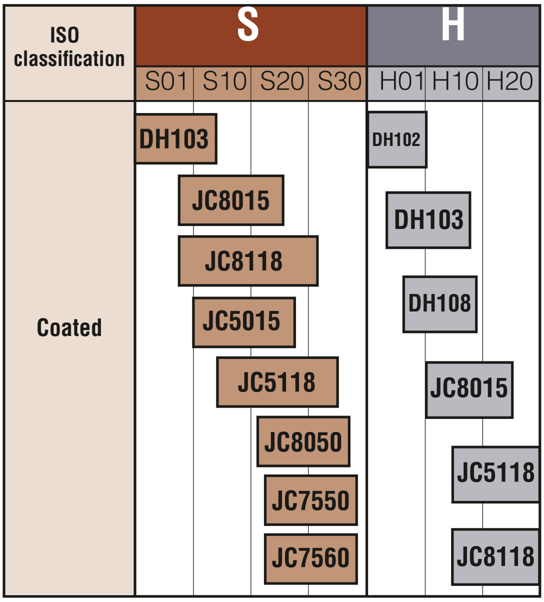
JC10000

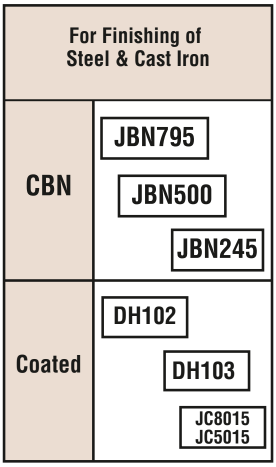
JC20003 JC20015

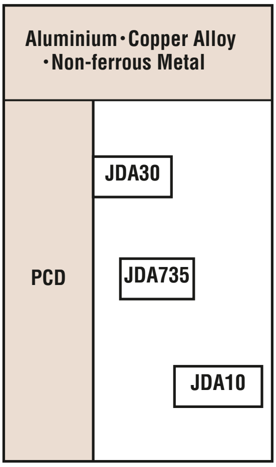
CX75 CX90

DIJET Grades for Turning Tools









Grade Comparison Chart

COATED GRADES FOR MILLING

ISO Codes		DIJET	Mitsubishi	Tungaloy	Sumitomo	Kyocera	Hitachi	Sandvik	Kennametal	NTK
P	**P01**	**DH103**				PR915 PR1005	TH308 TH303 JP4105			
	P10	**DH103** **JC8015** **JC8115**	VP15TF MS6015 MP6120	AH710 SH725	AC520U	PR930 PR1225 PR1215	JP4115 PN215 JP4120	GC1010	KC505M KC510M KC515M KC715M	DT4 VM1
	P20	**JC8015** **JC8118** **JC5118**	VP15TF VP20RT MP6120	AH120 AH725	ACP200 AC1030U AC530U	PR1230 PR1425 PR1525	IP2000 CY150 P4120	GC15 GC1125	KC522M KC525M KC527M KC610M KC620M KC635M KC715M KC720M KC927M KCPM20	DM4 TM4 QM3
	P30	**JC5015** **JC5118** **JC8118** **JC5040**	VP20RT VP15TF MP6130	AH9030 AH730 SH730	ACP200 ACP300	PR1230 PR1525 PR1425	JS4045 CY250 PTH30E	GC1130 GC2030 GC34	KC530M KC537M KC725M KC730M KC735M KCMP30 KCPK30	TM4 QM3 DM4
	P40	**JC5040** **JC8050** **JC7560**	VP30RT	AH3135 AH740	ACP300		JS4060 PTH40H JM4160	GC2040 GC1145	KC735M	
M	**M10**	**DH103**	VP15TF VP10RT		AC520U ACM100	PR1525 PR1225 PR1215	IP50S IP100S	GC1010 GC1105	KC515M KCPM20	DT4 VM1
	M20	**JC8015** **JC8118**	VP20RT VP15TF MP7130	AH120 AH725 SH725	AC1030U AC6040M ACM300	PR1525 PR1225 PR1215	JP4120 CY150	GC15 GC34 GC1115	KC522M KC525M KC610M KC635M KC720M KC927M	DM4 TM4 QM3
	M30	**JC8015** **JC5118** **JC8118**	MP7035 MP7130 MP7140	AH630 AH130 AH6030	ACP6040M ACM300 ACP200	PR1125 PR1535	JS4045 CY250 PTH30E	GC1040 GC2030 GC2035	KC530M KC537M KC725M KC730M KC735M KCMP30	DM4 QM3 TM4
	M40	**JC8050** **JC7560** **JC7550**	VP30RT MP7035 MP7140	AH645 AH140 AH3135	ACP300 AC6040M ACU300		JM4160 PTH40H	GC1040 GC1145		
K	**K01**	**DH103**			AC510U ACK260		TH303 ATH80D ATH10E		KC907M	
	K10	**JC8015**	VP10RT	AH110 GH110	AC520U ACK260	PR1210 PR1510 PR905	JP4120 PTH13S	GC1020 GC1010	KC514M KC515M KC914M KC917M KCK15	
	K20	**JC8015** **JC5015** **JC8118**	VP15TF VP20RT VP10RT	AH120 SH725	AC520U AC1030U ACK280	PR1210 PR1510 PR905	JP4120 CY150	GC1020 GC34	KC520M KC522M KC524M KC527M KC610M KC620M KC635M KC924M KC927M KCPM20	DM4 QM3
	K30	**JC5015**	VP15TF VP20RT		ACK300		JS4045 CY250		KC537M KCPK30	
S	**S01**	**DH103**	MP9005 VP05RT	AH905		PR005S PR1305	PN215 JP9105			DT4
	S10	**JC5015** **JC8015** **JC8118**	MP9005 MP9015 MP9020	AH110 AH8005	AC510U	PR1310 PR015S	IP100S JP9115	GC1010 GC1105	KC510M	DT4
	S20	**JC5015** **JC5118** **JC8118**	MP9130 MP9015 MP9020	AH120 AH725 AH8015	AC520U	PR015S PR1325	JP4120 PTH30E	GC15 S30T GC1115	KC522M KC525M KC610M	DT4 TM4 DM4
	S30	**JC8050** **JC7560** **JC7550**	MP9130	SH730 AH4035		PR1535	JM4160 PTH40H	GC1040 GC2040 GC34	KC725M KCMP30	
H	**H01**	**DH102** **DH103**	MP8010		AC503U		TH303 TH308 JP4105	GC1010		
	H10	**DH108** **JC8015**	MP8010 VP15TF		AC503U		PN208 PN215 JP4115		KC505M KC510M	
	H20	**JC8118** **JC5118**	VP15TF	AH120			JP4120	GC34		

Carbide Grades

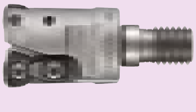
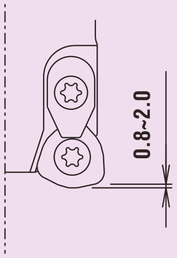
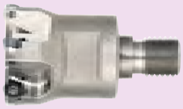
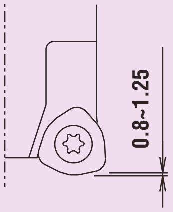
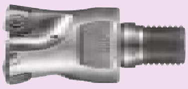
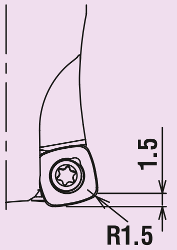
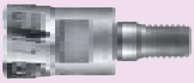
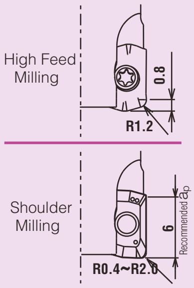
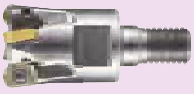
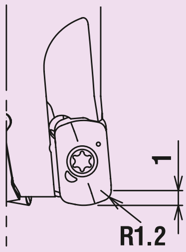
CERMET GRADES

ISO Codes		DIJET	Mitsubishi	Tungaloy	Sumitomo	Kyocera	Hitachi	Sandvik	Kennametal	NTK
P		LN10	AP25N VP25N	NS520	T1000A	TN610 PV710			KT1120	T15
	P10	LN10 CX75	AP25N NX2525 NX3035	GT9530	T1500A T1500Z	TN610 PV710	CZ25	CT5015	KT315 KT910	T15
	P20	CX75 CX90	NX2525 MP3025 NX3035	GT9530 NS9530	T1500A T1500Z T3000Z	TN620 PV720 TN90	CH550 CH7030 MZ1000	**GC1525**	KT5020 KTPK20	C7X
	P30	CX90	NX4545 VP45N MX3030	NS740	T3000Z T4500A T250A		CH7035			C7X N40
M	M10	LN10 CX75	AP25N NX2525 VP25N	NS520	T1000A T1500Z	TN60 PV720 TN620		**GC1525**	KT315 KT910	C7X T15
	M20	CX75	AP25N NX2525 VP25N	GT9530 NS9530	A1500A A1500Z	TN90 PV720 TN620	CH550 CH7030 MZ1000		KT5020 KTPK20	C7X
	M30		NX4545 MX3030	NS740	T4500A T3000Z		CH7035			C7X N40
K	K01	LN10	AP25N VP25N	NS520	T1000A	PV7005			KT1120	T15
	K10	LN10 CX75	AP25N NX2525 VP25N	GT9530 NS9530	T1500A T1500Z	PV7005 PV710 TN610	CH550 MZ1000	CT5015	KT315 KT910	C7X T15
	K20	CX75	AP25N NX2525 VP25N		T3000Z		CH7030		KT5020 KTPK20	
	K30						CH7035			

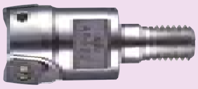
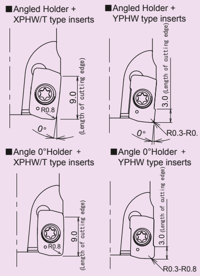
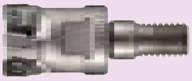
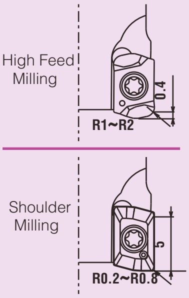
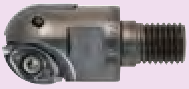
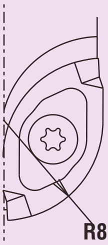
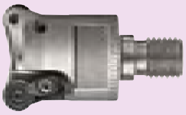
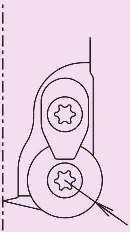
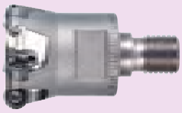
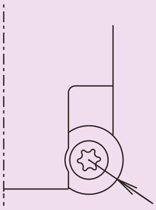
Tooling by DIJET®

Modular Head Series

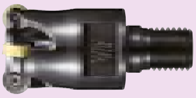
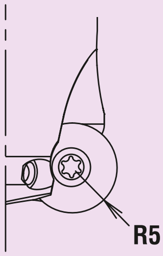
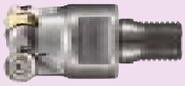
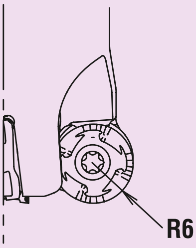
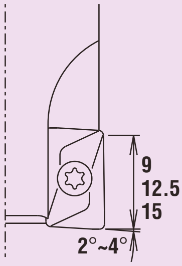
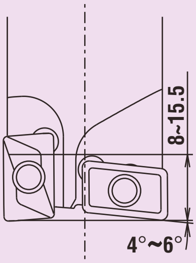
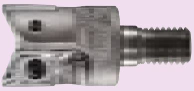
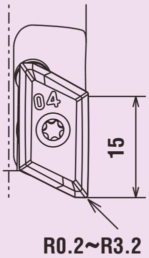
Modular Head Series

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		Face Milling Pocket Milling Copy Milling Helical Interpolation
High Feed Copy Milling	High Feed Diemaster Fine pitch type **MSH** Type B013	G-Body  φ20~φ40		Face Milling Pocket Milling Copy Milling Helical Interpolation
High Feed & Efficient Copy Milling	SKS GII **MSG** Type B024	G-Body  φ25~φ42		Face Milling Copy Milling Pocket Milling Helical Interpolation Plunge Milling
High Feed Copy Milling	QM MAX **MQX** Type B030	G-Body  φ16~φ42		Face Milling Pocket Milling Copy Milling Helical Interpolation Shoulder Milling Slotting
High Feed & Efficient Copy Milling	QM Max G II **MXG** Type B080	G-Body  φ16~φ42		Face Milling Copy Milling Pocket Milling Helical Interpolation Slotting

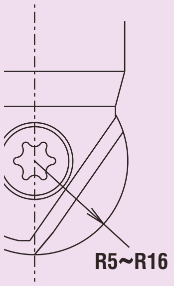
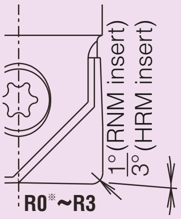
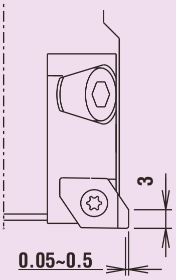
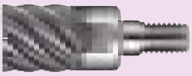
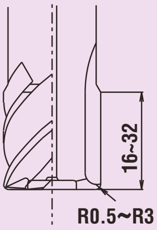
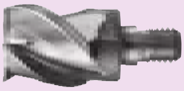
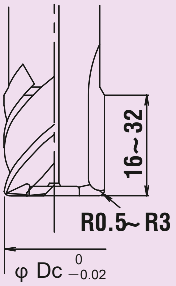
Modular Head Series

Type	Tool	Type and Range	Entering Angle/Max .ap	Applications
High Efficient tilted wall finishing	**QM MAX** **MQT Type** **B086**	G-Body  φ16~φ35	 Max. ap=1.5 ■Angled Holder + XPHW/T type inserts ■Angled Holder + YPHW type inserts ■Angle 0°Holder + XPHW/T type inserts ■Angle 0°Holder + YPHW type inserts 	Shoulder Milling
High Feed Copy Milling	**QM MILL** **MPM Type** **B090**	G-Body  φ10~φ32	 	Face Milling Pocket Milling Copy Milling Helical Interpolation Shoulder Milling Slotting
Copy Roughing	**Swing Ball** **MSW Type** **B107**	G-Body  φ16~φ32	 R8~R16	Copy Milling Shoulder Milling Slotting
Copy Milling oncommon &difficult to cut materials	**Super Diemaster** **Standard type** **SDH Type** **B111**	G-Body  φ15~φ40	 R3.5~R6	Face Milling Copy Milling Pocket Milling Helical Interpolation
Copy Milling oncommon &difficult to cut materials	**Super Diemaster** **Fine pitch type** **SDH Type** **B112**	G-Body  φ20~φ42	 R3.5~R6	Face Milling Copy Milling Pocket Milling Helical Interpolation

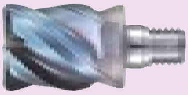
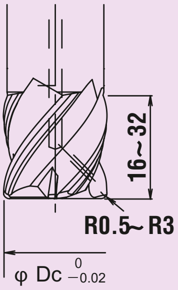
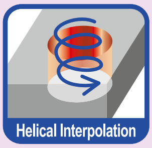
Modular Head Series

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

Modular Head Series

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

Modular Head Series

Type	Tool	Type and Range	Entering Angle/Max .ap	Applications
Anti-Vibration Type	**S-Head** **SMSR** Type B191	 φ16～φ32	 16～32 R0.5～ R3 φ Dc $^{0}_{-0.02}$	 Shoulder Milling  Copy Milling  Pocket Milling  Helical Interpolation
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

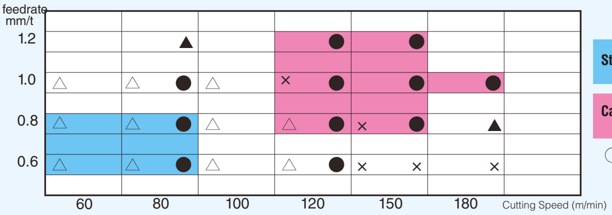
■ CUTTINGCONDITIONS

- 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 (○,△,×)

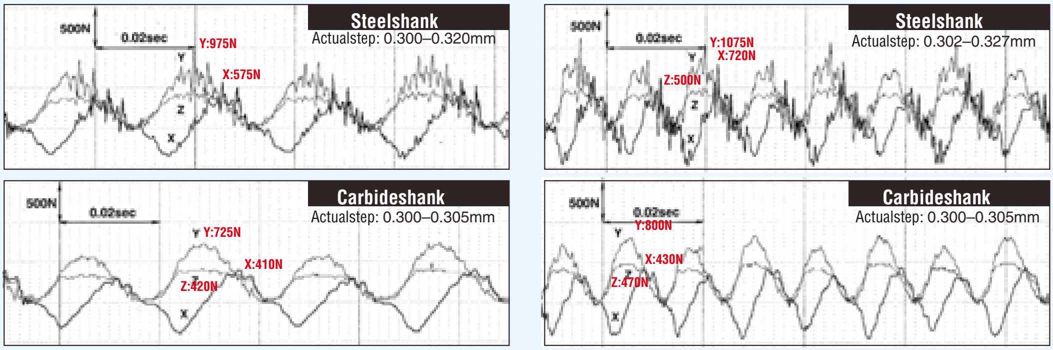
Carbideshankbody：MSN-M10-140-S20C+MSH-2020-M10(●,▲,×)

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

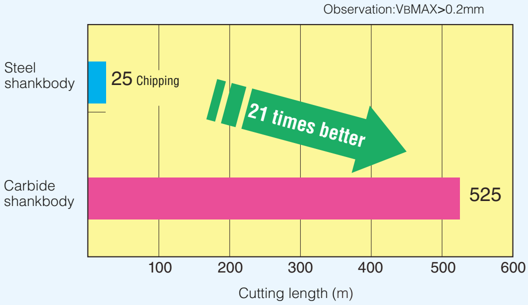
Improved efficiency by 3 times!

■ VIBRATIONS COMPARISON

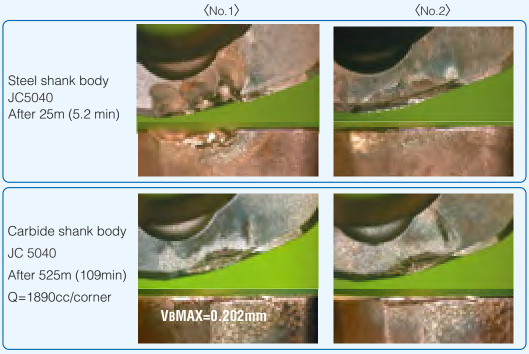
Low cutting speed (Vc=80m/min) High cutting speed (Vc=150m/min)



■ TOOL LIFE COMPARISON



■ CONDITION OF THE INSERTS AFTER ABOVE TESTS



Steel shank body
JC5040
After 25m (5.2 min)

Carbide shank body
JC 5040
After 525m (109min)
Q=1890cc/corner

■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

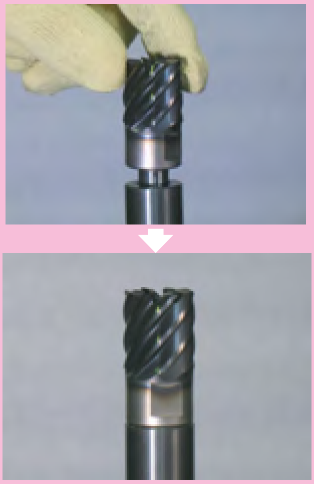
⚠ Mounting Modular head and MSN/MGN shank holder

Tightening procedure

1 Cleaning

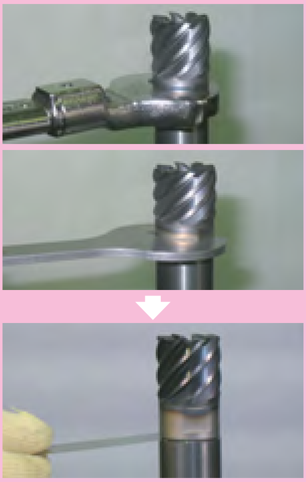
Remove dirt and chips with air blow from the connecting thread and face of modular head and MSN/MGN shank holder.

2 Initial Tightening



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

3 Final Tightening

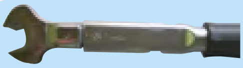


Tighten slowly with torque control spanner wrench or special spanner wrench for S-Head and confirm that there is no gap.

⚠ 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

■ 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**

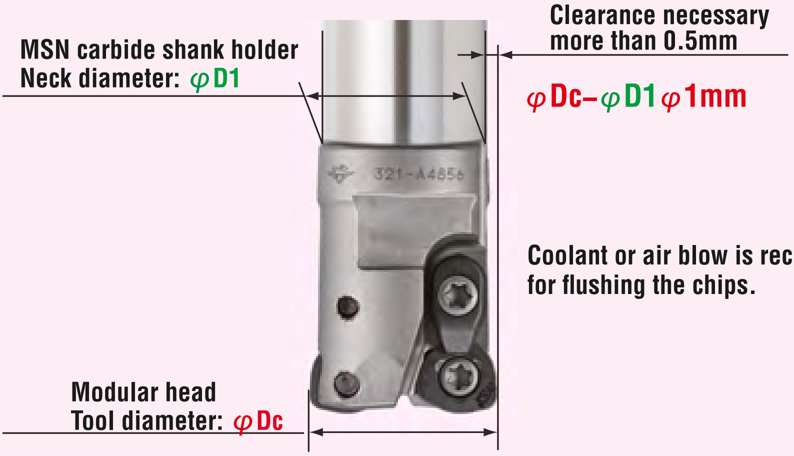
※Modular heads are supplied without spanner wrench.

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.



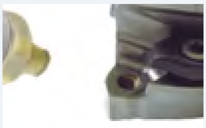
In case of finishing operation (like Mirror Ball, Mirror Radius etc.), the damage risk of the carbide shank is low. Clearance more than 0.5mm is not necessary.

⚠ 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

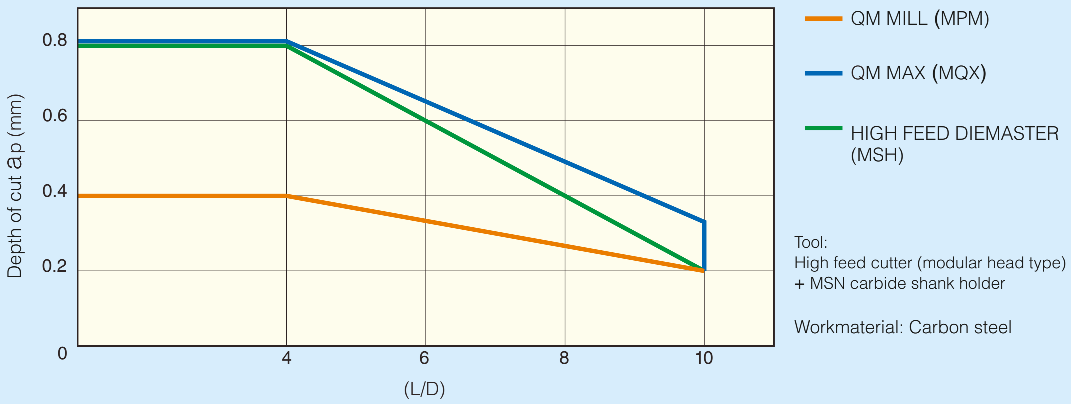
5 Confirm the insert is completely fixed, then tighten the screw for clamp set. (The insert can be removed ifthe clamp set loosens even if it doesn't completely detach)

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

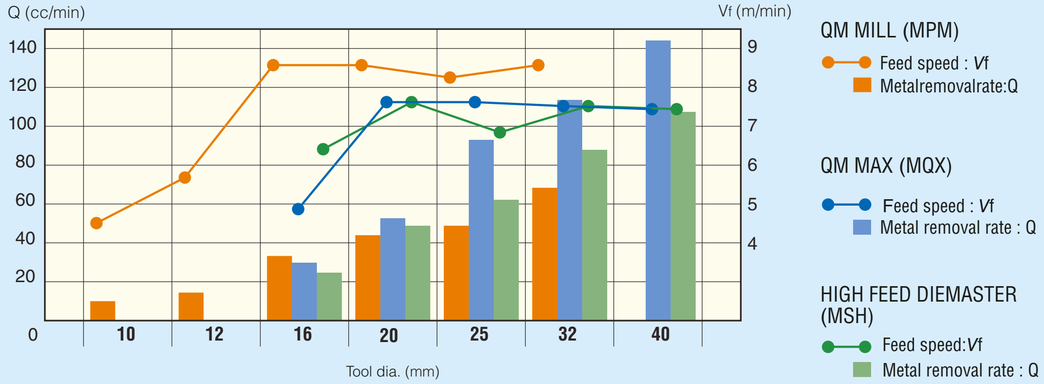
ap (Depth of cut : mm)

- 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).

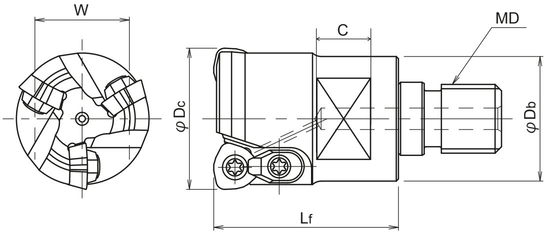
Machine

- 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).

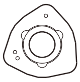
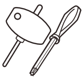
High Feed Diemaster MSHTYPE

G-Body Standard Type Through Coolant Hole

Face Milling Pocket Milling Copy Milling Helical Interpolation



BODY

Cat No.	Stock	No. of flutes	Dimensions (mm)						Inserts	Parts		
			φDc	Lf	φDb	MD	C	W		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

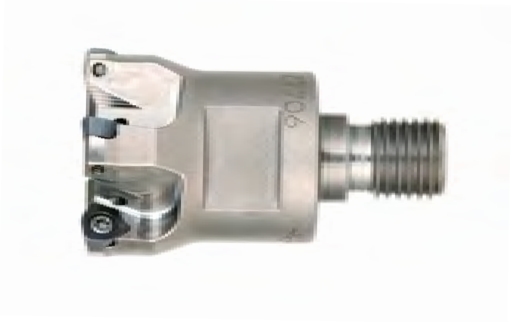
Clamp Screw	Recommended Torque (N•m)
TSW-2556H	0.9
DSW-306H	1.8
CSW-408H	3.6
DSW-4510H	6.0

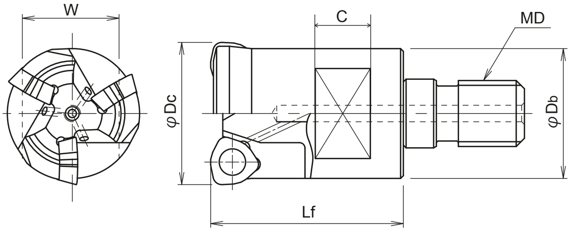
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

High Feed Diemaster MSHTYPE

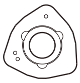
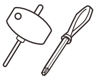
G-Body **Fine Pitch Type** **Through Coolant Hole**

Face Milling Pocket Milling Copy Milling Helical Interpolation





BODY

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

INSERT WITHOUT CHIPBREAKER

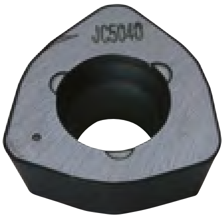


Fig.1

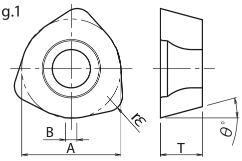


Fig.2

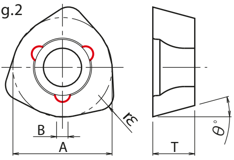


Fig.3

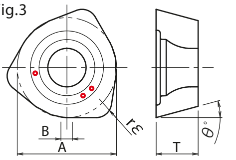


Fig.4

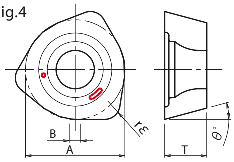


Fig.5

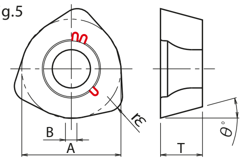
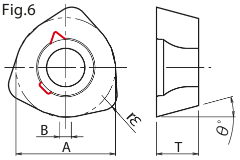


Fig.6



Cat. No.	Tole-rance	Dimensions (mm)					PVD coated				
		A	T	B	rε	θ°	JC7560	JC8015	JC8050	JC8118	JC5040
WOMW04T215ZER	M	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		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

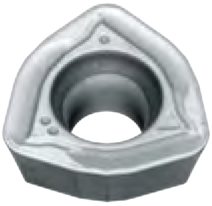


Fig.7

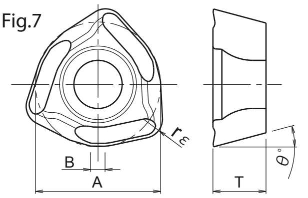


Fig.8

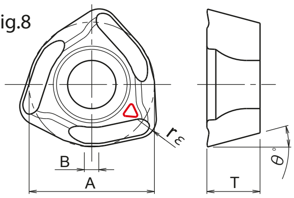
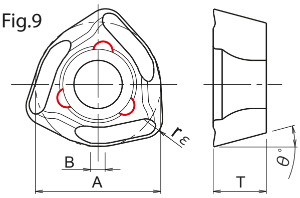


Fig.9



Cat. No.	Tole-rance	Dimensions (mm)					PVD coated			
		A	T	B	rε	θ°	JC7560	JC8015	JC8050	JC8118
WOMT04T215ZER	M	6.5	2.8	0.8	1.5	13	●Fig.9	●Fig.7	●Fig.9	●
WDMT050316ZER		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

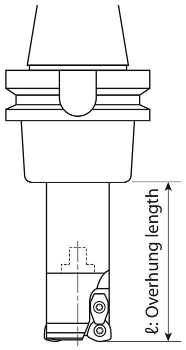
● MSH type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia.(mm)							
		16/17				20/21/22			
		No.of teeth 2N				No.of teeth 2N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (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, a_p: 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

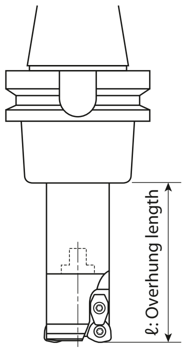
● MSH type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)							
		20/21/22				25/26			
		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	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, a_p: 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

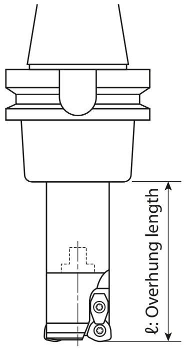
● MSH type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)			
		25/26			
		No.of teeth 3N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (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, a_p: 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 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

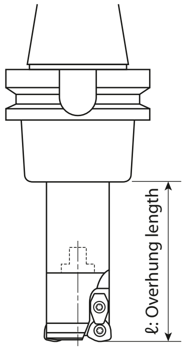
● MSH type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)			
		32/33/35			
		No.of teeth 2N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (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, a_p: 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 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

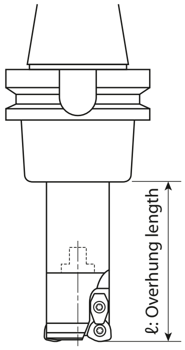
● MSH type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)											
		32				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, ap: Depth of cut, n: Spindle speed, Vf: 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		
Grades / Cat. No.	JC5040	JC8050	JC7560	JC8118	JC8050	JC7560	JC8118	JC8015	JC5040	JC8050	JC7560
WOMW04T215ZER	○	○	◎	◎	●	○	◎	◎	○	○	◎
WOMT04T215ZER		☆	☆	☆	☆		☆	☆		☆	☆
WDMW050316ZTR	○	○	◎	○	●	○	○	○	○	○	◎
WDMW050316ZER		●		◎			◎			●	
WDMT050316ZER		☆	☆	☆	☆	☆	☆	☆		☆	☆
WDMW06T320ZTR	○	○	◎	○	●	○	○	○	○	○	◎
WDMW06T320ZER		●		◎			◎			●	
WDMT06T320ZER		☆	☆	☆	☆	☆	☆	☆		☆	☆
WDMW080520ZTR	○	○	◎	○	●	○	○	○	○	○	◎
WDMW080520ZER		●		◎			◎			●	
WDMT080520ZER		☆	☆	☆	☆	☆	☆	☆		☆	☆

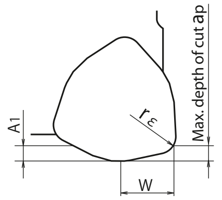
Work Materials	Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB			Nodularcastiron FCD500, FCD700 (GGG50, GGG70) Below 300HB		Stainless steel SUS304 Below 250HB		
Grades / Cat. No.	JC8118	JC8015	JC7560	JC8118	JC8015	JC8050	JC7560	JC8118
WOMW04T215ZER	◎	○	○	◎	○	●		○
WOMT04T215ZER	☆	☆	☆	☆	☆	○	◎	
WDMW050316ZTR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

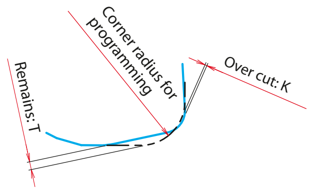
Work Materials	Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	
Grades / Cat.No.	JC8118	JC8015
WOMW04T215ZER	◎	○
WOMT04T215ZER	×	×
WDMW050316ZTR	●	○
WDMW050316ZER	◎	
WDMT050316ZER	×	×
WDMW06T320ZTR	●	○
WDMW06T320ZER	◎	
WDMT06T320ZER	×	×
WDMW080520ZTR	●	○
WDMW080520ZER	◎	
WDMT080520ZER	×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

•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

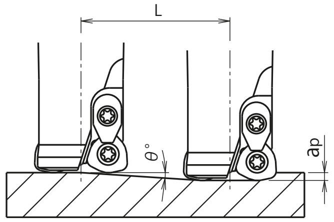




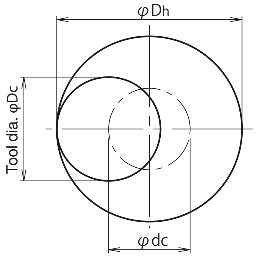
	Corner radius for programming	T	K	rε	W	ap	
04 Type	R1.5 (Recommended)	0.29	0	1.5	2.7	0.8	0.8
	R2	0.19	0.04				
05 Type	R2 (Recommended)	0.35	0	1.6	3.6	1.25	1.2
	R2.5	0.25	0.12				
06 Type	R2.5 (Recommended)	0.44	0	2.0	4.5	1.5	1.5
	R3	0.34	0.1				
08 Type	R3 (Recommended)	0.63	0	2.0	6.0	2.0	2.0
	R3.5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

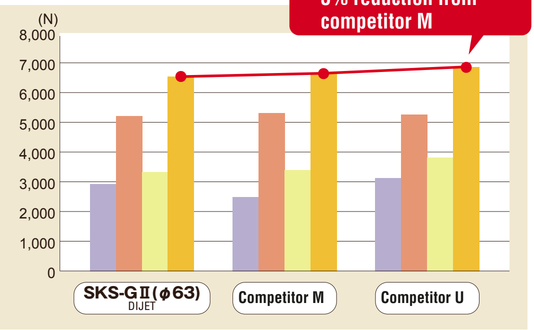
Features 3

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

Cutting performance

Cutting force comparison

7% reduction from competitor U,
5% reduction from competitor M



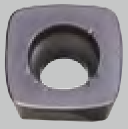
- ▨ (Feed force)
- ▨ (Main force)
- ▨ (Back force)
- ▨ (Resultant force)

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

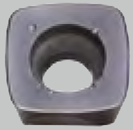
SKS G II MSGTYPE

Features 4

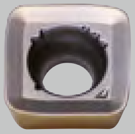
3 insert grades “JC8118”, “JC8050” & “JC7550” can be widely applied from general & mold steel to hard-to-cut materials such as high hardened die steel, titanium alloy & stainless steel



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.

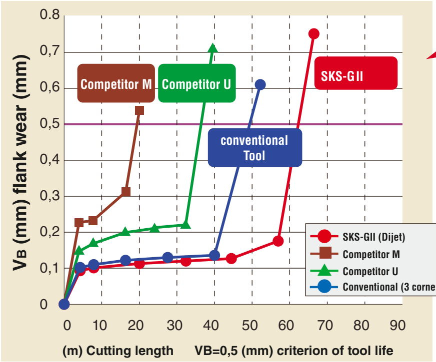
Application

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.

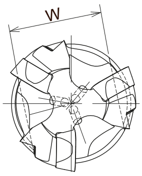
(32HRC)
Material: P20
- ø 63mm
  Tool dia.
  Insert No.
  SPNW100415ZTR (JC8118)
- Cutting conditions
  Vc=150m/min, fz=1mm/t,
  ap=1.5mm, ae=37.5mm,
  Air blow,
  Down cut,
  Test by one insert

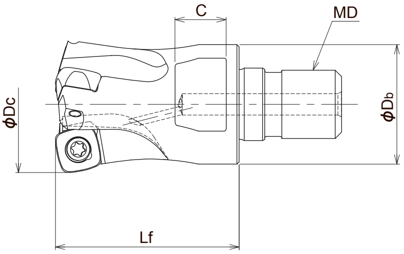
SKS GII MSGTYPE

Modular head type (Insert 10-type)

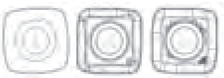
Through Coolant Hole

G-Body





BODY

Cat. No.	Stock	No. of flutes	Dimensions(mm)						Applicable Inserts	Parts	
			φDc	Lf	φDb	MD	C	W		Clamp Screw 	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			

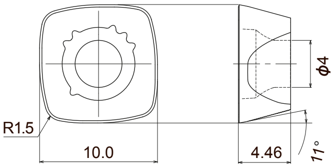
Note) 1. All cutters are supplied without inserts.
2. In case of using MSG-4040/4042-10-M16, recommend combining with MSN carbide shank straight arbor type.
3. Please refer page 009 for recommended tightening torque.

Arbor B193

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

Insert 10-type

Fig.1 SPNW100415ZTR



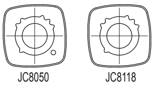


Fig.2 SPET100415ZPER-SM

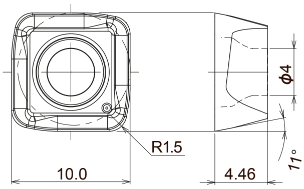
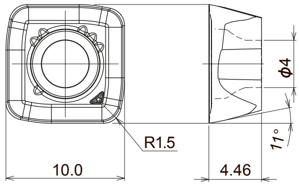


Fig.3 SPMT100415ZPER-SM



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

● Standard stock items
10 inserts per case.

SKS GII MSGTYPE

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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, Vf: Feed speed

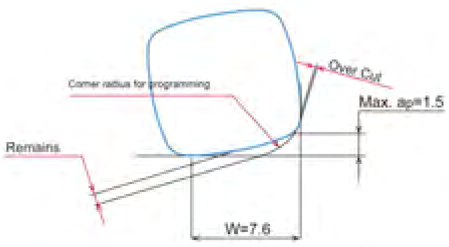
NOTE

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.

SKS GII MSG TYPE

Definition of corner shape for programming

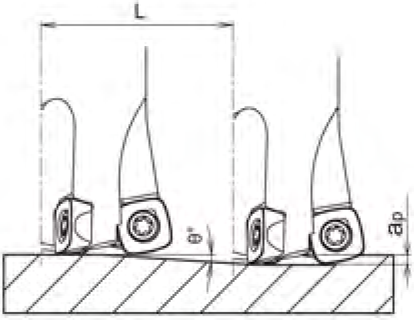
■ SPNW10 / SPE(M)T type inserts



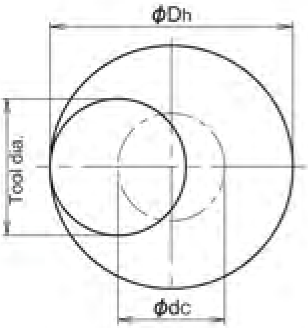
Corner R for programming	Over cut	Remains
R2.5	0	0.99
R3.0 (Standard)	0	0.84
R3.5	0.09	0.71
R4.0	0.23	0.59

■ 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 MQX TYPE

QM MAX Quick&Mini

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

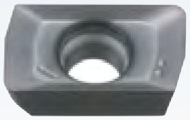
High feed insert for unfavorable condition


EPMW100312ZER


EPMW100312ZTR

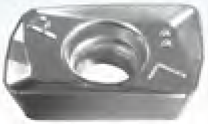

EPMW100312ZTR

Shoulder milling insert


ZPMT1003…ZER

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

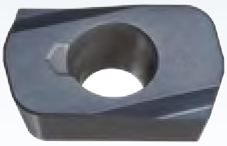
NEW Shoulder milling insert for aluminum alloy


ZPMT1003…ZER-NL

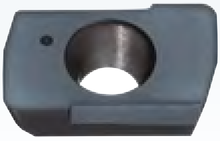
NEW Shoulder milling insert (From semi-finishing to finishing)


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.

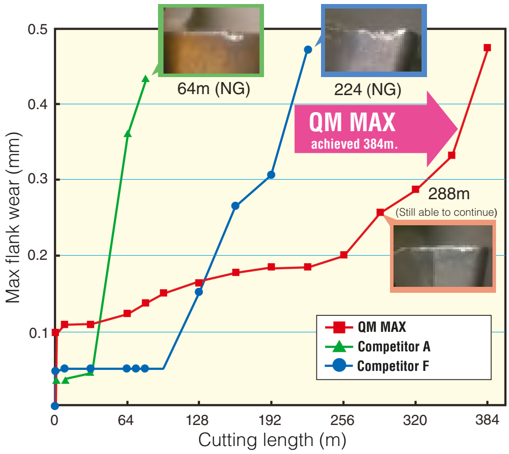
Adopted PVD coated grade “JC5118” possible to cut general steel, hardened material, titanium alloy and heat-resistant alloy, tough grade “JC8050” for interrupted cutting, and new PVD coated grade “JC7560” improved heat-fracture resistance & impact strength and tool life. And, available now uncoated grade “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

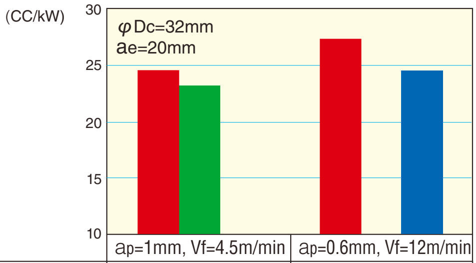
Tool life comparison

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

NEW ZPMT-PL

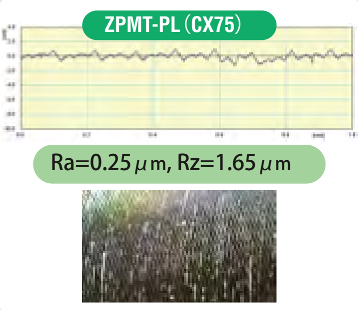
Series expansion, shoulder milling insert from semi-finishing to finishing side & bottom face for QM MAX MQX / QXP type.

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”.

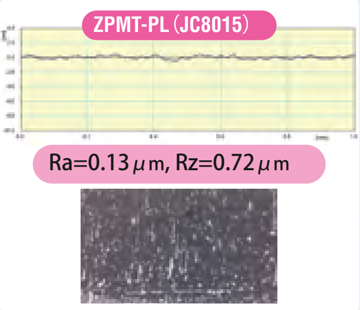
Cutting performance

Surface roughness (bottom)

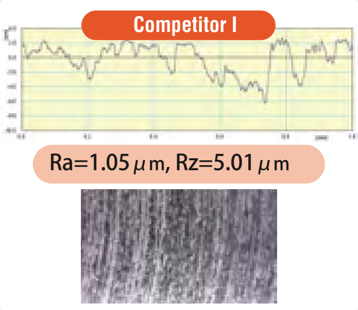
Material: C50 (raw material), Tool dia.: Ø25mm
Vc=160.2m/min, fz=0.12mm/t, ap=0.2mm, Overhung length: 60mm



Ra=0.25μm, Rz=1.65μm



Ra=0.13μm, Rz=0.72μm

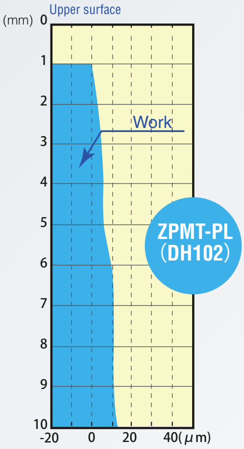


Ra=1.05μm, Rz=5.01μm

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

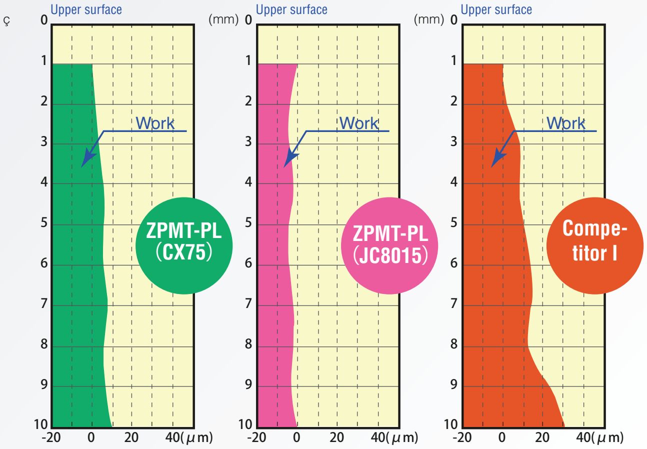
Material: SKD11 (60HRC)
1.2379 (60HRC)
Tool dia: Ø26 mm
Vc=180m/min,
fz=0.15mm/t,
ap=2×8=16mm,
ae=0.1mm

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)**

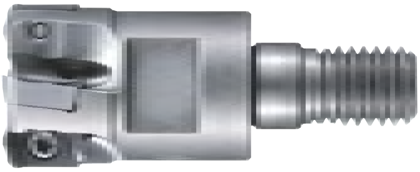
QM MAX

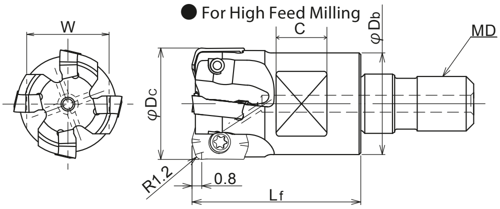
MQXTYPE

G-Body

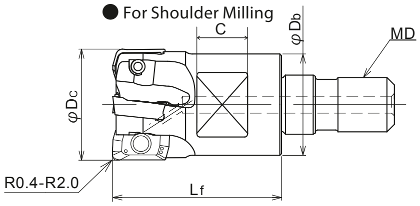
Through Coolant Hole

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





● For High Feed Milling



● For Shoulder Milling

BODY

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

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

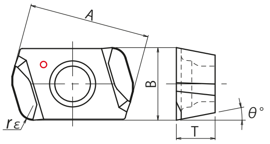
QM MAX

MQX TYPE

MQX TYPE

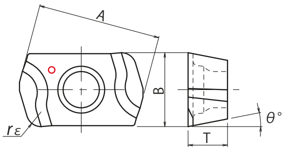
High feed insert (EPMT100312ZER)

Cutting condition B033~B036



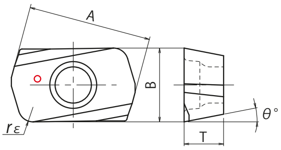
High feed insert for unfavorable condition (EPMW100312ZER)

Cutting condition B033~B036



High feed insert for unfavorable condition (EPMW100312ZTR)

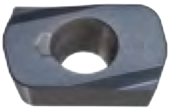
Cutting condition B033~B036

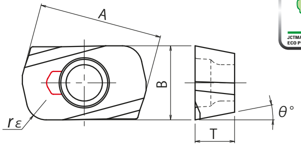


(JC7560)

High hardened steel (EPHW100316ZTR)

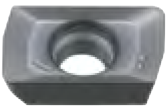
Cutting condition B037~B039

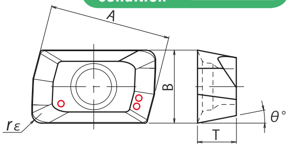




Shoulder milling insert (EPMT1003ZER)**

Cutting condition B040~B047

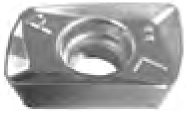


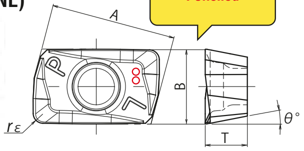


NEW **Shoulder milling insert for aluminum alloy (ZPMT1003**ZER-NL)**

Cutting condition B074

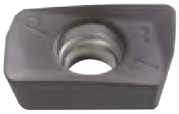
Polished

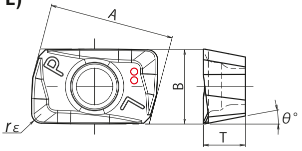




NEW **Shoulder milling insert (From semi-finishing to finishing) (ZPMT100308ZER-PL)**

Cutting condition B066~B073

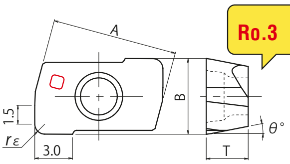




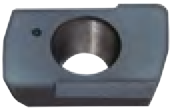
“MIRROR INSERT” for finishing side & bottom face (YPHW1003ZER-15) (YPHW100308ZTR-F1) (YPHW100308ZER-F)**

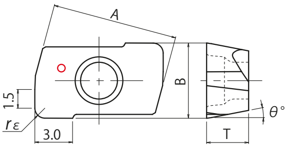
Cutting condition B048~B058

Ro.3

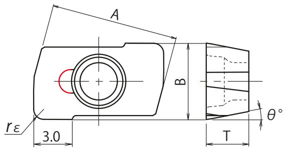


(YPHW100303ZER-15)





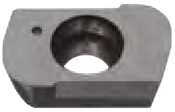
(YPHW100308ZER-15)

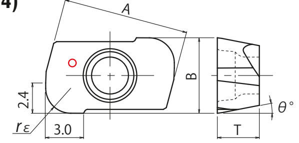


(YPHW100308ZER-F)

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

Cutting condition B059~B065





QM MAX

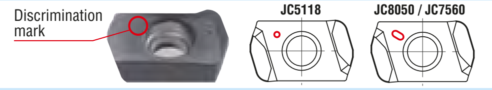
MQXTYPE

Type	Cat. No.	Tole-rance	PVD coated						Uncoated		Cermet	Dimensions (mm)				
			JC5118	JC8118	DH102	JC7560	JC8015	JC8050	FZ15	FC18	CX75	A	T	B	rε	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

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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, 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 chips out.

QM MAX

MQX TYPE

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)	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)
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, 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 MQX TYPE

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)	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)
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, 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 chips out.

QM MAX MQX TYPE

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)	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)
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, 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 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)	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	~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)	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	0.30	~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, 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 chips out.

QM MAX MQX TYPE

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					No. of teeth 5N				
		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	~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					32/35				
		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	~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

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 MQX TYPE

■ 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)	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)	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)	~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, 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 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)	a_p (mm)	$a_p \times a_e$ (mm²)	n (min⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm²)	n (min⁻¹)	V_f (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, 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 MQX TYPE

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, 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 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)	a_p (mm)	$a_p \times a_e$ (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm)	n (min^{-1})	V_f (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, 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 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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, 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 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)	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)
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, 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 MQX TYPE

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)	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)
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, 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 chips out.

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)	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)
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, 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 MQX TYPE

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)	P_f (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	P_f (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	P_f (mm)	a_e (mm)	n (min^{-1})	V_f (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, 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 / 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 **MQX**TYPE

■ 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)	P_f (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	P_f (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	P_f (mm)	a_e (mm)	n (min^{-1})	V_f (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, P_f : Pick feed, 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 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.

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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, 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 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)	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)
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, 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 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)	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)
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, 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 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)	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)
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, 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 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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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

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 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)									
		25/26									
		No. of teeth 4N					No. of teeth 5N				
		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)
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, 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 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)									
		30/32/35					32/35				
		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)
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, 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 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)	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)
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, 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 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)	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)
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, 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 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.

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)	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)
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, 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 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)	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)
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, 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 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)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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)	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)
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, 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 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					No. of teeth 5N				
		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)
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					32/35				
		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)
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, 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 occurs, 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 / 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)	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)
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, 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 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 "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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, V_f: Feed speed

NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut a_p or Feed speed.
3 If machine does not have enough power, recommend to reduce the depth of cut a_p or Spindle speed and Feed speed.
4 Use air blow.

■ 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)	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)
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, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, V_f: Feed speed

■NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut a_p or Feed speed.
3 If machine does not have enough power, recommend to reduce the depth of cut a_p 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)	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)
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, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, V_f: Feed speed

NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut a_p or Feed speed.
3 If machine does not have enough power, recommend to reduce the depth of cut a_p or Spindle speed and Feed speed.
4 Use air blow.

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)	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)
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, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, V_f: Feed speed

NOTE

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

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

3 If machine does not have enough power, recommend to reduce the depth of cut a_p 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					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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

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 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 a_p or Feed speed.
3 If machine does not have enough power, recommend to reduce the depth of cut a_p or Spindle speed and Feed speed.
4 Use air blow.

QM MAX **MQX**TYPE

■ 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					No. of teeth 5N				
		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)
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, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, V_f: Feed speed

NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut a_p or Feed speed.
3 If machine does not have enough power, recommend to reduce the depth of cut a_p 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)	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)
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, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, V_f: Feed speed

NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut a_p or Feed speed.
3 If machine does not have enough power, recommend to reduce the depth of cut a_p or Spindle speed and Feed speed.
4 Use air blow.

■ 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)	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)
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, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, V_f: Feed speed

■NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut a_p or Feed speed.
3 If machine does not have enough power, recommend to reduce the depth of cut a_p 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)	a_p (mm)	a_pxa_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_pxa_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_pxa_e (mm)	n (min^{-1})	V_f (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)	a_p (mm)	a_pxa_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_pxa_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_pxa_e (mm)	n (min^{-1})	V_f (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)	a_p (mm)	a_pxa_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_pxa_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_pxa_e (mm)	n (min^{-1})	V_f (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, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, V_f: Feed speed

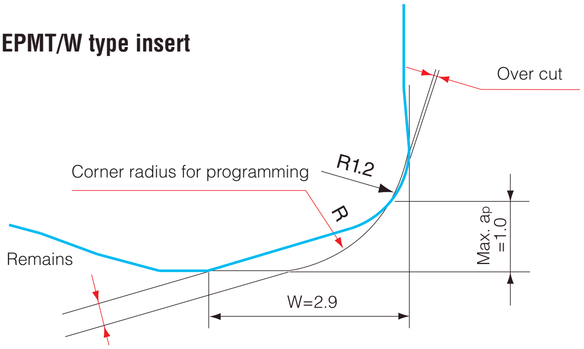
NOTE

1 The figure to be adjusted according to the machine rigidity or work rigidity.
2 In case of chatter occurring, recommend to reduce the depth of cut a_p or Feed speed.
3 If machine does not have enough power, recommend to reduce the depth of cut a_p or Spindle speed and Feed speed.
4 Use air blow.

QM MAX MQXTYPE

Definition of corner radius for programming

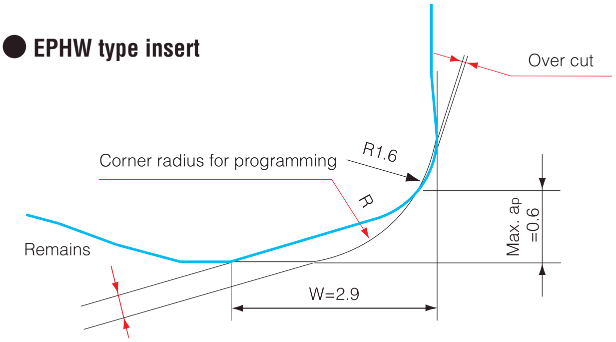
● EPMT/W type insert



(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-6AI-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

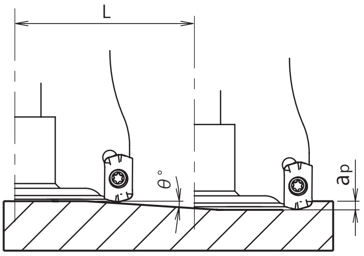
●: Unfavorable Condition ☆: Light Cutting ×: No good

QM MAX

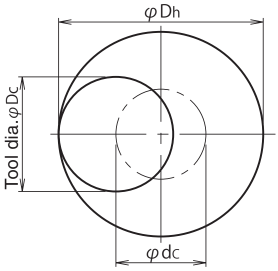
MQXTYPE

Instructions for profile milling with EMPT/W type insert

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

φdc=	φDh	φDc
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

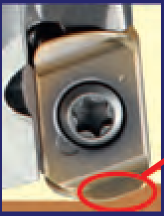
Note) The ramping angle 0.5° or less is recommended (please refer to the above table).

QM MAX G II — MXG TYPE

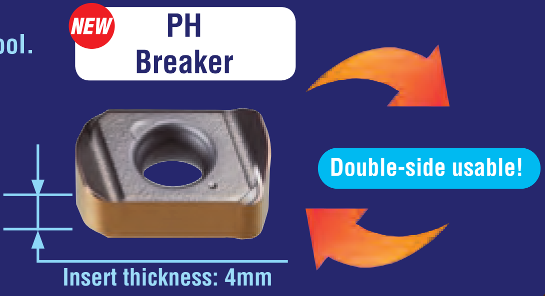
Feature of product

”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).

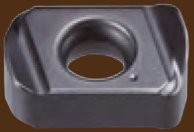


- Insert thickness: 4mm improved strength by 1.2 times compared with conventional tool.
- Economical double-side insert (4 corners).
- New strong edge type “PH breaker insert” is excellent in fracture resistance and applicable to heavy cutting.



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

ISO	P					M					K				H		
	P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30	H01	H10	H20
Applicable range		NEW JC8118					NEW JC8118					NEW JC8118				NEW JC8118	
				NEW JC7560					NEW JC7560								



<JC8118>

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

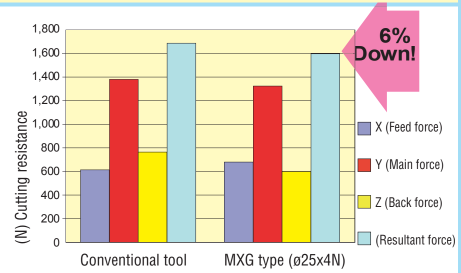
<JC7560>

”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.

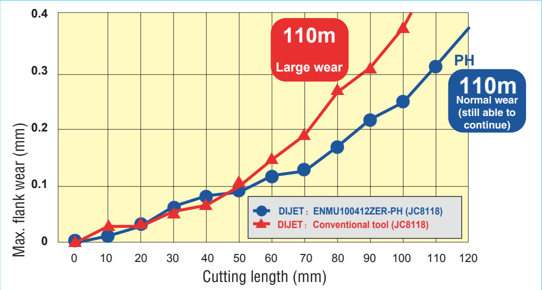
G-Body

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)



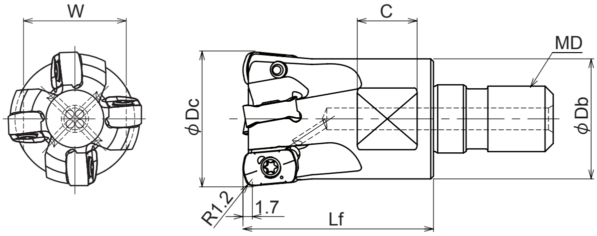
New strong edge type "PH breaker insert" supressed small chipping and achieved longer tool life compared with conventional tool.

QM MAX G II MXGTYPE

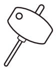
MXG TYPE

Through coolant hole

G-Body



BODY

Cat No.	Stock	No. of inserts	Dimensions (mm)						Applicable Inserts	Parts	
			φDc	Lf	φDb	MD	C	W		Clamp Screw 	Wrench 
MXG-2016-M8	●	2	**16**	23	14	M8	8	12	ENMU100412ZER-PH	TSW-2567H	A-08
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			
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.

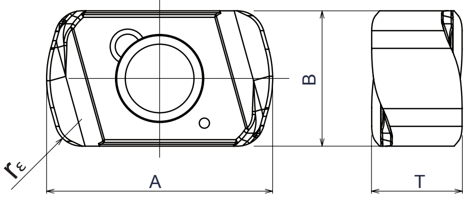
Arbor B193

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

MXG TYPE

Inserts

NEW -PH



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

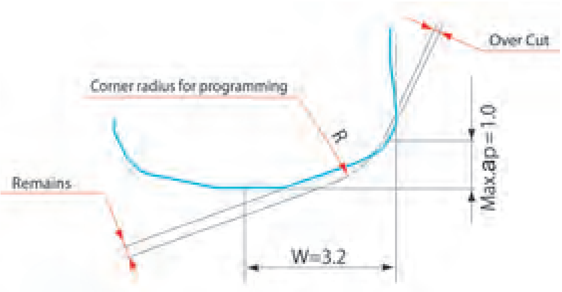
10 inserts per case

● Standard stock items

QM MAX G II

MXG TYPE

Definition of corner shape for programming

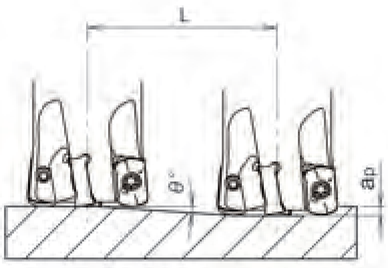


(mm)

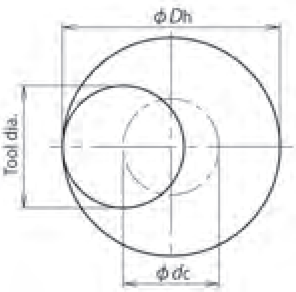
Corner radius for programming	Over cut	Remains
R1.0	0	0.52
R1.5 (Standard)	0	0.38
R2.0	0.08	0.24

■ 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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, 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 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.

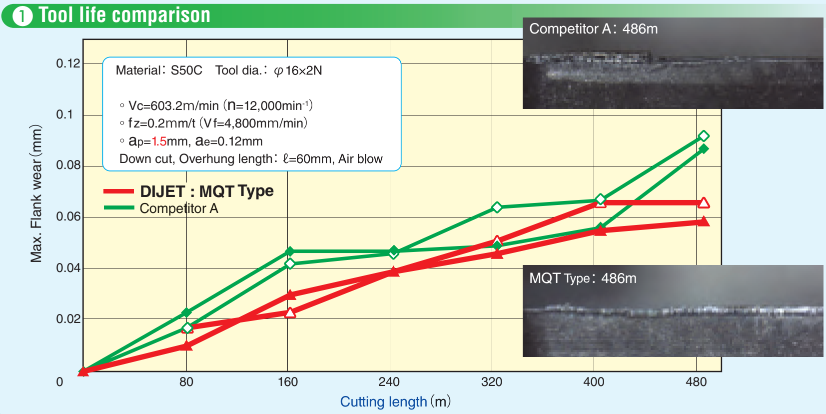
   ➡ Accuracy of tool dia. with master inserts –0.02 mm ～ –0.05 mm (XPHW/T tType inserts)

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

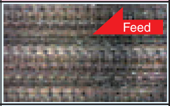
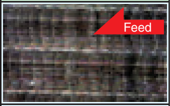
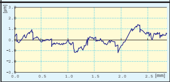
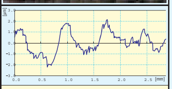


Material：S50C　Tool dia.：φ16×2N

- ◦ V_c=603.2m/min (n=12,000min^{-1})
- ◦ f_z=0.2mm/t (V_f=4,800mm/min)
- ◦ a_p=1.5mm, a_e=0.12mm

Down cut, Overhung length：ℓ=60mm, Air blow

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

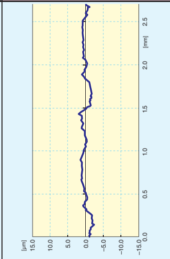
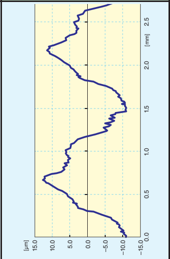
QM Max　MQT type achived good surface roughness and low cusp height even if ap=1.5mm.Frank wear also small.

Material：S50C　Tool dia.：φ16×2N

Cutting conditions：
- ◦ V_c=603.2m/min (n=12,000min^{-1})
- ◦ f=0.4mm/rev (V_f=4,800mm/min)
- ◦ a_p=1.5mm×27pass (Effective), a_e=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：
- ◦ V_c=603.2m/min (n=12,000min^{-1})
- ◦ f=0.4mm/rev (V_f=4,800mm/min)
- ◦ a_p=1.5mm, a_e=0.12mm

Down cut, Overhung length：ℓ=60mm

QM MAX

MQT TYPE

MQT TYPE

Modular head MQT type

Through coolant hole

Fig.1

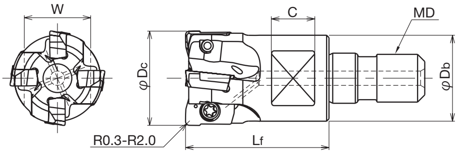
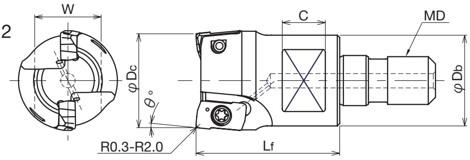
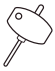


Fig.2



Inclined angle θ°	Cat No.	Stock	No. of inserts	Dimensions (mm)						Applicable Inserts	Parts		Fig.
				φDc	Lf	φDb	MD	C	W		Clamp Screw 	Wrench 	
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.

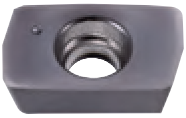
Clamp Screw	Recommended Torque (N•m)
TSW-2556H	1.1
DSW-2563H	1.1

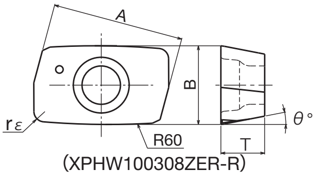
QM MAX **MQT** TYPE

MQT TYPE

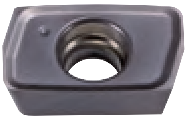
■ Inserts

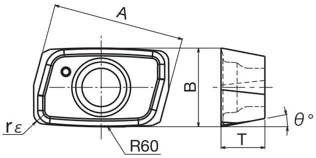
For tilted wall finishing
(XPHW100308ZER-R) (XPHT100308ZER-R)





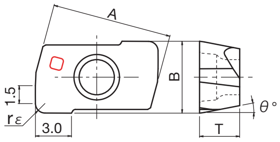
(XPHW100308ZER-R)



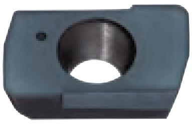


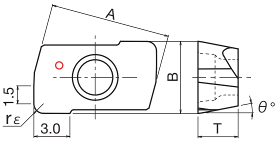
(XPHT100308ZER-R)

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

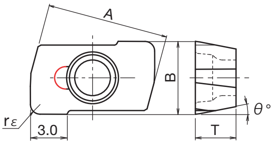


(YPHW100303ZER-15)



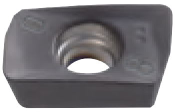


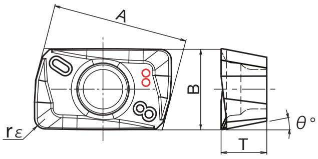
(YPHW100308ZER-15)



(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

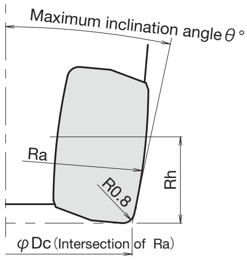
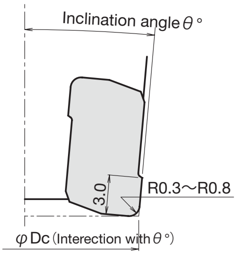


Fig.2 YPHW Type



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

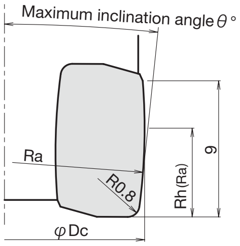
Fig.	Cat No.	Dc (mm)	Ra (mm)	Rh (mm)	Inclination angle
1	**MQT-2016A03-M8**	**φ15.5**	**R64.19**	**8.76**	**1°～6°**
1	**MQT-2016A05-M8**	**φ15.5**	**R64.34**	**10.98**	**3°～8°**
1	**MQT-2020A03-M10**	**φ19.5**	**R63.34**	**8.67**	**1°～6°**
1	**MQT-2020A05-M10**	**φ19.5**	**R63.46**	**10.85**	**3°～8°**

° 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	x 0.6	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**

Cusp height (μm)	ap(mm)
2.40	**1.1**
2.86	**1.2**
3.35	**1.3**
3.89	**1.4**
4.46	**1.5**

■ NOTE

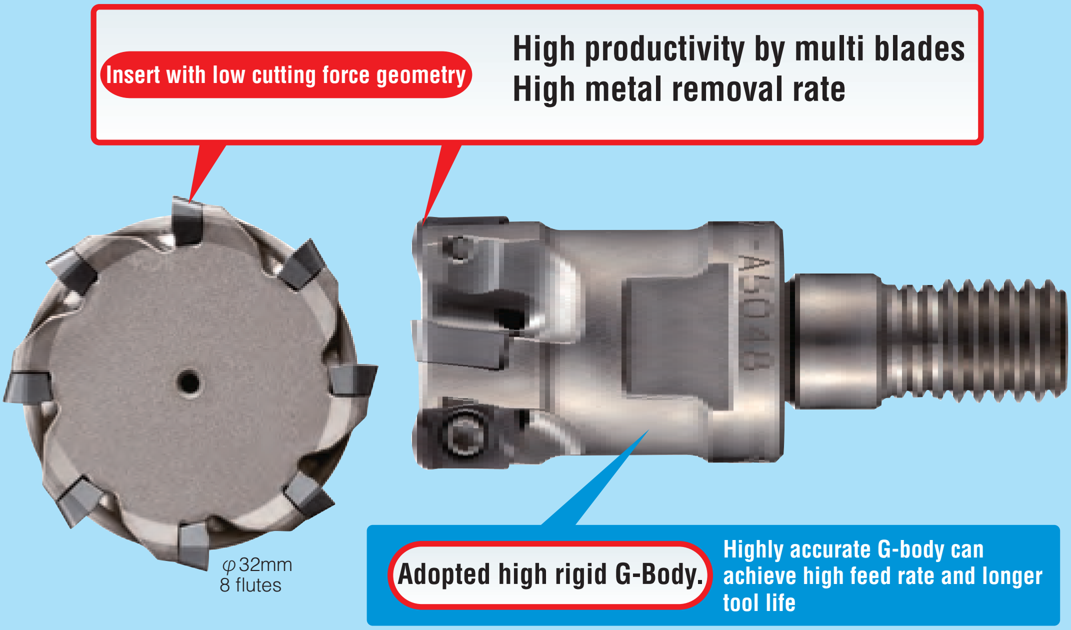
1) The figure to be adjusted according to the machine rigidity or work regidity.
2) In case of chatter occurring, recommend to reduce the depth of cut ap and Pick feed ae.
3) Use air blow.
4) In case carbon steel or die steel machining by CX75 inserts, reduce 80% above Vc, fz.

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 MPMTYPE

G-Body

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. 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

Adopted high rigid G-Body.

Highly accurate G-body can achieve high feed rate and longer tool life

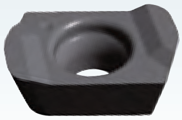
Insert variation

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

High feed insert

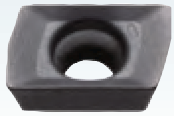
EOMT0602..ZER (R1.0,2.0)

High feed insert
for unfavourable condition



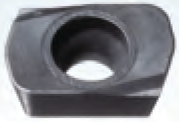
EOMW060210ZER

Shoulder milling insert
Deflection below 0.02mm



ZOMT0602…ZER
(R0.2,0.4,0.8)

For high hardened steel insert



EOHW060210ZTR

NEW "MIRROR INSERT" for finishing side & bottom face

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.

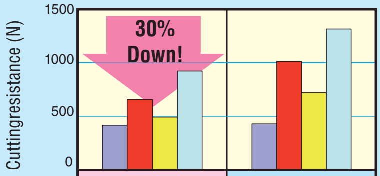
QM MILL MPM TYPE

Cutting performance of QM MILL against competitor

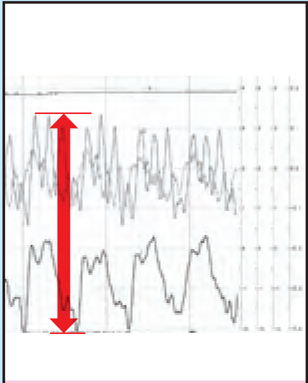
Cutting force comparison (f=5.2mm/rev)

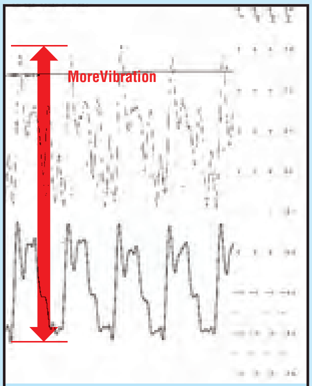
Material: S50C (C50, 1049)
Cutting conditions: Dc=16mm, Vc=120m/min, ap=0.3mm, ae=9mm, Down Cut

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

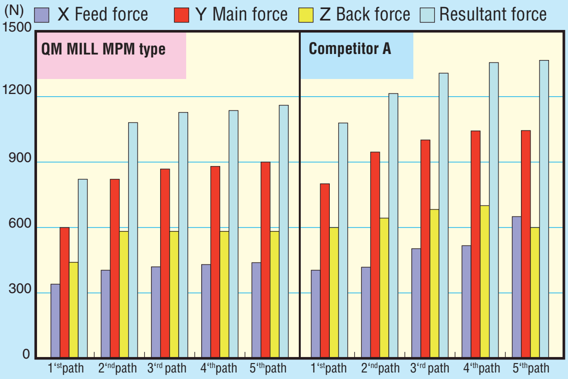


Competitor A
f=5.2mm/rev

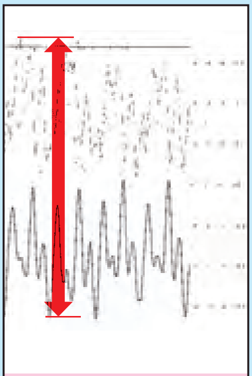
Cutting force comparison (f=4.0mm/rev)

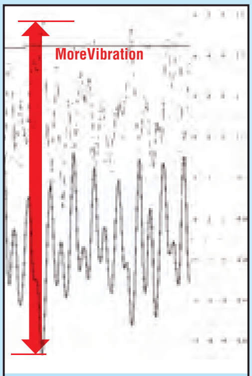
Material: S50C (C50,1049)
Cutting conditions: Dc=16mm,Vc=120m/min, ap=0.3mm, ae=9mm, Down Cut

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					

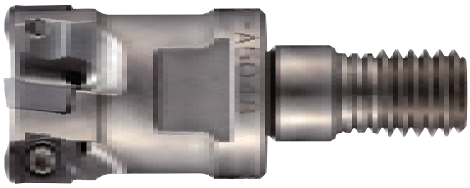
Chips by QM MILL show smooth cut and less heat generation.

QM MILL MPMTYPE

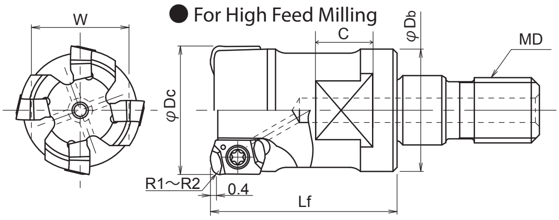
G-Body

Through Coolant Hole

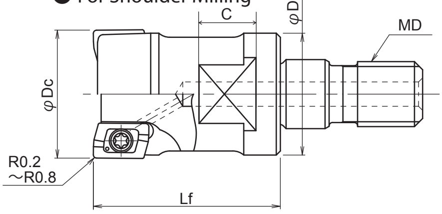
JCTMA 2008-005 ECO PRODUCT ★★★ | Face Milling | Pocket Milling | Shoulder Milling | Slotting | Copy Milling | Helical Interpolation



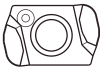
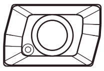
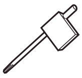
● For High Feed Milling



● For Shoulder Milling



BODY

Cat. No.	Stock	No. of flutes	Dimensions(mm)						Inserts	Parts	
			φDc	Lfφ	Db	MD	C	W	 	Clamp Screw 	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 MPMTYPE

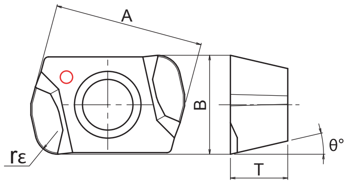
MPM / PME TYPE

■ INSERTS

High feed insert

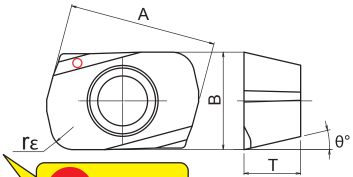
Grade (JC7560)

Cutting condition B092~B094



High hardened steel

Cutting condition B095~B096

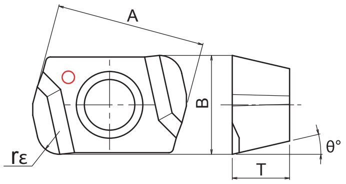


NEW R2 type

High feed insert for unfavourable condition

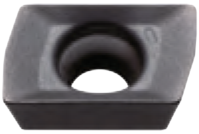
Grade (JC7560)

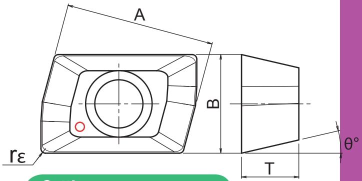
Cutting condition B092~B094



Shoulder milling insert

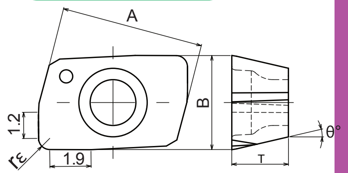
Cutting condition B097~B099





NEW **"MIRROR INSERT" for finishing side & bottom face**

Cutting condition B101~B106



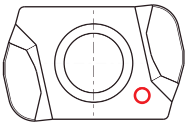
Type	Cat. No.	Tole-rance	PVD coated						Dimensions (mm)				
			JC5118	JC8015	DH102	JC7560	JC8050	JC8118	A	T	B	r ε	θ °
High feed insert	EOMT060210ZER	M	○			●	●	●	6.5	2.5	4.3	1.0	13°
	EOMT060220ZER	M	○				●	●	6.5	2.5	4.3	2.0	13°
High feed insert for unfavourable condition	EOMW060210ZER	M	○			●	●	●	6.5	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.

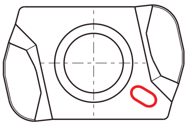
Identification of grade for QM MILL insert

Identification for the grades has been defined by different mark.

JC5118



JC8050 / JC7560



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

QM MILL MPMTYPE

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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, 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　MPMTYPE

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)	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)
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, 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 (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)	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)
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, 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 MPMTYPE

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)	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)	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	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, 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 MPMTYPE

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)	a_p (mm)	$a_p \times a_e$ (mm²)	n (min⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm²)	n (min⁻¹)	V_f (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm²)	n (min⁻¹)	V_f (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, 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 MPMTYPE

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)	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)	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, 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 MPMTYPE

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)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	V_f (mm/min)	ℓℓ (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	~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

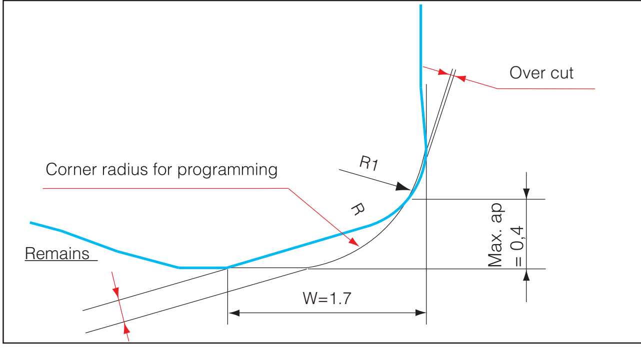
ℓ : Overhung length, a_p: Axial depth of cut, a_e: Radial depth of cut, n: Spindle speed, V_f: Feed speed

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

Definition of corner radius for programming



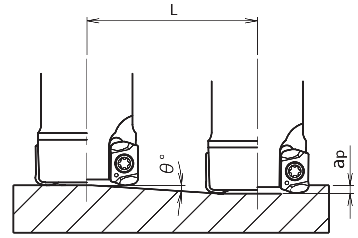
(mm)

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

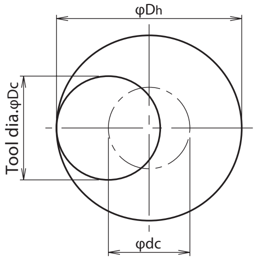
Note) In case of setting corner radius for programming to R2, recommend to use EOMT060220ZER or EOHW060220ZTR.

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

MPMTYPE

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)	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)
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, 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 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 MPMTYPE

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)	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)
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, 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 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 MPMTYPE

■ 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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, 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 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 MPMTYPE

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)	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)
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, 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 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

MPMTYPE

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)	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)
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, 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 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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, a_p : Axial depth of cut, a_e : Radial depth of cut, n : Spindle speed, V_f : Feed speed

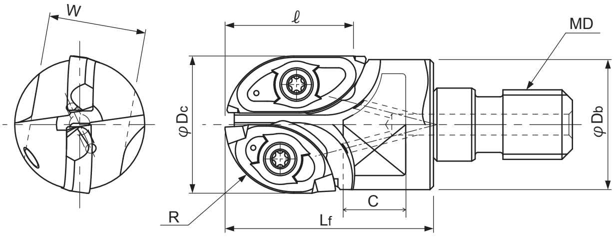
■ NOTE

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 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

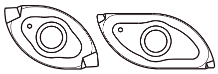
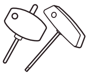
G-Body **Through Coolant Hole**

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



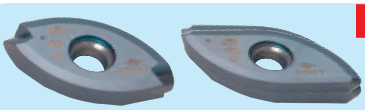
BODY

Arbor B193

Cat. No.	Stock	No. of flutes	Dimensions (mm)								Inserts	Parts	
			R	φDc	ℓ	Lf	φDb	MD	C	W		Clamp Screw	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

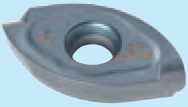
Note) 1. Please refer page B105-B106 for recommended cutting conditions
2. All cutters are supplied without inserts.
3. Please refer page B009 for recommended tightening torque.

Inserts series expansion.



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

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

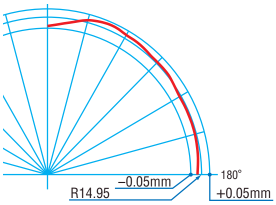


② Insert for semi-finishing (main blade -H type)

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.

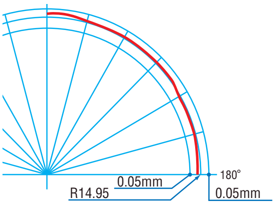
Insert comparison

SWB-HM type for Regular purpose insert



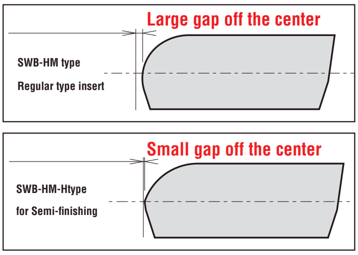
R min. 14.906
R max. 14.981

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)

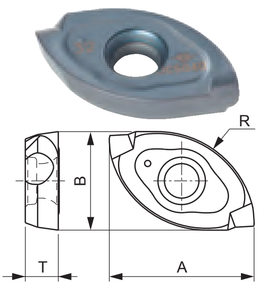


Fig. 2 (Sub blade)

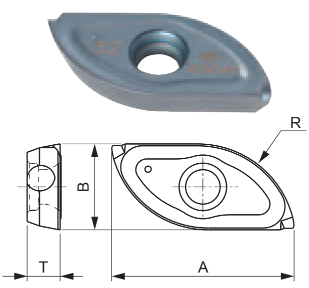


Fig. 3 (Main blade for welded & hardened steel)

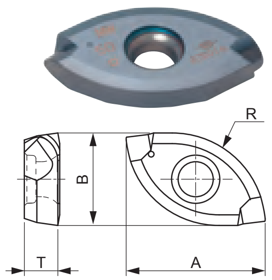
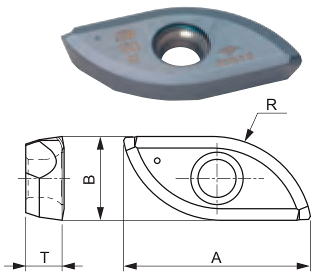


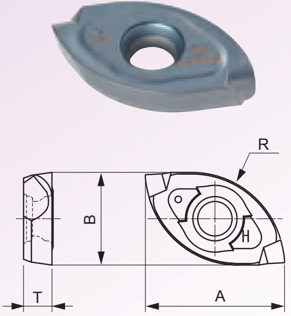
Fig. 4 (Sub blade for welded &hardened steel)



■ 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)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, a_p: Depth of cut, a_e: Pick feed, 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 feed speed.
3) In case of short overhung length, a_p Xa_e = maximum 3mm can be applied except hardened steel. But please adjust V_f according to machine and work rigidity.

Swing Ball MSW TYPE

■ RECOMMENDED CUTTING CONDITIONS

● MSW type ＋ MSN Carbide Shank Holder

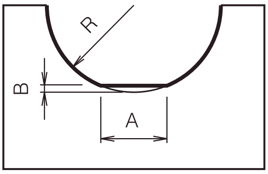
Work Materials	Insert Grades	Tool dia. (mm)														
		20					25					30/32				
		No. of teeth 2N					No. of teeth 2N					No. of teeth 2N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
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, a_p: Depth of cut, a_e: Pick feed, 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 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

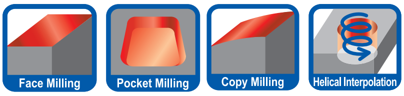
Adopted double clamping mechanism for more rigidity.

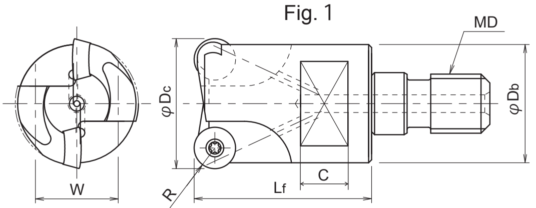
Positive axial rake

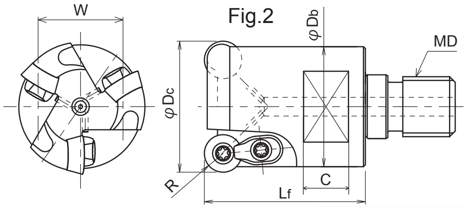
- R3.5 & R5 inserts→ A.R.; +6°
- R6 & R8 inserts→A.R.; +8°

⇒Reduced cutting forces by 21% than conventional Diemaster.

G-Body **Standard Type** **Through Coolant Hole**

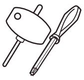






■ BODY

Arbor B193

Cat. No.	Stock	No. of flutes	Dimensions (mm)							Inserts	Parts			Fig.
			φDc	R	Lfφ	Db	MD	C	W		Clamp Screw	Clamp Set	Wrench	
														
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”

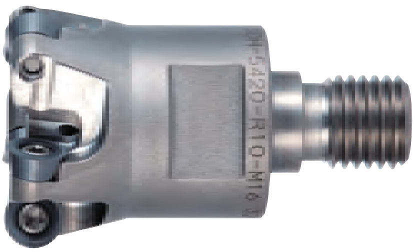
Clamp Screw	Recommended Torque (N•m)
TSW-2556H	0.9
CSW-408H	3.6
DSW-410H	3.6

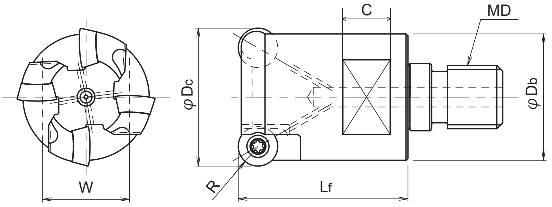
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

Super Diemaster SDH TYPE

G-Body **Fine pitch type** **Through Coolant Hole**

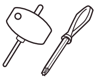
Face Milling Pocket Milling Copy Milling Helical Interpolation





BODY

Arbor B193

Cat. No.	Stock	No. of flutes	Dimensions (mm)							Inserts	Parts	
			φDc	R	Lfφ	Db	MD	C	W		Clamp Screw	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.

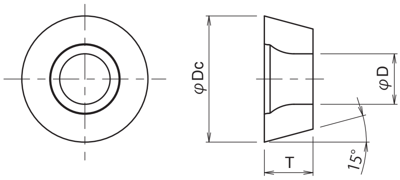
Clamp Screw	Recommended Torque (N•m)
TSW-2556H	0.9
CSW-408H	3.6
DSW-410H	3.6

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

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

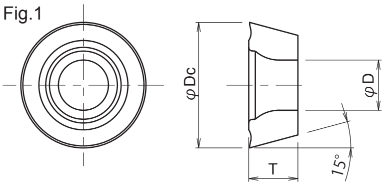
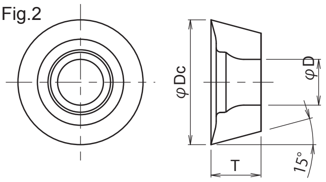


Fig.2



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	○	○	●	◎	10	4.1	4.4	1
RDMT1004MOE-ML	M			●					2
RDMT1004MOT	M	○	○	●	◎				1
RDMT1204MOE	M	○	○	●	◎	12	4.8	4.4	1
RDMT1204MOE-ML	M			●					2
RDMT1204MOT	M	○	○	●	◎				1

10 Inserts per case.

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

Super Diemaster SDHTYPE

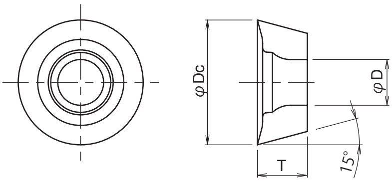
INSERTS

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

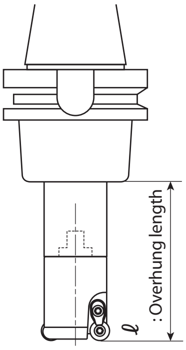
Work Materials	Insert Grades	Tool dia. (Insert size)							
		15/16 R3.5				20/22 R3.5			
		No. of teeth 2N				No. of teeth 2N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	70	1.4	3,500	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, 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

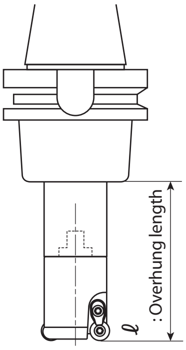
Work Materials	Insert Grades	Tool dia. (Insert size)							
		20/22 R3.5				25/28 R5			
		No. of teeth 3N				No. of teeth 2N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	70	1.2	3,500	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, 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

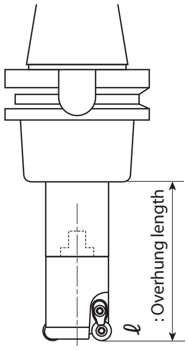
Work Materials	Insert Grades	Tool dia. (Insert size)							
		25 R3.5 /25 R5 /28 R5				30 R5 /32 R6 /35 R5			
		No. of teeth 3N				No. of teeth 2N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 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

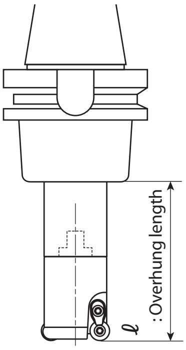
Work Materials	Insert Grades	Tool dia. (Insert size)							
		32/35 R5				30 R5 /35 R6			
		No. of teeth 3N				No. of teeth 3N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	100	2.5	2,000	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, 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.



RECOMMENDED CUTTING CONDITIONS

● SDH type ＋ MSN Carbide Shank Holder

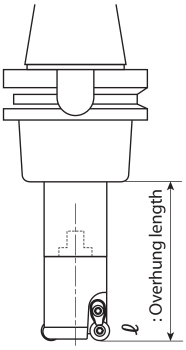
Work Materials	Insert Grades	Tool dia. (Insert size)							
		30/32/35 R5				40 R6			
		No. of teeth 4N				No. of teeth 2N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	100	2	2,100	2,500	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, 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

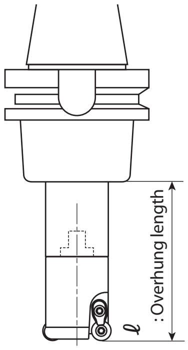
Work Materials	Insert Grades	Tool dia. (Insert size)							
		40 R6				42 R5			
		No. of teeth 4N				No. of teeth 5N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118 JC8118	100	2	1,900	2,300	100	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, 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

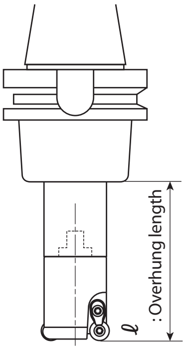
Work Materials	Insert Grades	Tool dia. (Insert size)							
		20/22 R3.5				25 R3.5 /25 R5 /28 R5			
		No. of teeth 3N				No. of teeth 3N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 Recommended to use without chipbreaker	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, 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

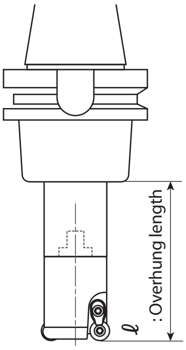
Work Materials	Insert Grades	Tool dia. (Insert size)							
		30 R5 /35 R6				30/32/35 R5			
		No. of teeth 3N				No. of teeth 4N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 Recommended to use without chipbreaker	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 SDHTYPE

RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● SDH type ＋ MSN Carbide Shank Holder

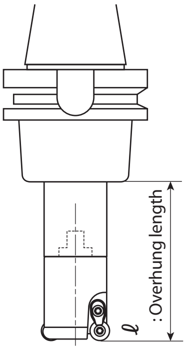
Work Materials	Insert Grades	Tool dia. (Insert size)							
		40 R6				42 R5			
		No. of teeth 4N				No. of teeth 5N			
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 Recommended to use without chipbreaker	100	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

ISO	P					M					K				N				S				H		
	P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30	N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20
Application Range															FZ05	FZ05	FZ05								
			JC5040	JC5040	JC5040		JC8118	JC8118	JC8118	JC8118										JC8118	JC8118	JC8118			
		JC5118	JC5118	JC5118	JC5118		JC5118	JC5118	JC5118	JC5118										JC5118	JC5118	JC5118		JC5118	JC5118
		JC8118	JC8118	JC8118	JC8118																		DH103	DH103	
		JC8015	JC8015	JC8015			JC8015	JC8015	JC8015			JC8015	JC8015	JC8015						JC8015	JC8015			JC8015	JC8015
									JC8050	JC8050											JC8050	JC8050			

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												◎

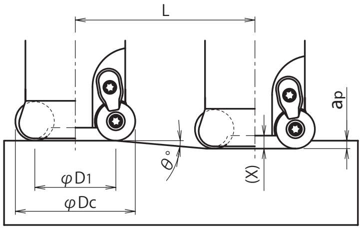
•RDMW type: without chipbreaker •RD○T type: with chipbreaker

◎~First choice, Good condition ○~Moderate condition ●~Unfavorable condition ☆~Light cutting

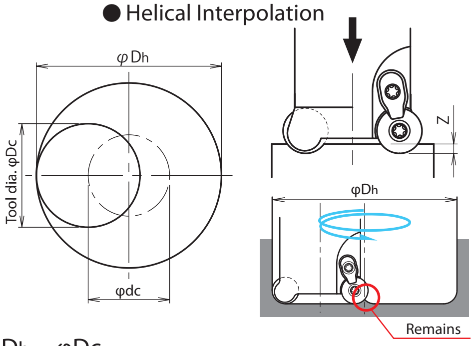
Super Diemaster SDHTYPE

Instructions for profile milling

● Ramping



● Helical Interpolation



● Calculation of tool pass dia. $\underset{\text{Tool pass dia.}}{\varphi dc} = \underset{\text{Bore dia.}}{\varphi Dh} - \underset{\text{Tool dia.}}{\varphi Dc}$

● 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

JCTMA 2009-005 ECO PRODUCT ★★★

Face Milling

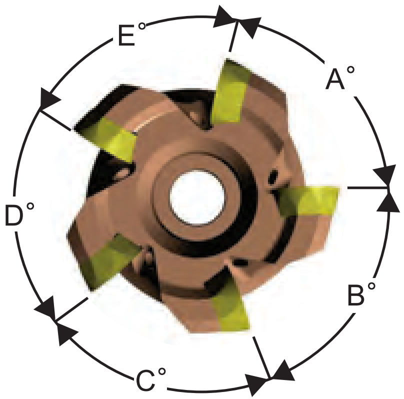
Copy Milling

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).

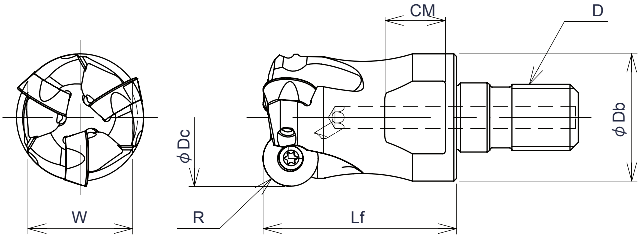
Insert shape of TDM / MTD small diameter type

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

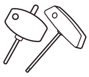
Blade-Chipper **MTD**TYPE

MTD TYPE

Modualar head MTD type



Arbor B193

Cat. No.	Stock	No. of flutes	Dimensions (mm)							Inserts	Parts	
			φD_c	R	L_f	φD_b	MD	C	W		Clamp Screw 	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

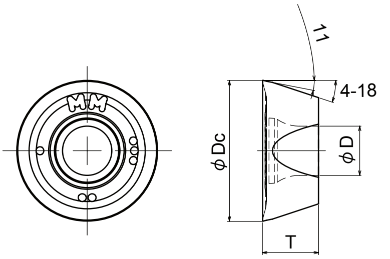
Blade-Chipper MTD TYPE

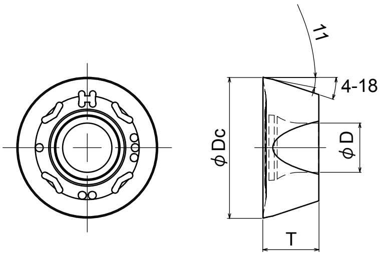
MTD TYPE

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.

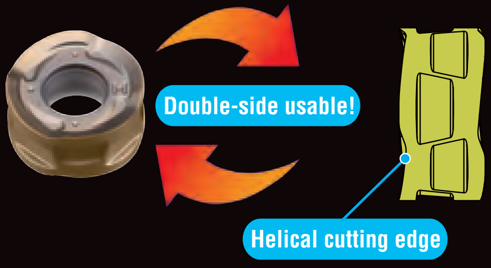
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

EXTREME DIEMASTER MTX TYPE

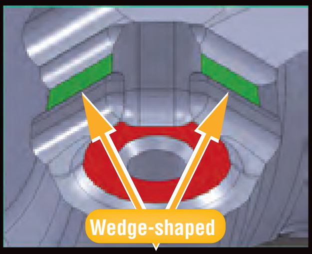
Features

”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”.

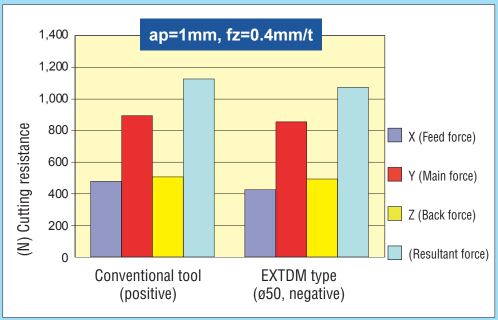
- Insert are arranged in an **irregular pitch** (except for 3 tooth type). Prevents chattering & vibration.

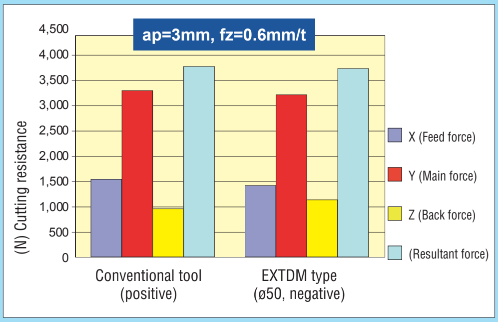
Cutting performance

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)

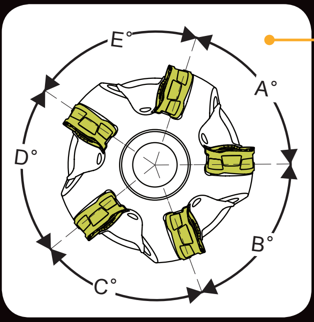
Cutting force of EXTDM is almost the same as the conventional positive cutter.



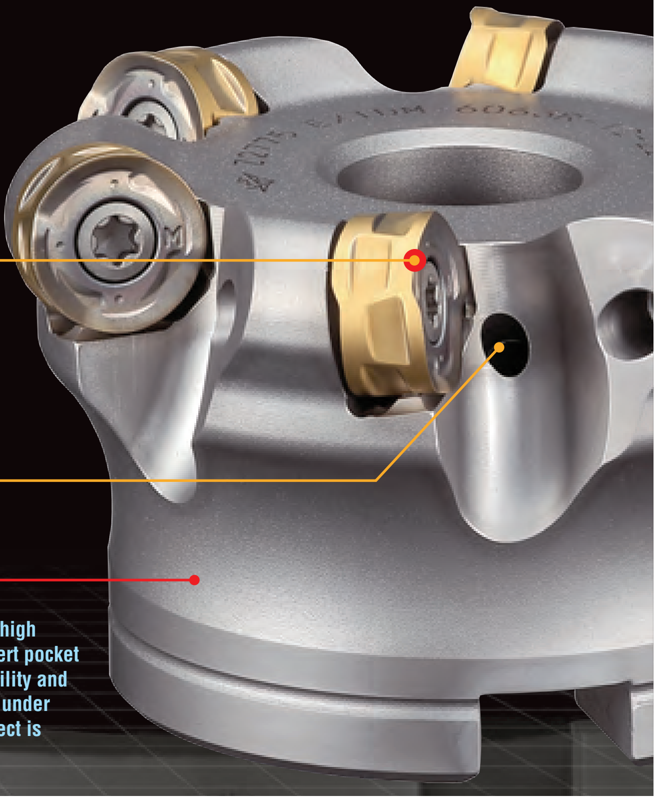


EXTREME DIEMASTER MTXTYPE

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

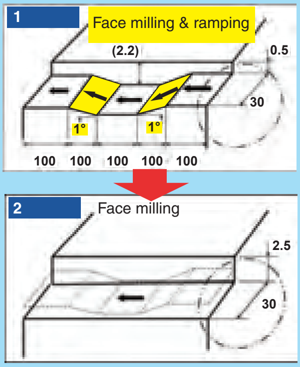
G-Body

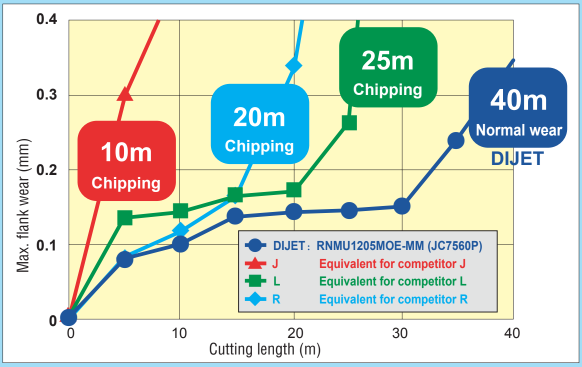
Adopted GN surface-hardening treatment on thermal resistant high strength steel gives high hardness over 65HRC and secure insert pocket and holder against thermal deformation, improved body durability and tool life by 30% or more. Make it difficult to be damaged even under severe cutting conditions.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



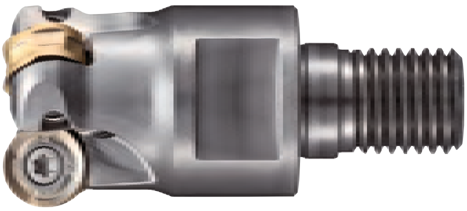


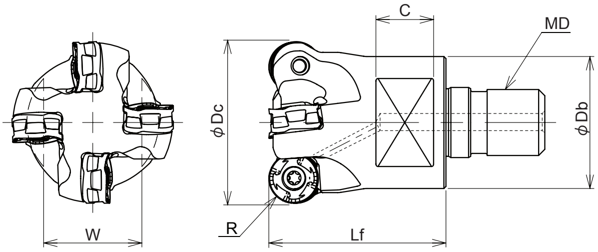
EXTREME DIEMASTER MTXTYPE

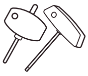
MTX TYPE

■ Modular head MTX type

G-Body





Cat. No.	Stock	No. of inserts	Dimensions (mm)							Applicable inserts	Parts	
			φDc	R	Lf	φDb	MD	C	W		Clamp Screw	Wrench
												
MTX-3032-12-M16	●	3	32	6	43	28	M16	12	22	RNMU1205MOE-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

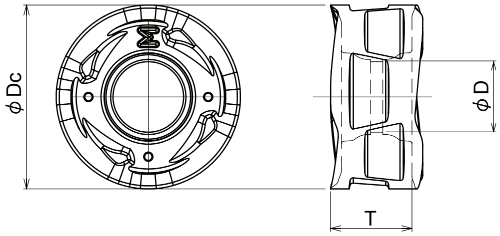
Clamp Screw	Recommended Torque (N•m)
TSW-410H	3,5

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

EXTREME DIEMASTER

MTXTYPE

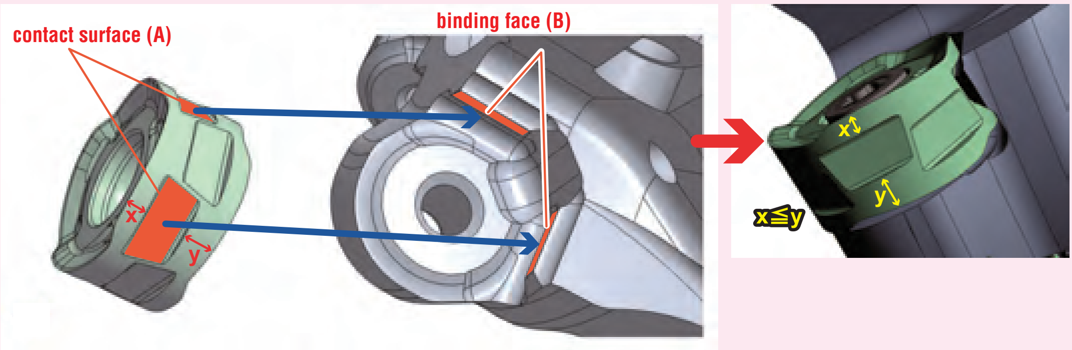
■ Inserts



Cat. No.	Tolerance	Total of corners (double-side)	PVD coated	Dimensions (mm)		
			NEW JC7560P	φDc	T	φD
RNMU1205MOE-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

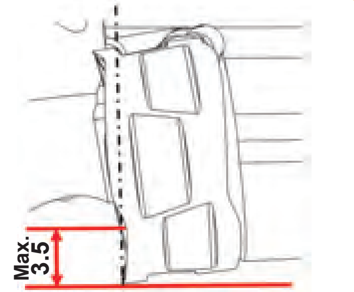
ℓ : Overhung length, ap: Depth of cut, Vc:cutting speed,
n: Spindle speed, Vf: Feed speed, fz: feed per tooth

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.

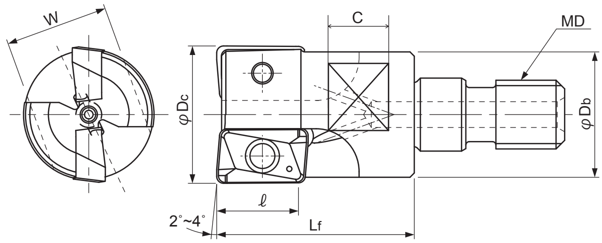


Tool dia. (mm)	Max. ramping angle
32	0.7°
40	0.8°
50	1°
52	1°
63	0.8°
66	0.8°

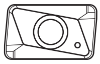
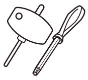
Side Chipper MICTYPE

Through Coolant Hole

Face Milling Shoulder Milling Slotting



BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm)							Inserts	Parts	
			φDc	ℓ	Lf	φDb	MD	C	W		Clamp Screw 	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

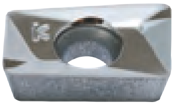
● Standard stock items □: Stock in Japan ○: Soon to be deleted

Side Chipper MICTYPE

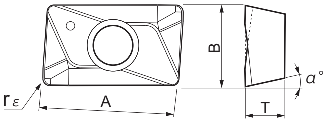
INSERTS

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.

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

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 MICTYPE

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)	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) 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, a_p: 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 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)	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	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, a_p: 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 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

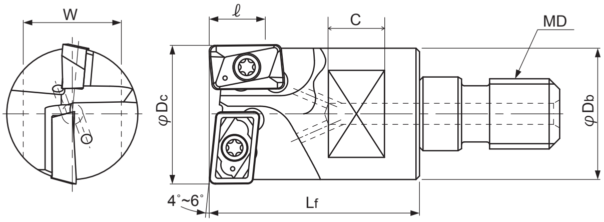
NOTE

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.

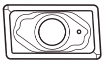
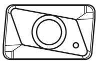
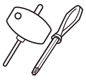
Super End Chipper MECTYPE

Through Coolant Hole

Shoulder Milling · Slotting · Pocket Milling · Copy Milling · Helical Interpolation · Spot Facing



BODY

Cat. No.	Stock	No. of flutes	Dimensions(mm)							Inserts	Parts	
			φD_c	ℓ	L_f	φD_b	MD	C	W		Clamp screw	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

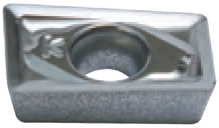
Super End Chipper MECTYPE

INSERTS

Z◯MT-Ltype

Central Insert

Z◯MT-LPtype

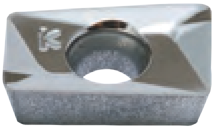


Central Insert (Polished)

Z◯MT-Rtype

Peripheral Insert

Z◯MT-RPtype



Peripheral Insert (Polished)

Fig.1 Central Insert

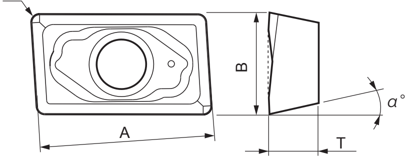
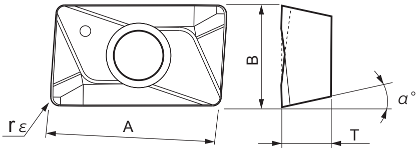


Fig.2 Peripheral Insert



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.

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

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 MECTYPE

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

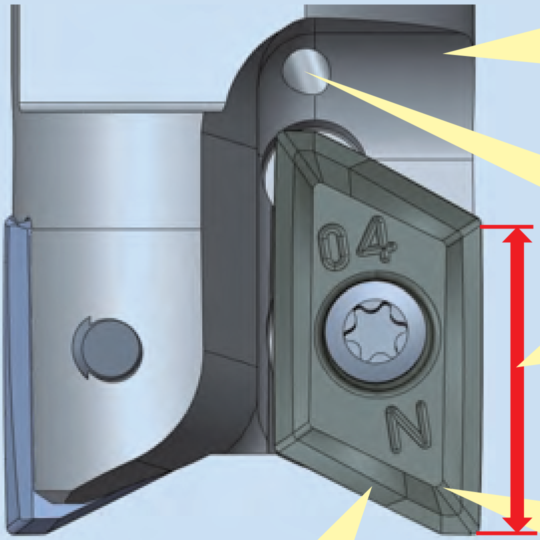
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of ramping, ramping angle up to 3% is recommended.
4) In case of full slotting, recommend to reduce spindle speed and feed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

Aero Chipper **MAL**TYPE

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

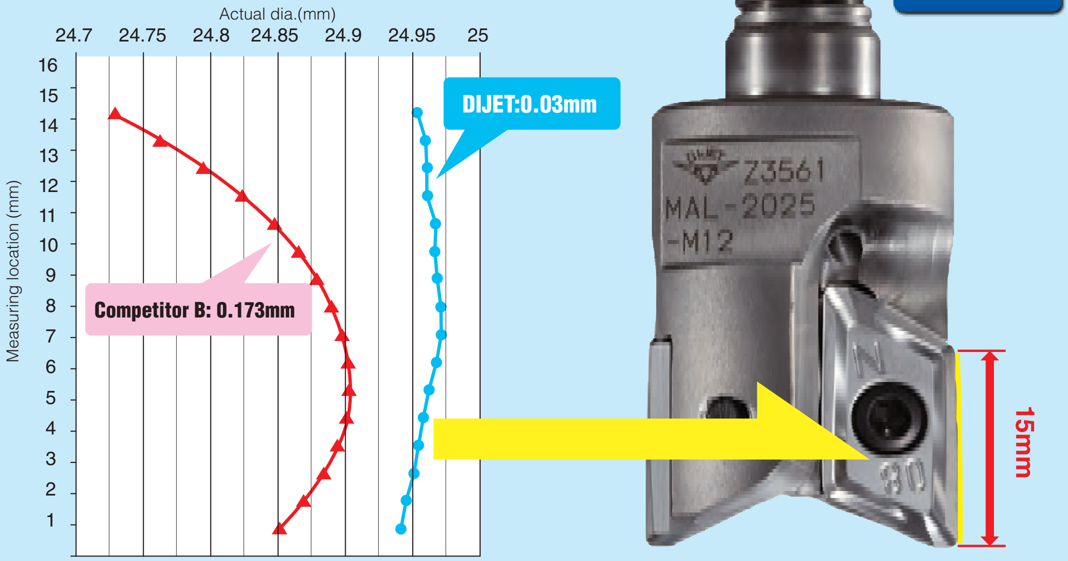
■ CUTTING PERFORMANCE of DIJET against competitor

Aerospace Tooling G-Body

Accuracy on cutting edge

HighPrecision

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

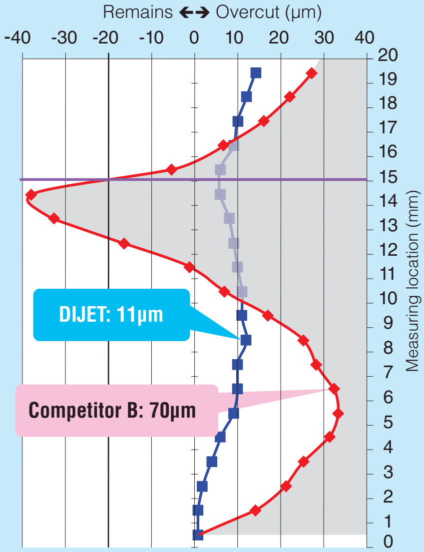


AERO CHIPPER showed much precise dimensions on insert than competitor B'sinsert.
Accuracy on cutting edge DIJET: 0.03mm, Competitor B: 0.173mm

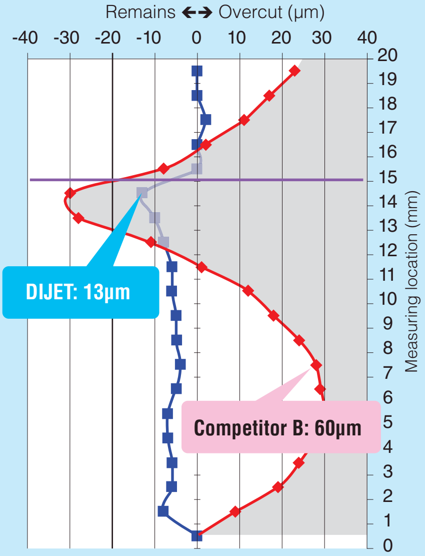
Machining accuracy

HighPrecision

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



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

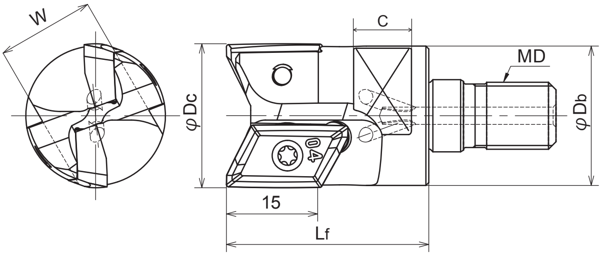


Tool dia.: φ25 (DIJET: Modular head MAL + MSN carbide shank holder)
Workmaterial: A5056 n=20,000 (min^{-1}), Vc=1,570 (m/min), ap=15 (mm) (2times), ae=3 (mm), Wet, Downcut

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

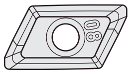
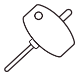
Aero Chipper MALTYPE

G-Body **Through Coolant Hole**



Arbor B193

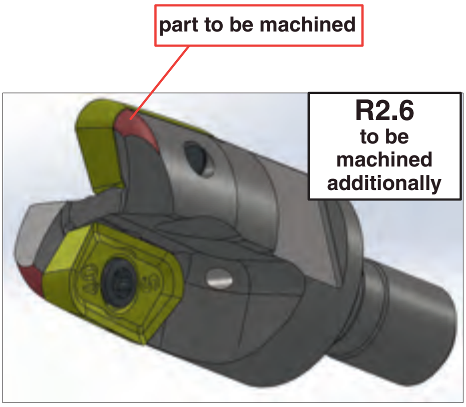
BODY

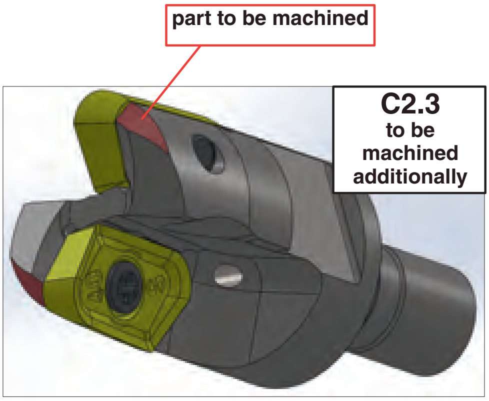
Cat. No.	Stock	No. of flutes	Dimensions (mm)						Max. spindle speed (min.$^{-1}$)	Inserts	Parts	
			φDc	Lf	φDb	MD	C	W			Clamp Screw 	Wrench 
MAL-1020-M10	●	1	**20**	35	19.5	M10	9	14	15,000	XOGT1605○○ PD○R	DSW-4075	A-15
MAL-2025-M12	●	2	**25**	35	24	M12	10	19	40,000		DSW-4085	
MAL-2028-M12	●	2	**28**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





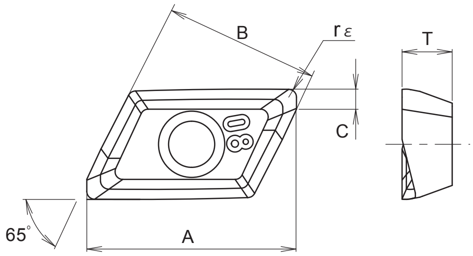
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

Aero Chipper MAL TYPE

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.

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

Aero Chipper

MAL TYPE

RECOMMENDED CUTTING CONDITIONS / WIDE SHOULDER MILLING

● MAL type ＋ MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		20					25					28				
		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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, a_p: Depth of cut, a_e: width 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 feed speed.

Aero Chipper MALTYPE

RECOMMENDED CUTTING CONDITIONS / NARROW SHOULDER MILLING

● MAL type ＋ MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		20					25					28				
		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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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)	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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (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, a_p: Depth of cut, a_e: width 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 feed speed.

Aero Chipper

MALTYPE

RECOMMENDED CUTTING CONDITIONS / SLOTTING

● MAL type ＋ MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)											
		20				25				28			
		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)
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)	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)
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, a_p: Depth of cut, a_e: width of cut, n: Spindle speed, V_f: Feed speed

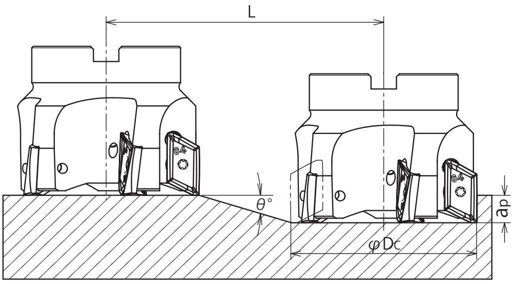
NOTE

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 feed speed.

Aero Chipper MAL TYPE

INSTRUCTIONS FOR PROFILE MILLING

Ramping

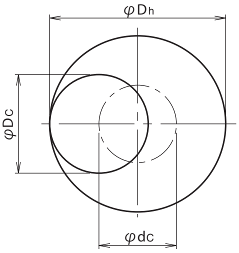


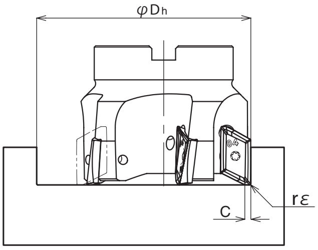
Tooldia. (mm)	Aluminium alloy		Stainless steel		Titanium alloy		Max. depth of cut (mm)
	Max. ramping angle(°)	Total cutting length(mm)	Max. ramping angle(°)	Total cutting length(mm)	Max. ramping angle(°)	Total cutting length(mm)	
φDc	θ°	L	θ°	L	θ°	L	ap
20	16	28	10	45	10	45	8
25	11 9	41	9	51	9	51	8
28		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.

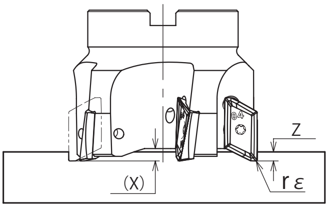
- Max. bore dia.
  φDh (φDc−rε −0.3)×2
- Min.boredia.
  φDh (φDc−C 0.3)×2
- Depth of cut per one circuit should not exceed max. depth of cut ap
- Down cutting isrecommended, so tool pass rotation should be counterclockwise.

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

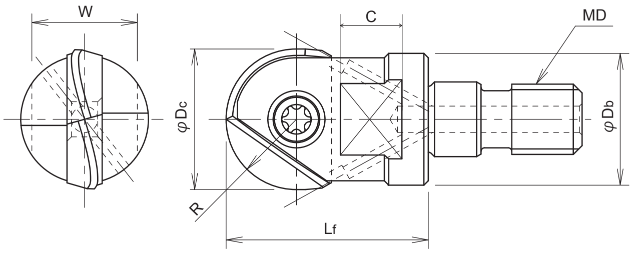
1) Do not continue ramping after drilling.
2) In case of drilling, apply 50% or less Zaxis feed speed from standard cutting condition table.
3) Long consecutive chips may come out in case of drilling, confirm the safe condition sufficiently.

Mirror Ball MBXTYPE

Through Coolant Hole

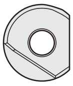
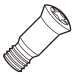
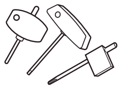
Accuracy of MBX type modul ar head mounted on MSN carbide shank holder:
O.D. run out below 15μm (Target below 10μm)

Copy Milling
Pocket Milling
Slotting



BODY

Arbor B193

Cat. No.	Stock	Dimensions (mm)							Inserts	Parts	
										Clamp Screw	Wrench
		R	φD_c	L_f	φD_b	MD	C	W			
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

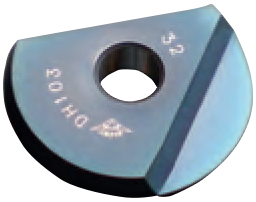
Note) 1. Please refer page B157-B162 for recommended cutting conditions.
2. All cutters are supplied without inserts and wrench.
3. Please refer page B009 for recommended tightening torque.

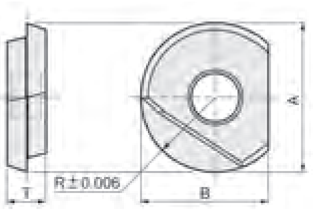
Clamp Screw	Recommended Torque (N•m)
FSW-3007H	1.2
FSW-3509H	2.0
FSW-4013H	3.0
FSW-5016H	4.0
FSW-6020	5.0
FSW-8025	6.0

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

Mirror Ball 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.

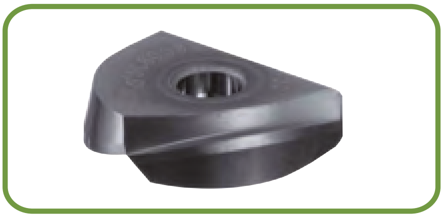
Dimensions (mm) φDc	Recommended Torque N· m
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

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

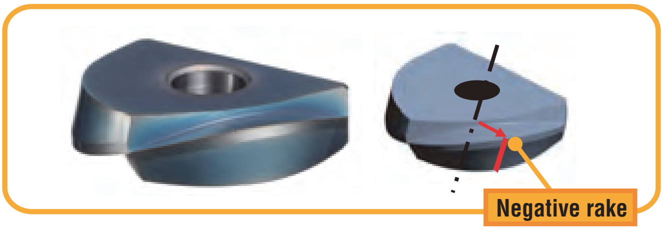
Mirror Ball MBXTYPE

■ INSERT (S type, TG type) Mirror S

BNM-S: Standard type



BNM-TG: Stronger cutting edge type



BNM-SS Type

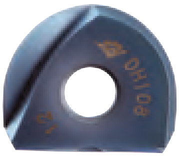
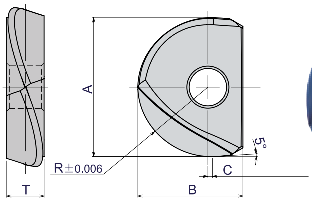


Fig. 1 Below R8
(Tool dia. Below 16mm)



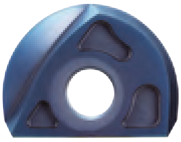
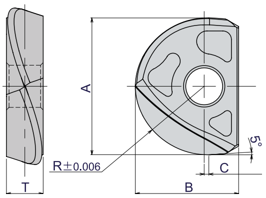


Fig. 2 Above R10
(Tool dia. Above 20mm)



Radius form accuracy of inserts: within ±0.006mm

Cat. No.	PVD coated	Dimensions (mm)					Fig.
	NEW **DH108** (Z10)	R	A	B	C	T	
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	Dimensions (mm)				
	DH102 (Z01)	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.

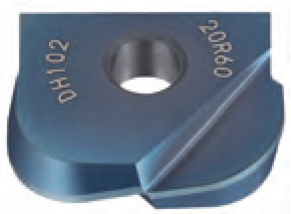
Note) "Mirror S, Mirror TG" inserts are exclusive use of MIRROR BALL.
Please use only in MIRROR BALL body and modular head.

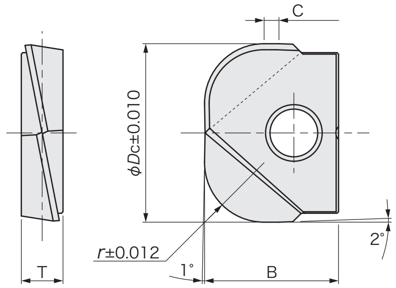
Please refer page B157 for "Instructions for mounting insert"

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

Mirror Ball MBXTYPE

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).

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

Mirror Ball **MBX**TYPE

RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● MBX type ＋ MSN Carbide Shank Holder

Work Materials	Insert Grades		Cutting speed V_c (m/min)	Tool dia. (mm)						Max. Depth of cut a_p (mm)	Max. Pick feed a_e (mm)
	BNM	BNM-S BNM-TG		10		12		16			
				n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (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, V_f: 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 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

MBXTYPE

RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● MBX type ＋ MSN Carbide Shank Holder

Work Materials	Insert Grades		Cutting speed V_c (m/min)	Tool dia. (mm)						Max. Depth of cut a_p (mm)	Max. Pick feed a_e (mm)
	BNM	BNM-S BNM-TG		20		25		30/32			
				n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (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, V_f: 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 MBXTYPE

RECOMMENDED CUTTING CONDITIONS

● MBX type ＋ MSN Carbide Shank Holder

Work Materials	Insert Grades		Cutting speed V_c (m/min)	Tool dia. (mm)						Max. Depth of cut a_p (mm)	Max. Pick feed a_e (mm)
	BNM	BNM-S BNM-TG		10		12		16			
				n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (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, V_f: 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 MBXTYPE

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)
	BNM	BNM-S BNM-TG		20		25		30/32			
				n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (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, V_f: 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 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 GRMTYPE

H.S.C. RECOMMENDED CUTTING CONDITIONS

MBX and MSN with GRM insert

Work Materials	Grades	Cutting speed Vc (m/min)	Tool dia. (mm)				Depth of cut a_p (mm)	Profile milling Max. Pick a_e (mm)	Face milling Pick a_e (mm)
			Ø16 x R5		Ø 25 x R6				
			n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)			
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)				Depth of cut a_p (mm)	Profile milling Max. Pick a_e (mm)	Face milling Pick a_e (mm)
			Ø256 x R8		Ø 30 x R10				
			n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)			
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, V_f: 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	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

RECOMMENDED CUTTING CONDITIONS

● MBX and MSN with GRM insert

Work Materials	Grades	Cutting speed Vc (m/min)	Tool dia. (mm)				Depth of cut ap (mm)	Profile milling Max. Pick ae (mm)	Face milling Pick ae (mm)
			Ø16 x R5		Ø 20 x R6				
			n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)			
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)				Depth of cut ap (mm)	Profile milling Max. Pick ae (mm)	Face milling Pick ae (mm)
			Ø25 x R8		Ø 30 x R10				
			n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)			
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

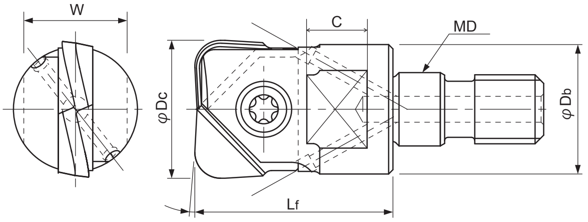
Through Coolant Hole

Copy Milling
Shoulder Milling
Face Milling
Pocket Milling
Helical Interpolation

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

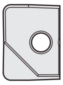
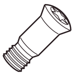
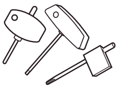
☆ **HRM type: O.D. run out: below 15μm (Target below 10μm)**
Corner radius accuracy: within ±0.015mm

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



Arbor B193

BODY

Cat. No.	Stock	Dimensions (mm)						Inserts	Parts	
		φD_c	L_f	φD_b	MD	C	W		Clamp screw	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

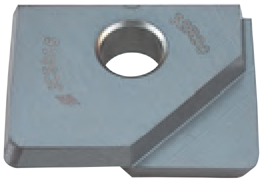
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

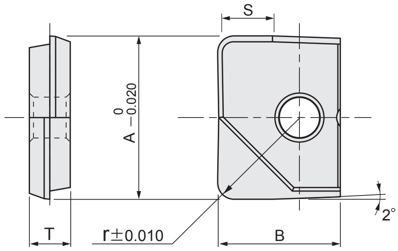
Mirror Radius

MRXTYPE

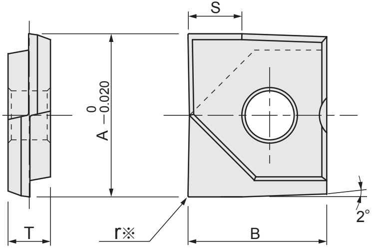
INSERTS

Radius form accuracy of insert:
within ±0.010mm





● RNM-□□□-R0



※Corner radius : below 0.1mm

Cat. No.	PVD coated		Dia-mond coated	Un-coated	Dimensions (mm)				
	JC8015 (Z10~20)	DH103 (Z05)	JC10000	KT9 (K10)	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	6.7	20	15	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				

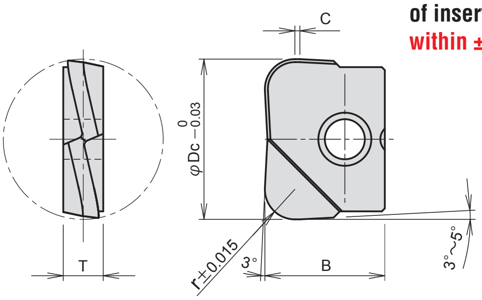
2 inserts per case, but JC10000: 1 piece per case.

Please refer page B167 for “Instructions for mounting insert”

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

Mirror Radius MRXTYPE

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.

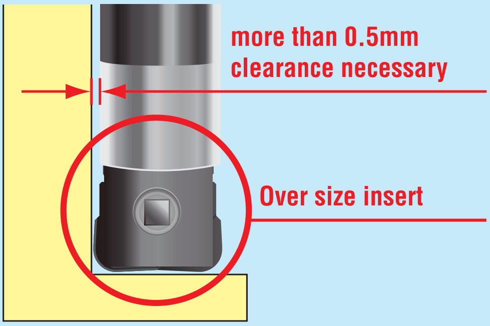
Note)“HRM“ insert is exclusive use of MIRROR RADIUS carbide shank body.
Please use only in MIRROR RADIUS carbide shank body and modular head.

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**

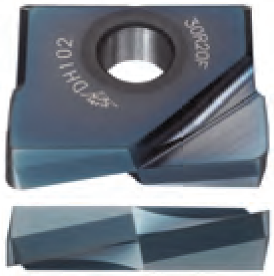


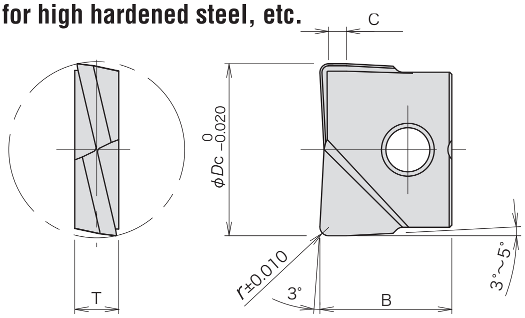
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

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

MRXTYPE

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})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (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, V_f: 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

MRXTYPE

■ 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})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (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 MRXTYPE

RECOMMENDED CUTTING CONDITIONS

● MRX type with RNM insert ＋ MSN Carbide Shank Holder

Work Materials	Insert Grades	Cutting speed V_c (m/min)	Tool dia. (mm)					
			10		12/13		16/17	
			n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (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, V_f: 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)					
			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	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	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 MRXTYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH FEED MACHINING

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

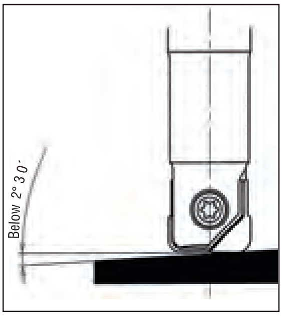
※Recommended to reduce depth of cut a_p by corner radius with keeping feed speed Vf. (Refer the below table)

Work Materials	Insert Grades	Tool dia. (mm)									
		φ10×R2/φ11×R2					φ12×R2/φ13×R2				
		ℓ (mm)	a_e (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_e (mm)	a_p (mm)	n (min^{-1})	V_f (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 a_p according to above table with keeping feed speed									

ℓ : Overhung length, a_p: Depth of cut, a_e: Pick feed, 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 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 a_p, n, V_f 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

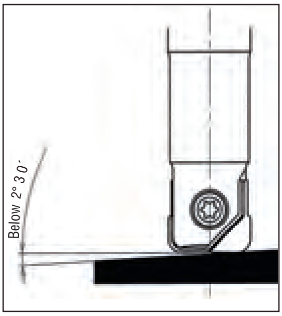
※Recommended to reduce depth of cut a_p by corner radius with keeping feed speed Vf. (Refer the below table)

Work Materials	Insert Grades	Tool dia. (mm)									
		φ16×R3/φ17×R3					φ20×R3/φ22×R3				
		ℓ (mm)	a_e (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_e (mm)	a_p (mm)	n (min^{-1})	V_f (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	R1	ap×0.50			Corner radius	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, a_p: Depth of cut, a_e: Pick feed, 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 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 a_p, n, V_f 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.

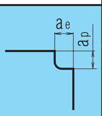
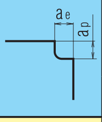
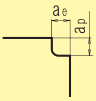
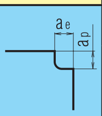
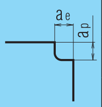
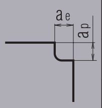
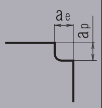
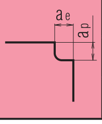
Recommend to use Torque control wrenches (Page C180)
Refer the right table for recommended tightening torque.

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

Mirror Radius MRXTYPE

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		φ12	
				n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (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

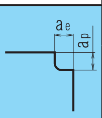
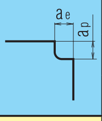
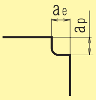
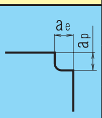
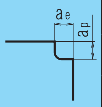
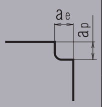
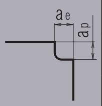
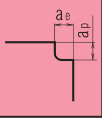
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung lengt hover 3 x Dc, cuting speed and feed speed to be reduced according to the right table.
4) Use air blow to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

Overhung length L/Dc	Vc (m/min)	V_f (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 MRXTYPE

■ 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		φ20	
				n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (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.

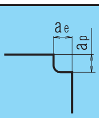
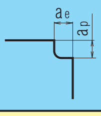
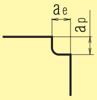
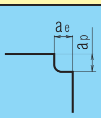
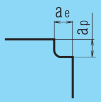
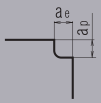
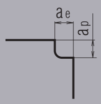
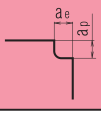
Overhung length L/Dc	Vc (m/min)	V_f (mm/min)
~3Dc 3D cor less	100%	100%
3Dc~5Dc Over 3Dc, up to 5Dc	70%	70%
5Dc~10Dc Over 5Dc, up to 10Dc	50%	50%

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		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		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

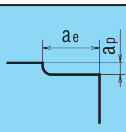
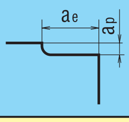
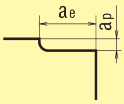
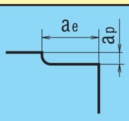
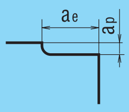
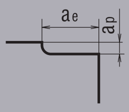
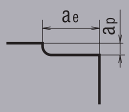
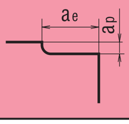
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung lengt hover 3 x Dc, cuting speed and feed speed to be reduced according to the right table.
4) Use air blow to 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})	V$_f$ (mm/min)	n (min^{-1})	V$_f$ (mm/min)	n (min^{-1})	V$_f$ (mm/min)	n (min^{-1})	V$_f$ (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
			a_p(mm)	0.15		0.20		0.20		0.20	
			a_e(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
			a_p(mm)	0.15		0.20		0.20		0.20	
			a_e(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
			a_p(mm)	0.15		0.20		0.20		0.20	
			a_e(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
			a_p(mm)	0.15		0.20		0.20		0.20	
			a_e(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
			a_p(mm)	0.15		0.20		0.20		0.20	
			a_e(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
			a_p(mm)	0.10		0.15		0.15		0.15	
			a_e(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
			a_p(mm)	0.10		0.15		0.15		0.15	
			a_e(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
			a_p(mm)	0.15		0.20		0.20		0.20	
			a_e(mm)	1.5		1.8		2.4		3.0	

a_p: Depth of cut, a_e: Pick feed, 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 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.

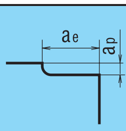
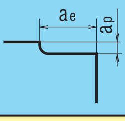
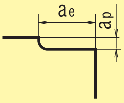
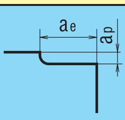
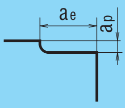
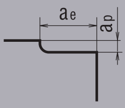
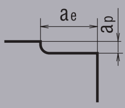
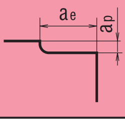
Overhung length L/Dc	Vc (m/min)	V$_f$ (mm/min)
~3Dc 3Dc or less	100%	100%
3Dc~5Dc Over 3Dc, up to 5Dc	70%	70%
5Dc~10Dc Over 5Dc, up to 10Dc	50%	50%

Mirror Radius

MRXTYPE

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})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (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, 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 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)	V_f (mm/min)
3Dc or less	100%	100%
Over 3Dc, up to 5Dc	70%	70%
Over 5Dc, up to 10Dc	50%	50%

Back & Forth Cutter

MPFTYPE

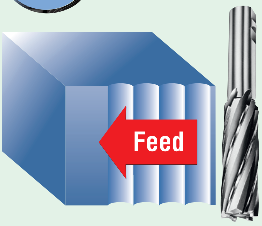
High speed up and down two way cutting can improve the efficiency and accuracy.

1 High speed & high accuracy can be achieved.

➡ Surface roughness and Parallelism/Perpendicularity: 0.01mm or less (feed & pick direction).

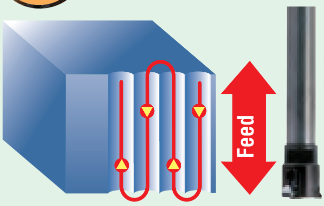
Improvement of machining method

Current method: by end mill



- ● Long machining time
- ● Deflection and waviness problem occurs.

Improved method: by up and down cutting motion



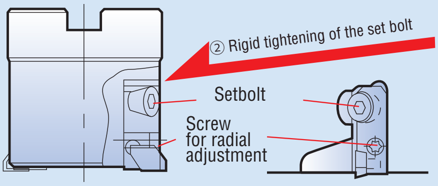
- ● Short machining time
- ● Excellent surface roughness
- ● Deflection & waviness areperfect.

Excellent verticalness and surface roughness

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.

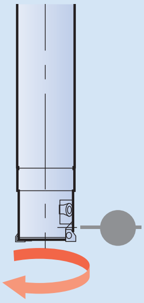
STEP2 On the machine

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.

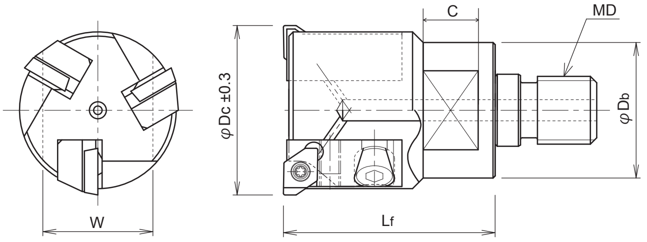
4 Consolidating of parts.

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

Reciprocating Milling

Up & Down Milling



Arbor B193

BODY

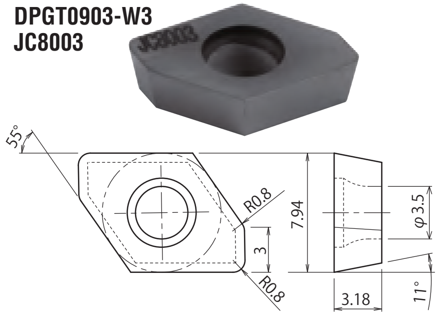
Cat. No.	Stock	No. of flutes	With/Without Coolant hole	Dimensions (mm)					
				φDc	Lf	φDb	MD	C	W
MPF-2030-M16	☐	2	--	**30**	50	28	M16	12.5	22
MPF-2033-M16	☐	2	--	**33**	50	32	M16	12.5	22
MPF-3040-M16	☐	3	●	**40**	50	32	M16	13	26

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.

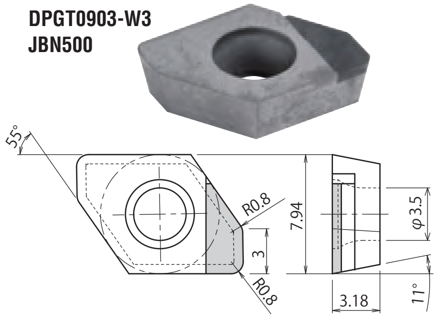
Clamp Screw	Recommended Torque (N•m)
DSW-307H	1.8

INSERTS

DPGT0903-W3
JC8003



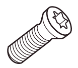
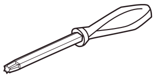
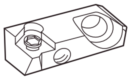
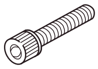
DPGT0903-W3
JBN500



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 MPFTYPE

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

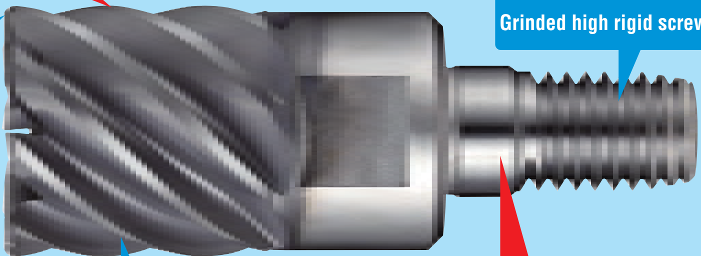
1) In case of chattering and rough surface roughness, recommended to reduce feed per tooth.
2) In case of using as face mill, recommend to reduce feed per tooth up to 0.05 mm.

S-Head SMSATYPE

- 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.

Excellent cutting by positive geometry

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.



Grinded high rigid screw (Patented)

Original radius shape

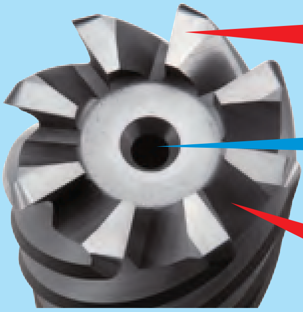
Adopted helical lead gash form R1 or more.
Radius form accuracy: Within ±0.02mm

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.

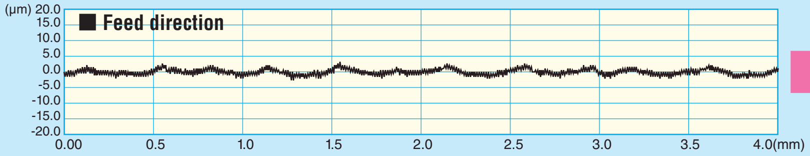
Excellent chip evacuation by wider end gash pocket

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

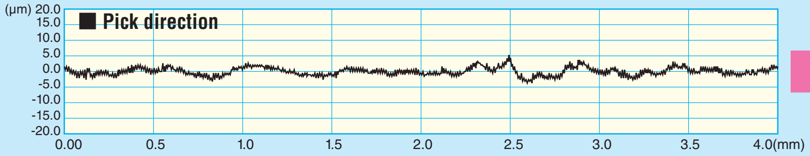
■ Cutting performance of S-HEAD

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



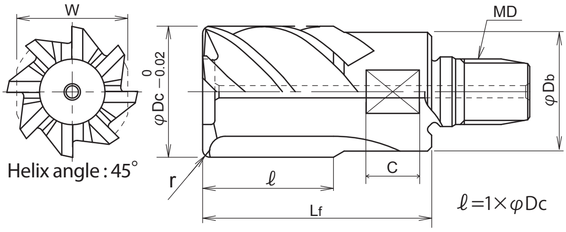
Ra:1.00μm
Rz:5.97μm

S-Head

SMSA TYPE

Through Coolant Hole

Face Milling Shoulder Milling Copy Milling



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							

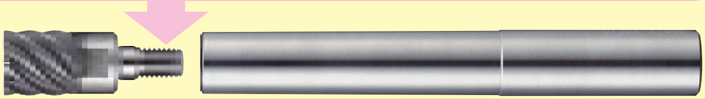
Note) Please refer page B180-B183 for recommended cutting conditions.

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.

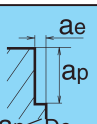
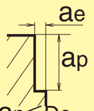
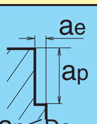
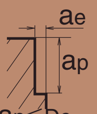
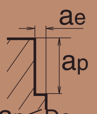
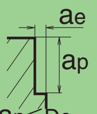
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

S-Head SMSATYPE

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})	V_f (mm/min)	ℓ (mm)	n (min^{-1})	V_f (mm/min)
Carbon & Alloy steel S50C, SCM440 (C50, 1.7223) Below 250HB	 ap≦Dc ae≦0.03Dc	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	 ap≦Dc ae≦0.03Dc	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	 ap≦Dc ae≦0.03Dc	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	 ap≦Dc ae≦0.03Dc	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	 ap≦Dc ae≦0.03Dc	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	 ap≦Dc ae≦0.03Dc	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, V_f: Feed speed

NOTE

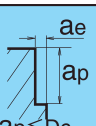
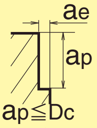
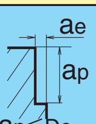
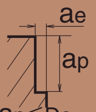
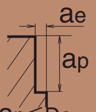
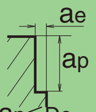
1) In case of side face finishing for improved productivity & efficiency, please increase ap and reduce ae. This will also help to reduce the heat generation.
2) In case of bottom face finishing for improved productivity & efficiency, recommended to use lower (shallow) depth of cut and increase feed 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})	V_f (mm/min)	ℓ (mm)	(min^{-1})	V_f (mm/min)
Carbon & Alloy steel S50C, SCM440 (C50, 1.7223) Below 250HB	 ap≦Dc ae≦0.03Dc	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	 ap≦Dc ae≦0.03Dc	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	 ap≦Dc ae≦0.03Dc	100	900	240	110	700	180
		150	800	180	160	600	130
		200	600	120	210	500	100
Heat resistant alloy Inco718 35-43HRC	 ap≦Dc ae≦0.03Dc	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	 ap≦Dc ae≦0.03Dc	100	900	240	110	700	180
		150	800	180	160	600	130
		200	600	120	210	500	100
Aluminium alloy A5052, A7075 50-110HB	 ap≦Dc ae≦0.03Dc	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, a_p: Depth of cut, a_e: width of cut, n: Spindle speed, V_f: Feed speed

NOTE

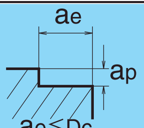
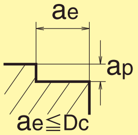
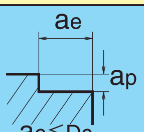
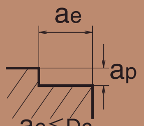
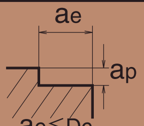
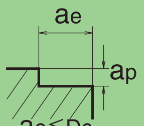
1) In case of side face finishing for improved productivity & efficiency, please increase a_p and reduce a_e. This will also help to reduce the heat generation.
2) In case of bottom face finishing for improved productivity & efficiency, recommended to use lower (shallow) depth of cut and increase feed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

S-Head SMSATYPE

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})	V_f (mm/min)	ℓ (mm)	n (min^{-1})	V_f (mm/min)
Carbon & Alloy steel S50C, SCM440 (C50, 1.7223) Below 250HB	 ae≦Dc ap≦0.03Dc	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	 ae≦Dc ap≦0.03Dc	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	 ae≦Dc ap≦0.03Dc	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	 ae≦Dc ap≦0.03Dc	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	 ae≦Dc ap≦0.03Dc	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	 ae≦Dc ap≦0.03Dc	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, V_f: Feed speed

NOTE

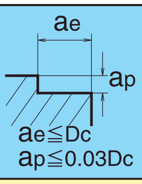
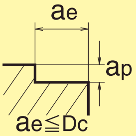
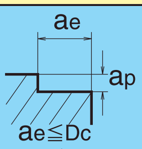
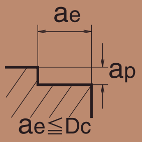
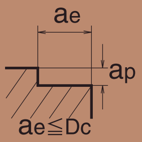
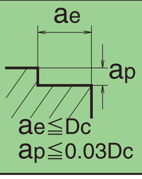
1) In case of side face finishing for improved productivity & efficiency, please increase ap and reduce ae. This will also help to reduce the heat generation.
2) In case of bottom face finishing for improved productivity & efficiency, recommended to use lower (shallow) depth of cut and increase feed 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})	V_f (mm/min)	ℓ (mm)	(min^{-1})	V_f (mm/min)
Carbon & Alloy steel S50C, SCM440 (C50, 1.7223) Below 250HB	 ae≦Dc ap≦0.03Dc	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	 ae≦Dc ap≦0.03Dc	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	 ae≦Dc ap≦0.03Dc	100	900	700	110	700	550
		150	800	600	160	600	500
		200	600	500	210	500	400
Heat resistant alloy Inco718 35-43HRC	 ae≦Dc ap≦0.03Dc	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	 ae≦Dc ap≦0.03Dc	100	900	700	110	700	550
		150	800	600	160	600	500
		200	600	500	210	500	400
Aluminium alloy A5052, A7075 50-110HB	 ae≦Dc ap≦0.03Dc	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, V_f: 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

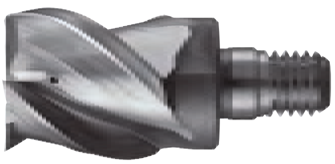
1. **Solid modular head** SMAL type showed the same performance as the solid end mill, by the combination with carbide shank MSN type. And, overhung length is of wide range, due to many variation in carbide shank MSN type.
2. Adopted the cutting edge geometry suitable for aluminum alloy machining. **Positive 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.

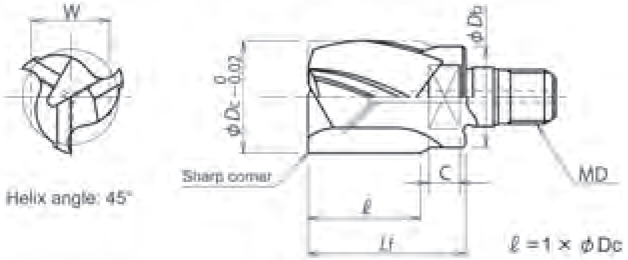
SMAL TYPE

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

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

Sharp Corner | Shoulder Milling | Slotting | Pocket Milling | Helical Interpolation | Counter boring





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

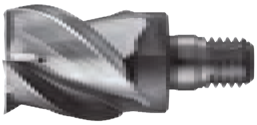
Note) 1. When mounting head to shank, tighten with recommended tightening torque value not to be over-tightening. (See the right table "Attention to mounting S-Head SMAL type".)
2. Only use torque control spanner wrench or DIJET DS type spanner wrench.
3. Spindle speed shall not exceed recommended cutting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

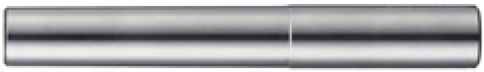
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

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

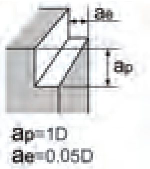
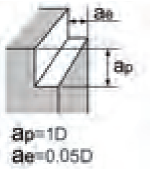
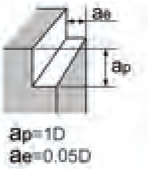
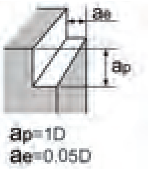
■NOTE

1) 1. S-Head are supplied without spanner wrench.

2) Only use torque control spanner wrench or DIJET DS type spanner wrench.

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								
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

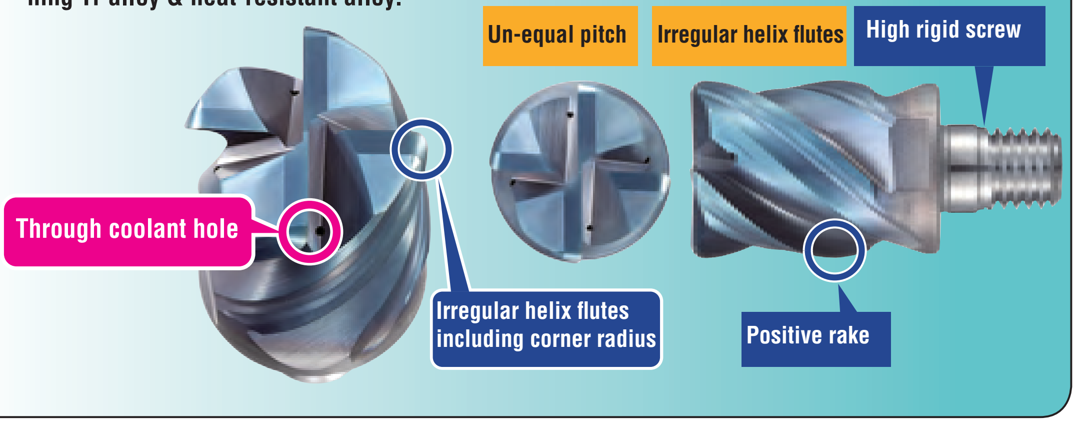
L／D	Spindle speed n（min-1）	Feed speed Vf（mm/min）	a_p
～4D	0%	0%	Up to 0.15D
5～6D	Not recommended.		
7～8D	Not recommended.		

S-Head SMSR TYPE

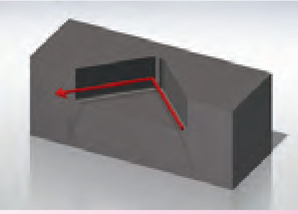
Solid modular head “Anti-vibration S-Head” SMSR type

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.

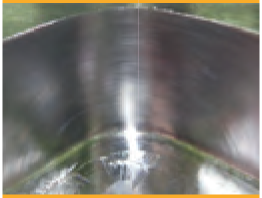


Cutting performance



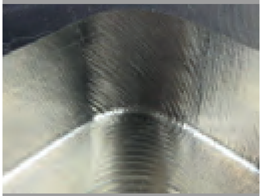
V-shaped machining
Overhung length: 80mm
Shoulder milling, Down cut

No chatter



SMSR Type

Chatter



Conventional tool

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!	

S-Head SMSR TYPE

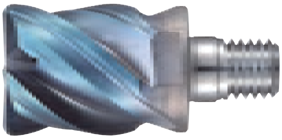
SMSR TYPE

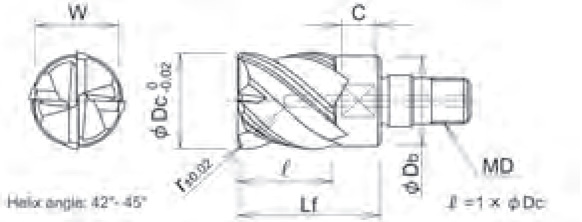
Solid modular head „Anti-vibration S-Head“ SMSR type

Through Coolant Hole

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

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





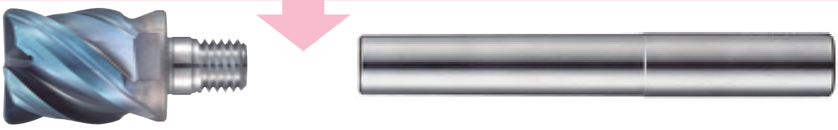
Cat. No.	Stock	Grade	No. of inserts	Dimensions (mm)							
				r	φDc	ℓ	Lf	φDb	MD	C	W
SMSR-4160R05-M8	●	DH115	4	0.5	16	16	24	15	M8	5.5	14
SMSR-4160R10-M8	●			1							
SMSR-4160R20-M8	●			2							
SMSR-4160R30-M8	●			3							
SMSR-4200R05-M10	●			0.5	20	20	29	19	M10	5.5	17
SMSR-4200R10-M10	●			1						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

MSNTYPE

Through Coolant Hole

Fig.1

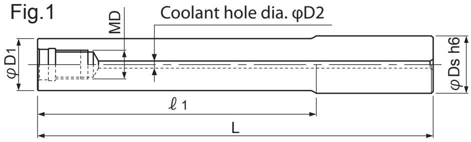
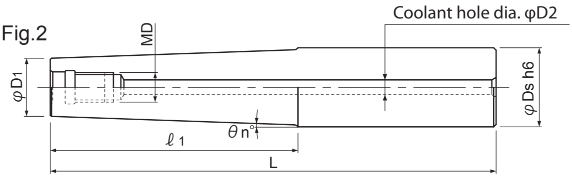


Fig.2



■ END MILL SHANK TYPE

Cat. No.	Stock	Dimensions (mm)							Weight (kg)	Fig.
		φDs	ℓ1	L	φD1	θn°	MD	φD2		
MSN-M6-12-S10C	●	10	12	60	9.7	–	M6	3	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	–			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	–	M8	4	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′			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	–	M10	6	0.29	1
MSN-M10-40-S20C	●	20	40	100	19.5	–		4	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	–			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

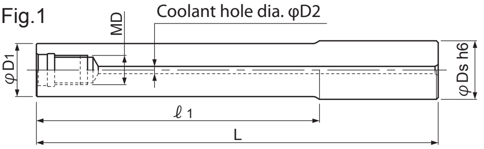
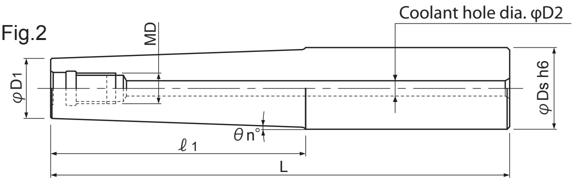


Fig.2



END MILL SHANK TYPE

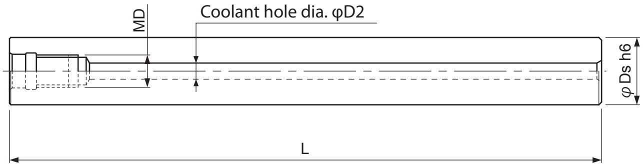
Cat. No.	Stock	Dimensions (mm)							Weight (kg)	Fig.
		φDs	ℓ1	L	φD1	θn°	MD	φD2		
MSN-M12-25-S25C	●	**25**	25	90	24	–	M12	6	0.53	1
MSN-M12-55-S25C	●	**25**	55	120	24	–			0.72	1
MSN-M12-100T-S32C	●	**32**	100	180	23.5	2°			1.61	2
MSN-M12-105-S25C	☐	**25**	105	170	24	–			1.03	1
MSN-M12-135-S25C	●	**25**	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	–	M16	8	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′			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.

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

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

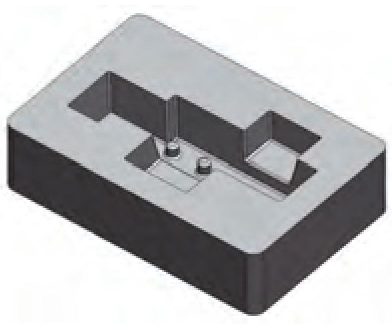
Note) Please refer page B007 for recommended tightening torque.

● 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.

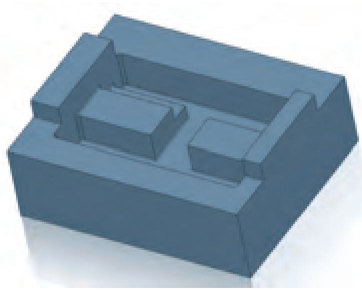


Work	Partname	Die casting mold
	Material	DH21: Hardened die steel (1.2344MD)
	Hardness	48HRC
Tool	Tool No.	Head: MRN-120-M6-H (Through coolant hole) Holder: MSN-M6-50-S12C
	Insert No. Grade	HRM-120-R20 (JC8015)
Cutting conditions	n, (Vc)	n=4,000min^{-1},Vc=150m/min
	Vf,(f)	Vf=4,000mm/min,f=1mm/rev
	ap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

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.

2. Replacement to coolant through modular head.



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
	ap	0.5mm
	ae	4mm
	Coolant	Internal air blow
	Machine	Vertical MC

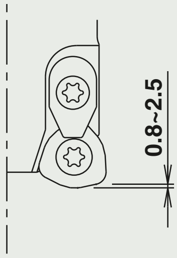
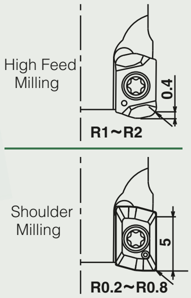
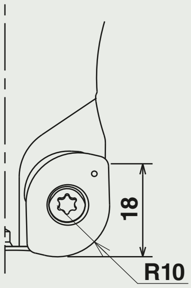
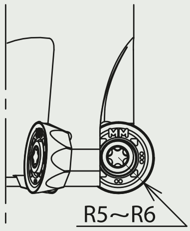
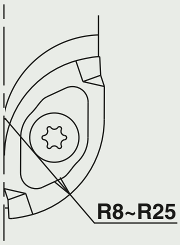
Result

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.

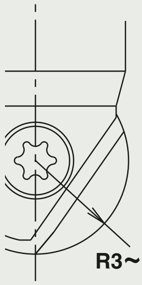
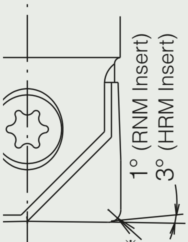
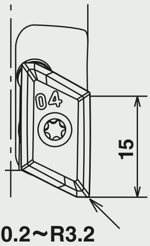
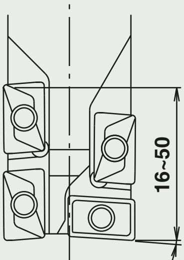
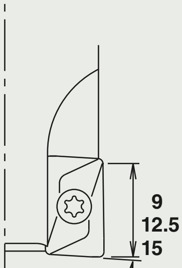
Tooling by DIJET®

Indexable Tools

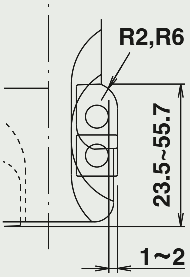
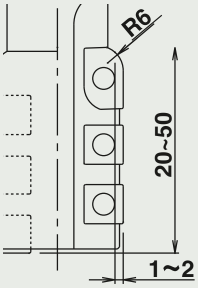
Indexable Tools - End Mill Type

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
High Feed Copy Milling	**High Feed Diemaster** **SKS TYPE** C036	 φ16~φ32		Face Milling Pocket Milling Copy Milling Helical Interpolation
High Efficient Copy Milling	**QM MILL** **PME TYPE** C092	 φ10~φ14		Face Milling Pocket Milling Copy Milling Helical Interpolation Shoulder Milling Slotting
High Efficient Roughing	**Wild Radius** **WDR TYPE** C101	 φ40		Face Milling Pocket Milling Copy Milling Helical Interpolation Shoulder Milling
Roughing for Turbine Blade	**Blade Chipper** **TDM TYPE** C136	 φ25~φ32		Face Milling Copy Milling Pocket Milling
Copy Roughing	**Swing Ball** **SWB TYPE** C158	 φ16~φ50		Copy Milling Shoulder Milling Slotting

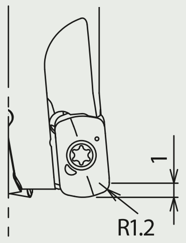
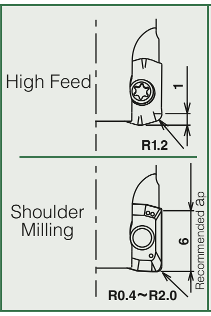
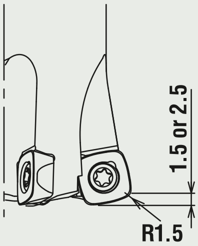
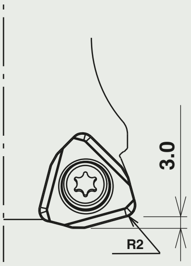
Indexable Tools - End Mill Type

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
Copy Milling	**Mirror Ball** **BNM**TYPE **C172**	 φ6~φ32	 R3~R16	Copy Milling Pocket Milling Slotting
Shoulder Finishing & Copy Milling	**Mirror Radius** **RNM**TYPE **C192**	 φ6~φ32	 R0※~R3 ※R0 shows: corner radius below 0.1mm.	Face Milling Pocket Milling Copy Milling Helical Interpolation Shoulder Milling
Aerospace Tooling	**Aero chipper** **ALX**TYPE **C221**	G-Body  φ20~φ40	 R0.2~R3.2	Slotting Shoulder Milling Pocket Milling Copy Milling Helical Interpolation
Multi-Functional Cutting	**Super End Chipper** **SEC**TYPE **C227**	 φ16~φ50	 3.5°~6°	Helical Interpolation Shoulder Milling Pocket Milling Copy Milling Slotting Spot Milling
Shoulder Milling	**Side Chipper** **SIC**TYPE **C237**	 φ16~φ50	 2°~4°	Face Milling Shoulder Milling Slotting

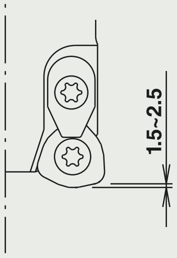
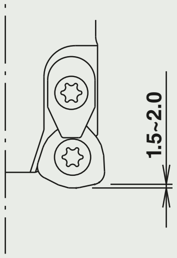
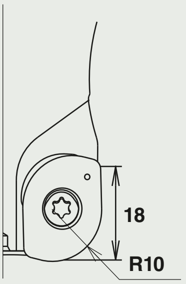
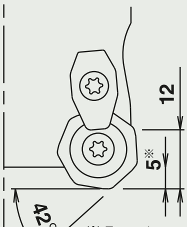
Indexable Tools - End Mill Type

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
Under Milling	**Under Cutter** **DUM-W※RTYPE** C214	 φ25~φ50		
Under Milling	**Under Cutter** **DUMTYPE** C214	 φ32~φ50		

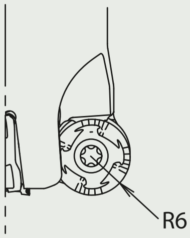
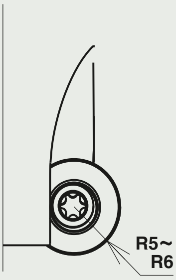
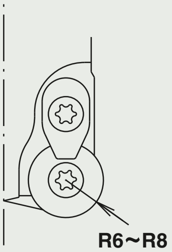
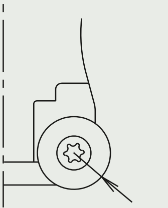
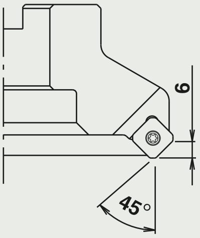
Indexable Tools - Face Mill Type

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
High Efficient Copy Milling	QM MAX G II GMX TYPE C052	G-Body  φ50~φ66		Face Milling Pocket Milling Helical Interpolation Copy Milling Slotting
High Efficient Copy Milling	QM MAX QXP TYPE C056	G-Body  φ40~φ66		Face Milling Pocket Milling Copy Milling Helical Interpolation Shoulder Milling Slotting
High Feed & Efficient Copy Milling	SKS G II SKG TYPE C014	G-Body  φ50~φ100		Face Milling Pocket Milling Copy Milling Helical Interpolation Plunge Milling
High Feed & Efficient Copy Milling	SKS Extreme EXSKS TYPE C027	G-Body  φ50~φ160		Face Milling Pocket Milling Copy Milling Helical Interpolation Plunge Milling

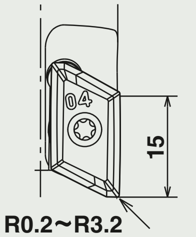
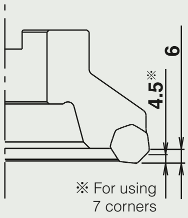
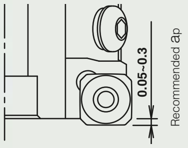
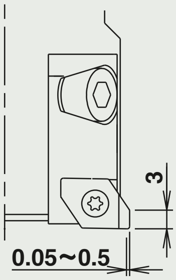
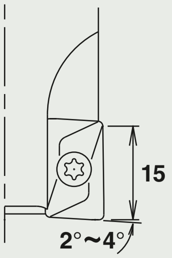
Indexable Tools - Face Mill Type

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
High Feed Copy Milling	**High Feed Diemaster** **SKSTYPE** C034	G-Body  φ40~φ160		Face Milling Pocket Milling Copy Milling Helical Interpolation Plunge Milling
High Feed Copy Milling	**High Feed Diemaster** Fine pitch type **SKSTYPE** C035	G-Body  φ50~φ80		Face Milling Pocket Milling Copy Milling Helical Interpolation Plunge Milling
High Efficient Roughing	**Wild Radius** **WDRTYPE** C100	 φ50~φ125		Face Milling Pocket Milling Copy Milling Helical Interpolation Shoulder Milling
High Metal Removal Roughing	**Hepta Mill** **HEPTYPE** C108	G-Body  φ50~φ200	 ※ For using 7 corners	Face Milling Pocket Milling Copy Milling Helical Interpolation Plunge Milling

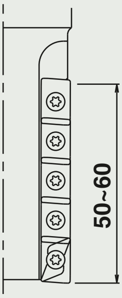
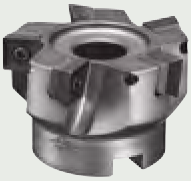
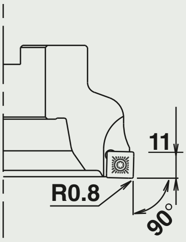
Indexable Tools - Face Mill Type

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
For hard-to-cut Material	TDM EXTREME EXTDM TYPE C130	G-Body  φ50~φ66		Face Milling Pocket Milling Helical Interpolation Copy Milling
Roughing for Turbine Blade	Blade Chipper TDM TYPE C134	 φ50, φ52		Face Milling Pocket Milling Copy Milling
Copy Milling on common & difficult to cut materials	Super Diemaster Standard type HDM TYPE C143	G-Body  φ50~φ63	 R6~R8	Face Milling Pocket Milling Copy Milling Helical Interpolation
Copy Milling on common & difficult to cut materials	Super Diemaster Fine pitch type HDM TYPE C144	G-Body  φ50~φ80	 R6~R8	Face Milling Pocket Milling Copy Milling Helical Interpolation
Face Milling	DIJET Mill 45 SSE45 TYPE C250	G-Body  φ50~φ125		Face Milling

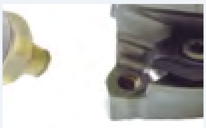
Indexable Tools - Face Mill Type

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
Aerospace Tooling	**Aero Chipper** **ALX TYPE** C220	G-Body  φ50~φ63		Helical Interpolation Pocket Milling Copy Milling Shoulder Milling Slotting
High Efficient Face Milling	**Nega Hepta** **NHP TYPE** C122	 φ63~φ250		Face Milling Pocket Milling
Super Finishing	**Finish Jet Mill** **FJM TYPE** C256	 φ80~φ250		Face Milling
Up & Down Finishing	**Back & Forth Cutter** **PFC TYPE** C263	 φ50~φ80		Up & Down Milling Reciprocating Milling
Shoulder Milling	**Side Chipper** **SIC TYPE** C238	 φ50~φ125		Face Milling Shoulder Milling Slotting

Indexable Tools - Face Mill Type

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
High Efficient Side Milling	**Roughing Chipper** **RFC TYPE** C246	G-Body  φ50~φ80		Shoulder Milling
Shoulder Milling	**DIJET Mill 90** **SSD90 TYPE** C254	G-Body  φ50~φ125		Face Milling Shoulder Milling
Milling Inserts		C266-C269		

Insert set up 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 itself.

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 clampscrew

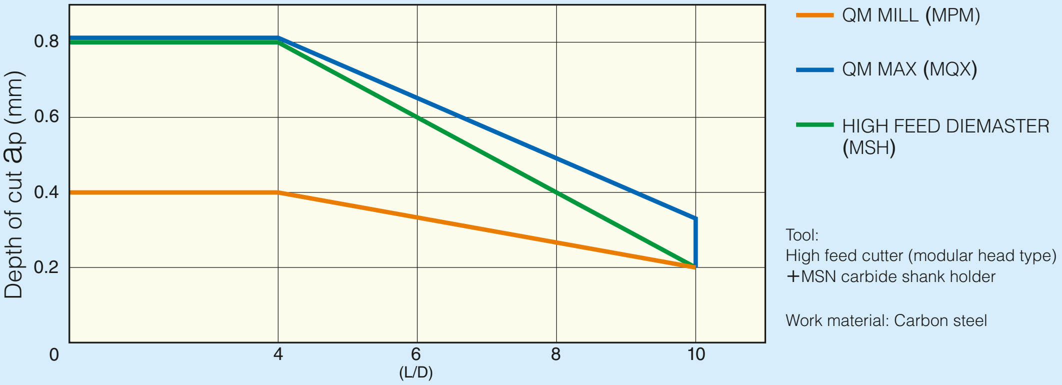
Wrench size	Recommended torque
T15	3.6 N·m
T20	6.0 N·m

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

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

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

Work material: Carbon steel

▼ Point

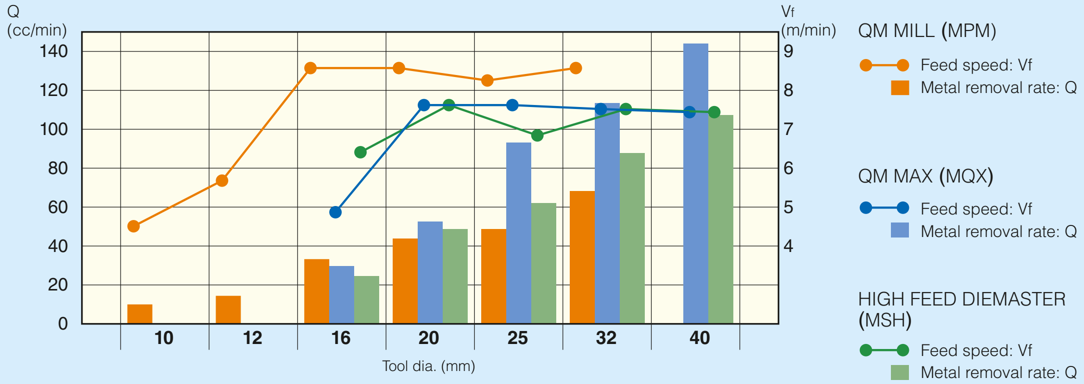
ap (Depth of cut: mm)

- 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 if 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, we recommend 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).

SKS G II

SKG 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

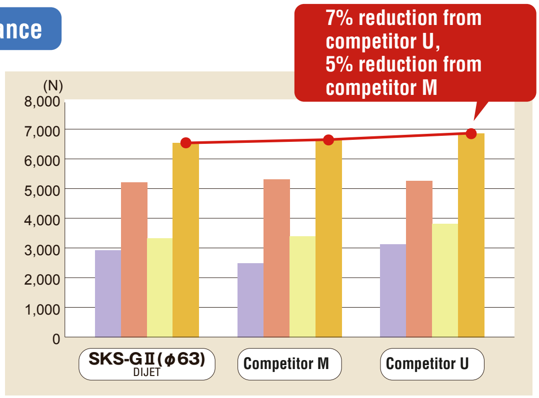
Adopted low cutting force & economical 4 corners positive insert, achieved stable high feed machining.

Features 3

Large ap machining is possible.
(Max. ap=1.5mm in case of using insert 10-type & Max.ap=2.5mm in case of using 14-type insert)

Cutting performance

Cutting force comparison



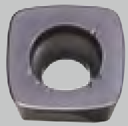
Material P21
- Tool dia. ø 63mm
  Insert No.
  SPNW100415ZTR (JC8118)
- Cutting conditions:
  Vc=80m/min, fz=1.5mm/t,
  ap=1.5mm, ae=40mm,
  Dry, Down cut

SKS G II

SKGTYPE

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.

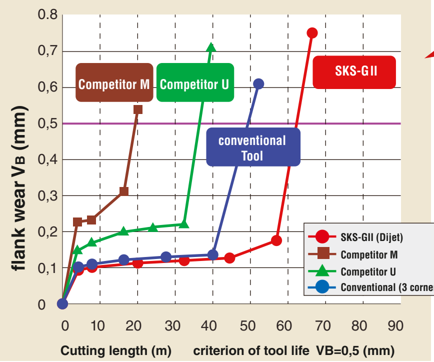
Application

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	JC8118							JC8118	JC8118	JC8118						JC8118	JC8118
				JC8050	JC8050																
									JC7550	JC7550							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

- Tool dia. ø 63mm
  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

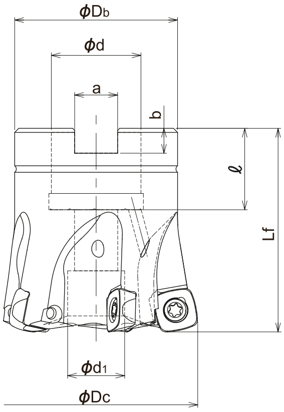
SKS G II

SKG TYPE

G-Body Through Coolant Hole

Face Milling | Pocket Milling | Copy Milling | Helical Interpolation | Plunge Milling

FACE MILL TYPE (Insert 10-type)

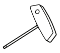


BODY

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	ℓ	Set Bolt		Weight (kg)
Metric Bore	**SKG-4050R-10-22**	●	4	**50**	50	40	22	14	10.4	6.3	20	M10x1.5x35*	Head cap screw (Slim Head)	0.3
	SKG-5050R-10-22	●	5	**50**	50	40	22	14	10.4	6.3	20	M10x1.5x35*		0.3
	SKG-5052R-10-22	●	5	**52**	50	42	22	16.6	10.4	6.3	20	M10	Head cap screw (JIS Standard)	0.3
	SKG-5063R-10-22	☐	5	**63**	50	48	22	17	10.4	6.3	20	M10		0.5
	SKG-5063R-10-27	☐	5	**63**	50	48	27	20	12.4	7	22	M12x1.75x30*		0.5
	SKG-6063R-10-22	●	6	**63**	50	48	22	17	10.4	6.3	20	M10		0.5
	SKG-6063R-10-27	●	6	**63**	50	48	27	20	12.4	7	22	M12x1.75x30*		0.5
	SKG-6066R-10-27	●	6	**66**	50	50	27	20	12.4	7	22	M12x1.75x30*		0.6
	SKG-6080R-10-27	●	6	**80**	50	60	27	20	12.4	7	22	M12x1.75x30*		0.9

Applicable inserts

SPNW10** SPET10** SPMT10**
Parts
Clamp screw

TSW-3509H
Wrench

A-15T

Note) 1. All cutters are supplied without inserts.
2. ⋆ mark shows: these cutter bodies are equipped with the set bolt because of the specified bolt size.
Except for these cutter bodies, please use the set bolt equipped with arbor.
3. Set bolt (M10x1.5x35*) is slim head type with Ø13 head dia.

Modular Head Type Please refer Page B024

Clamp Screw	Recommended Torque (N·m)
TSW-3509H	3.0

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.

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

SKS G II

SKGTYPE

Insert 10-type

Fig.1 SPNW100415ZTR

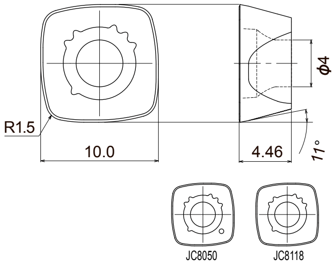


Fig.2 SPET100415ZPER-SM

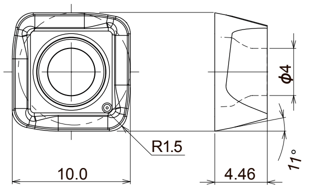
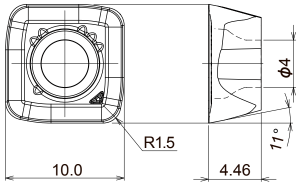


Fig.3 SPMT100415ZPER-SM



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

10 inserts per case.

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

SKS G II

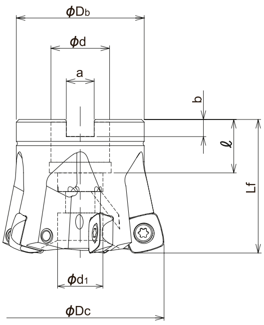
SKG TYPE

G-Body

Face Milling
Pocket Milling
Copy Milling
Helical Interpolation
Plunge Milling

FACE MILL TYPE (Insert 14-type)

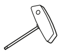
Fig.1 Through Coolant Hole



BODY

Type	Cat. No.	Stock	No. of inserts	Dimensions (mm)								Set Bolt		Weight (kg)	Fig.
				φDc	Lf	φDb	φd	φd1	a	b	ℓ				
Metric Bore	**SKG-4050R-14-22**	●	4	**50**	50	40	22	9.6	10.4	6.3	19.05	M10x1.5x35*	Head cap screw (Slim Head)	0.3	1
	SKG-4052R-14-22	●	4	**52**	50	42	22	17	10.4	6.3	19.05	M10x1.5x35*		0.3	1
	SKG-4063R-14-22	●	4	**63**	50	48	22	17	10.4	6.3	20	M10	Head cap screw (JIS Standard)	0.5	1
	SKG-4063R-14-27	●	4	**63**	50	48	27	20	12.4	7	22	M12x1.75x35*		0.5	1
	SKG-5066R-14-27	●	5	**66**	50	50	27	20	12.4	7	22	M12x1.75x35*		0.5	1
	SKG-5080R-14-27	●	5	**80**	50	60	27	37	12.4	7	22	M12x1.75x35*		0.8	1
	SKG-6100R-14-32	●	6	**100**	63	70	32	45	14.4	8	25	M16		1.6	1

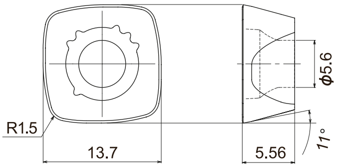
Applicable inserts
SPNW 140515ZTR
Parts
Clamp screw

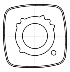
CSW-513H
Wrench

A-20

Note) 1. All cutters are supplied without inserts.
2. ∗ mark shows: these cutter bodies are equipped with the set bolt because of the specified bolt size.
Except for these cutter bodies, please use the set bolt equipped with arbor.
3. Set bolt (M10×1.5×35) is slim head type with Ø13 head dia.

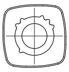
Clamp Screw	Recommended Torque (N·m)
CSW-513H	5.5

Insert 14-type





JC8050



JC8118

Cat. No.	Tolerance	PVD coated	
		JC8050	JC8118
SPNW140515ZTR	N	●	●

10 inserts per case.

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

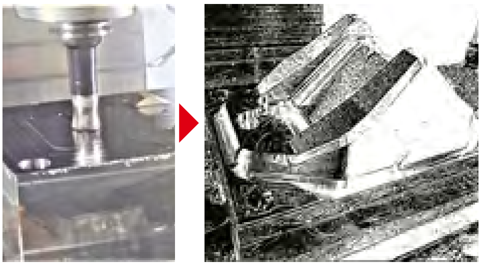
SKS G II

SKGTYPE

CUTTING DATA

1. High feed machining on mold steel (Insert 10-type)

Overhung length: 130mm
Contouring & slotting



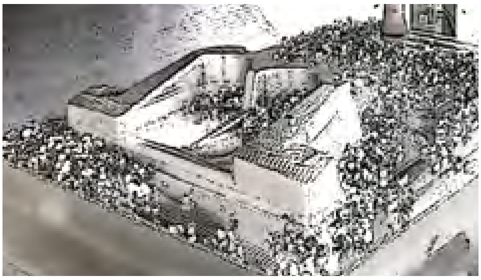
Result

Achieved high metal removal rate (Q=126cm^3/min) by 1.8 times compared with competitor's tool. And finished all the job with one corner, no wear or breakage, with a contact time of 3h 40min.

Work	Part name	Plastic mold
	Material	Mold steel (1.2311)
	Hardness	32-34HRC
Tool	Tool No.	MSG-3032-10-M16
	Insert No.	SPNW100415ZTR, JC8118
Cutting conditions	Cutting speed Vc, (n)	201m/min (2,000min^{-1})
	Feed speed Vf, (fz)	6,300mm/min (1.1mm/t)
	ap (mm)	0.8mm
	ae (mm)	25mm
	Coolant	Air blow
	Machine	Vertical MC

2. High feed machining on mold steel (Insert 14-type)

Overhung length: 220mm



Result

Achieved high metal removal rate (Q=330cm^3/min) by 1.2 times compared with competitor's tool. And able to machine about 3 hours per 1 corner.

Work	Part name	Plasticmold
	Material	Mold steel (1.2738)
	Hardness	36HRC
Tool	Tool No.	SKG-6080R-14-27
	Insert No.	SPNW140515ZTR, JC8118
Cutting conditions	Cutting speed Vc, (n)	140m/min, (560min^{-1})
	Feed speed Vf, (fz)	4,000mm/min, (1.2mm/t)
	ap (mm)	1.5mm
	ae (mm)	55mm
	Coolant	Air blow
	Machine	Vertical MC

3. High efficient machining on Ti-alloy (Insert 10-type)

Overhung length: 110mm

Result

Machining test piece shaped like aircraft parts. No chatter & smooth cutting, and achieved good chip removal.

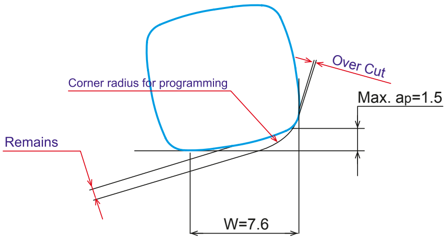
Work	Part name	Test piece
	Material	Ti-6Al-4V
	Hardness	50HRC
Tool	Tool No.	MSG-3032-10-M16
	Insert No.	SPET100415ZPER-SM, JC7550
Cutting conditions	Cutting speed Vc, (n)	60m/min (597min^{-1})
	Feed speed Vf, (fz)	1,075mm/min (0.6mm/t)
	ap (mm)	1mm
	ae (mm)	12.8mm
	Coolant	Wet (internal)
	Machine	Vertical MC

SKS G II

SKG TYPE

Definition of corner shape for programming

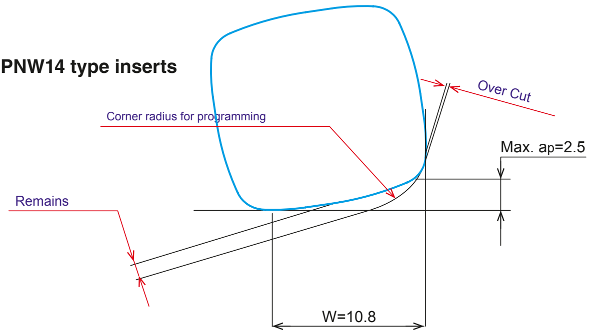
- SPNW10 / SPE(M)T type inserts



(mm)

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

- SPNW14 type inserts

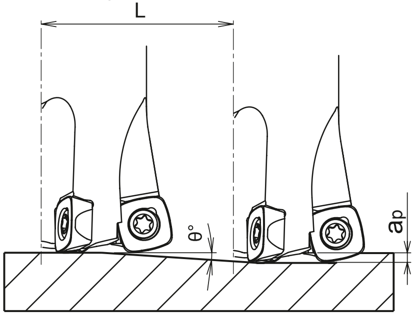


(mm)

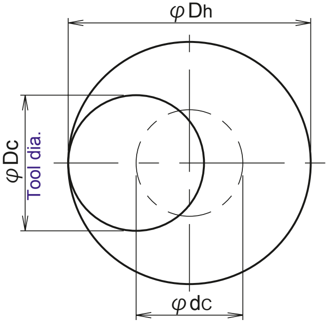
Corner radius for programming	Over cut	Remains
R3.5	0	1.60
R4.0 (Standard)	0	1.46
R4.5	0.06	1.32
R5.0	0.17	1.19

Attention for profile milling

- Ramping



- Helical interpolation



- Calculation of tool pass dia.

$$\underset{\text{Tool pass dia.}}{\varphi dc} = \underset{\text{Bore dia.}}{\varphi Dh} - \underset{\text{Tool dia.}}{\varphi Dc}$$

- 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 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)
SKG-*050R-10	50	34.8	1.5	1°	95.5	86	98
SKG-5052R-10	52	36.8	1.5	1°	95.5	90	102
SKG-*063R-10	63	47.8	1.5	0°45'	127.3	112	124
SKG-6066R-10	66	50.8	1.5	0°45'	127.3	118	130
SKG-6080R-10	80	64.8	1.5	0°30'	191	146	158
SKG-4050R-14	50	28.4	2.5	1°	143.2	80	98
SKG-4052R-14	52	30.4	2.5	1°	143.2	84	102
SKG-*063R-14	63	41.4	2.5	0°45'	191	106	124
SKG-5066R-14	66	44.4	2.5	0°45'	191	112	130
SKG-5080R-14	80	58.4	2.5	0°30'	286.5	140	158
SKG-6100R-14	100	78.4	2.5	0°20'	430	180	198
SKG-6125R-14	125	123.4	2.5	0°20'	430	230	248
SKG-7160R-14	160	138.4	2.5	0°15'	573	300	318

SKS G II

SKGTYPE

■ RECOMMENDED CUTTING CONDITIONS

● Facemill type (Insert 10-type)

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		No. of teeth 5N					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	JC8050 (JC8118) SPNW10	~150	1.5	~32	1,020	7,340	~150	1.5	~32	1,020	9,180
		200	1.2	~32	1,020	7,340	200	1.5	~32	1,020	9,180
		250	0.8	~32	890	5,340	250	1.2	~32	890	6,680
		300	0.6	~32	830	4,980	300	1	~32	830	6,230
		350	0.5	~32	830	4,650	350	0.5	~32	830	5,810
Die steel (1.2344,1.2379) Below 255HB	JC8050 (JC8118) SPNW10	~150	1.5	~32	1,020	7,340	~150	1.5	~32	1,020	9,180
		200	1.2	~32	1,020	7,340	200	1.5	~32	1,020	9,180
		250	0.8	~32	890	5,340	250	1.2	~32	890	6,680
		300	0.6	~32	830	4,980	300	1	~32	830	6,230
		350	0.5	~32	830	4,650	350	0.5	~32	830	5,810
Mold steel (1.2311,P20) 30-36HRC	JC8050 (JC8118) SPNW10	~150	1.5	~32	1,020	7,340	~150	1.5	~32	1,020	9,180
		200	1.2	~32	1,020	7,340	200	1.5	~32	1,020	9,180
		250	0.8	~32	890	5,340	250	1.2	~32	890	6,680
		300	0.6	~32	830	4,980	300	1	~32	830	6,230
		350	0.5	~32	830	4,650	350	0.5	~32	830	5,810
Mold steel (1.2311,P21) 38-43HRC	JC8118 (JC8050) SPNW10	~150	1.2	~32	700	4,200	~150	1.2	~32	700	5,250
		200	1	~32	700	4,200	200	1.2	~32	700	5,250
		250	0.7	~32	640	3,840	250	1	~32	640	4,800
		300	0.6	~32	510	2,860	300	0.5	~32	510	3,570
		350	–	–	–	–	350	–	–	–	–
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118 SPNW10	~150	1	~32	640	3,580	~150	1	~32	640	4,480
		200	0.8	~32	640	3,330	200	0.8	~32	640	4,160
		250	0.6	~32	640	3,070	250	0.6	~32	640	3,840
		300	–	–	–	–	300	–	–	–	–
		350	–	–	–	–	350	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8118 SPNW10	~150	1.5	~32	1,150	8,280	~150	1.5	~32	1,150	10,350
		200	1.5	~32	1,150	8,280	200	1.5	~32	1,150	10,350
		250	1.2	~32	1,150	6,900	250	1.2	~32	1,150	8,630
		300	0.8	~32	1,020	6,120	300	0.8	~32	1,020	7,650
		350	0.5	~32	1,020	6,120	350	0.5	~32	1,020	7,650
Stainless steel Below 250HB	JC7550 SPET10 SPMT10	~150	1	~32	950	4,940	~150	1	~32	950	6,180
		200	1	~32	950	4,940	200	1	~32	950	6,180
		250	0.8	~32	830	3,980	250	0.8	~32	830	4,980
		300	0.6	~32	760	3,040	300	0.6	~32	760	3,800
		350	0.4	~32	640	2,560	350	0.4	~32	640	3,200
Titanium alloy (Ti-6Al-4V)	JC7550 SPET10 SPMT10	~150	1	~32	380	910	~150	1	~32	380	1,140
		200	0.8	~32	380	910	200	0.8	~32	380	1,140
		250	0.6	~32	380	760	250	0.6	~32	380	950
		300	0.4	~32	380	610	300	0.4	~32	380	760
		350	–	–	–	–	350	–	–	–	–

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 Spindle speed and keep feed per tooth.
3) If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4) Use air blow.

SKS G II

SKG TYPE

RECOMMENDED CUTTING CONDITIONS

● Facemill type (Insert 10-type)

Work Materials	Insert Grades	Tool dia. (mm)														
		63					63/66					80				
		No. of teeth 5N					No. of teeth 6N					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	JC8050 (JC8118) SPNW10	~150	1.5	~44	810	7,290	~150	1.5	~44	810	8,750	~150	1.5	~60	640	6,910
		200	1.5	~44	810	7,290	200	1.5	~44	810	8,750	200	1.5	~60	640	6,910
		250	1.2	~44	710	5,330	250	1.2	~42	710	6,390	250	1.2	~55	560	5,040
		300	1	~44	660	4,950	300	1	~42	660	5,940	300	1	~55	520	4,680
		350	0.5	~44	660	4,620	350	0.5	~42	660	5,540	350	0.5	~55	520	4,370
Die steel (1.2344,1.2379) Below 255HB	JC8050 (JC8118) SPNW10	~150	1.5	~44	810	7,290	~150	1.5	~44	810	8,750	~150	1.5	~60	640	6,910
		200	1.5	~44	810	7,290	200	1.5	~44	810	8,750	200	1.5	~60	640	6,910
		250	1.2	~44	710	5,330	250	1.2	~42	710	6,390	250	1.2	~55	560	5,040
		300	1	~44	660	4,950	300	1	~42	660	5,940	300	1	~55	520	4,680
		350	0.5	~44	660	4,620	350	0.5	~42	660	5,540	350	0.5	~55	520	4,370
Mold steel (1.2311,P20) 30-36HRC	JC8050 (JC8118) SPNW10	~150	1.5	~44	810	7,290	~150	1.5	~44	810	8,750	~150	1.5	~60	640	6,910
		200	1.5	~44	810	7,290	200	1.5	~44	810	8,750	200	1.5	~60	640	6,910
		250	1.2	~44	710	5,330	250	1.2	~42	710	6,390	250	1.2	~55	560	5,040
		300	1	~44	660	4,950	300	1	~42	660	5,940	300	1	~55	520	4,680
		350	0.5	~44	660	4,620	350	0.5	~42	660	5,540	350	0.5	~55	520	4,370
Mold steel (1.2311,P21) 38-43HRC	JC8118 (JC8050) SPNW10	~150	1.2	~44	560	4,200	~150	1.2	~44	560	5,040	~150	1.2	~60	440	3,960
		200	1.2	~44	560	4,200	200	1.2	~44	560	5,040	200	1.2	~60	440	3,960
		250	1	~44	510	3,830	250	1	~42	510	4,590	250	1	~55	400	3,600
		300	0.5	~44	400	2,800	300	0.5	~42	400	3,360	300	0.5	~55	320	2,690
		350	–	–	–	–	350	–	–	–	–	350	–	–	–	–
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118 SPNW10	~150	1	~44	510	3,570	~150	1	~44	510	4,280	~150	1	~60	400	3,360
		200	0.8	~44	510	3,320	200	0.8	~44	510	3,980	200	0.8	~60	400	3,120
		250	0.6	~44	510	3,060	250	0.6	~42	510	3,670	250	0.6	~55	400	2,880
		300	–	–	–	–	300	–	–	–	–	300	–	–	–	–
		350	–	–	–	–	350	–	–	–	–	350	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8118 SPNW10	~150	1.5	~44	910	8,190	~150	1.5	~44	910	9,830	~150	1.5	~60	720	7,780
		200	1.5	~44	910	8,190	200	1.5	~44	910	9,830	200	1.5	~60	720	7,780
		250	1.2	~44	910	6,830	250	1.2	~42	910	8,190	250	1.2	~55	720	6,480
		300	0.8	~44	810	6,080	300	0.8	~42	810	7,290	300	0.8	~55	640	5,760
		350	0.5	~44	810	6,080	350	0.5	~42	810	7,290	350	0.5	~55	640	5,760
Stainless steel Below 250HB	JC7550 SPET10 SPMT10	~150	1.2	~44	760	5,320	~150	1.2	~44	760	6,380	~150	1.2	~60	600	5,040
		200	1	~44	760	4,940	200	1	~44	760	5,930	200	1	~60	600	4,680
		250	0.8	~44	660	3,960	250	0.8	~42	660	4,750	250	0.8	~55	520	3,740
		300	0.6	~44	610	3,050	300	0.6	~42	610	3,660	300	0.6	~55	480	2,880
		350	0.5	~44	510	2,550	350	0.5	~42	510	3,060	350	0.5	~55	400	2,400
Titanium alloy (Ti-6Al-4V)	JC7550 SPET10 SPMT10	~150	1	~44	300	900	~150	1	~44	300	1,080	~150	1	~60	240	860
		200	0.8	~44	300	900	200	0.8	~44	300	1,080	200	0.8	~60	240	860
		250	0.6	~44	300	750	250	0.6	~42	300	900	250	0.6	~55	240	720
		300	0.4	~44	300	600	300	0.4	~42	300	720	300	0.4	~55	240	580
		350	–	–	–	–	350	–	–	–	–	350	–	–	–	–

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 Spindle speed and keep feed per tooth.
3) If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4) Use air blow.

SKS G II

SKGTYPE

RECOMMENDED CUTTING CONDITIONS

● Facemill type (Insert 14-type)

Work Materials	Insert Grades	Tool dia. (mm)									
		50/52					63				
		No. of teeth 4N					No. of teeth 4N				
		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)
Carbon steel (C50,C55) Below 250HB	JC8050 (JC8118) SPNW14	~150	2	~28	890	6,410	~150	2	~40	710	5,110
		200	1.8	~28	890	6,410	200	1.8	~40	710	5,110
		250	1.5	~28	830	4,980	250	1.5	~40	660	3,960
		300	0.8	~28	760	4,560	300	0.8	~40	610	3,660
		350	0.6	~28	640	3,580	350	0.6	~40	510	2,860
Die steel (1.2344,1.2379) Below 255HB	JC8050 (JC8118) SPNW14	~150	2	~28	890	6,410	~150	2	~40	710	5,110
		200	1.8	~28	890	6,410	200	1.8	~40	710	5,110
		250	1.5	~28	830	4,980	250	1.5	~40	660	3,960
		300	0.8	~28	760	4,560	300	0.8	~40	610	3,660
		350	0.6	~28	640	3,580	350	0.6	~40	510	2,860
Mold steel (1.2311,P20) 30-36HRC	JC8050 (JC8118) SPNW14	~150	2	~28	890	6,410	~150	2	~40	710	5,110
		200	1.8	~28	890	6,410	200	1.8	~40	710	5,110
		250	1.5	~28	830	4,980	250	1.5	~40	660	3,960
		300	0.8	~28	760	4,560	300	0.8	~40	610	3,660
		350	0.6	~28	640	3,580	350	0.6	~40	510	2,860
Mold steel (1.2311,P21) 38-43HRC	JC8118 (JC8050) SPNW14	~150	1.6	~28	640	3,840	~150	1.6	~40	510	3,060
		200	1.4	~28	640	3,840	200	1.4	~40	510	3,060
		250	1.2	~28	640	3,840	250	1.2	~40	510	3,060
		300	0.7	~28	510	2,860	300	0.7	~40	400	2,240
		350	–	–	–	–	350	–	–	–	–
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118 SPNW14	~150	1	~28	570	2,740	~150	1	~40	450	2,160
		200	1	~28	570	2,280	200	1	~40	450	1,800
		250	0.8	~28	570	1,820	250	0.8	~40	450	1,440
		300	0.5	~28	450	1,260	300	0.5	~40	350	980
		350	–	–	–	–	350	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8118 SPNW14	~150	2	~28	1,150	8,280	~150	2	~40	910	6,550
		200	1.8	~28	1,150	8,280	200	1.8	~40	910	6,550
		250	1.5	~28	1,150	6,900	250	1.5	~40	910	5,460
		300	0.8	~28	1,020	6,120	300	0.8	~40	810	4,860
		350	0.6	~28	1,020	5,710	350	0.6	~40	810	4,540

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 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 Spindle speed and keep feed per tooth.
3) If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4) Use air blow.

SKS G II

SKGTYPE

RECOMMENDED CUTTING CONDITIONS

● Facemill type (Insert 14-type)

Work Materials	Insert Grades	Tool dia. (mm)									
		66					80				
		No. of teeth 5N					No. of teeth 5N				
		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)
Carbon steel (C50,C55) Below 250HB	JC8050 (JC8118) SPNW14	~150	2	~44	680	6,120	~150	2	~56	600	5,400
		200	1.8	~44	680	6,120	200	1.8	~56	600	5,400
		250	1.5	~44	630	4,730	250	1.5	~56	560	4,200
		300	0.8	~44	580	4,350	300	0.8	~56	520	3,900
		350	0.6	~44	480	3,360	350	0.6	~56	440	3,080
Die steel (1.2344,1.2379) Below 255HB	JC8050 (JC8118) SPNW14	~150	2	~44	680	6,120	~150	2	~56	600	5,400
		200	1.8	~44	680	6,120	200	1.8	~56	600	5,400
		250	1.5	~44	630	4,730	250	1.5	~56	560	4,200
		300	0.8	~44	580	4,350	300	0.8	~56	520	3,900
		350	0.6	~44	480	3,360	350	0.6	~56	440	3,080
Mold steel (1.2311,P20) 30-36HRC	JC8050 (JC8118) SPNW14	~150	2	~44	680	6,120	~150	2	~56	600	5,400
		200	1.8	~44	680	6,120	200	1.8	~56	600	5,400
		250	1.5	~44	630	4,730	250	1.5	~56	560	4,200
		300	0.8	~44	580	4,350	300	0.8	~56	520	3,900
		350	0.6	~44	480	3,360	350	0.6	~56	440	3,080
Mold steel (1.2311,P21) 38-43HRC	JC8118 (JC8050) SPNW14	~150	1.6	~44	480	3,600	~150	1.6	~56	400	3,000
		200	1.4	~44	480	3,600	200	1.4	~56	400	3,000
		250	1.2	~44	480	3,600	250	1.2	~56	400	3,000
		300	0.7	~44	390	2,730	300	0.7	~56	320	2,240
		350	–	–	–	–	350	–	–	–	–
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118 SPNW14	~150	1	~44	430	2,580	~150	1	~56	360	2,160
		200	1	~44	430	2,150	200	1	~56	360	1,800
		250	0.8	~44	430	1,720	250	0.8	~56	360	1,440
		300	0.5	~44	340	1,190	300	0.5	~56	280	980
		350	–	–	–	–	350	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8118 SPNW14	~150	2	~44	870	7,830	~150	2	~56	720	6,480
		200	1.8	~44	870	7,830	200	1.8	~56	720	6,480
		250	1.5	~44	870	6,530	250	1.5	~56	720	5,400
		300	0.8	~44	770	5,780	300	0.8	~56	640	4,800
		350	0.6	~44	770	5,390	350	0.6	~56	640	4,480

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 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 Spindle speed and keep feed per tooth.
3) If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4) Use air blow.

SKS G II

SKGTYPE

RECOMMENDED CUTTING CONDITIONS

Facemill type (Insert 14-type)

Work Materials	Insert Grades	Tool dia. (mm)									
		100					125				
		No. of teeth 6N					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)
Carbon steel (C50,C55) Below 250HB	JC8050 (JC8118) SPNW14	~150	2	~70	480	5,180	~150	2	~87	380	4,100
		200	1.8	~70	480	5,180	200	1.8	~87	380	4,100
		250	1.5	~70	450	4,050	250	1.5	~87	360	3,240
		300	0.8	~70	410	3,690	300	0.8	~87	330	2,970
		350	0.6	~70	350	2,940	350	0.6	~87	280	2,350
Die steel (1.2344,1.2379) Below 255HB	JC8050 (JC8118) SPNW14	~150	2	~70	480	5,180	~150	2	~87	380	4,100
		200	1.8	~70	480	5,180	200	1.8	~87	380	4,100
		250	1.5	~70	450	4,050	250	1.5	~87	360	3,240
		300	0.8	~70	410	3,690	300	0.8	~87	330	2,970
		350	0.6	~70	350	2,940	350	0.6	~87	280	2,350
Mold steel (1.2311,P20) 30-36HRC	JC8050 (JC8118) SPNW14	~150	2	~70	480	5,180	~150	2	~87	380	4,100
		200	1.8	~70	480	5,180	200	1.8	~87	380	4,100
		250	1.5	~70	450	4,050	250	1.5	~87	360	3,240
		300	0.8	~70	410	3,690	300	0.8	~87	330	2,970
		350	0.6	~70	350	2,940	350	0.6	~87	280	2,350
Mold steel (1.2311,P21) 38-43HRC	JC8118 (JC8050) SPNW14	~150	1.6	~70	320	2,880	~150	1.6	~87	250	2,250
		200	1.4	~70	320	2,880	200	1.4	~87	250	2,250
		250	1.2	~70	320	2,880	250	1.2	~87	250	2,250
		300	0.7	~70	250	2,100	300	0.7	~87	200	1,680
		350	–	–	–	–	350	–	–	–	–
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118 SPNW14	~150	1	~70	290	2,090	~150	1	~87	230	1,660
		200	1	~70	290	1,740	200	1	~87	230	1,380
		250	0.8	~70	290	1,390	250	0.8	~87	230	1,100
		300	0.5	~70	220	920	300	0.5	~87	180	760
		350	–	–	–	–	350	–	–	–	–
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8118 SPNW14	~150	2	~70	570	6,160	~150	2	~87	460	4,970
		200	1.8	~70	570	6,160	200	1.8	~87	460	4,970
		250	1.5	~70	570	5,130	250	1.5	~87	460	4,140
		300	0.8	~70	510	4,590	300	0.8	~87	410	3,690
		350	0.6	~70	510	4,280	350	0.6	~87	410	3,440

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 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 Spindle speed and keep feed per tooth.
3) If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4) Use air blow.

SKS G II

SKGTYPE

RECOMMENDED CUTTING CONDITIONS

● Facemill type (Insert 14-type)

Work Materials	Insert Grades	Tool dia. (mm)									
		160									
		No. of teeth ZN									
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)					
Carbon steel (C50,C55) Below 250HB	JC8050 (JC8118) SPNW14	~150	2	~112	300	3,780					
		200	1.8	~112	300	3,780					
		250	1.5	~112	280	2,940					
		300	0.8	~112	260	2,730					
		350	0.6	~112	220	2,160					
Die steel (1.2344,1.2379) Below 255HB	JC8050 (JC8118) SPNW14	~150	2	~112	300	3,780					
		200	1.8	~112	300	3,780					
		250	1.5	~112	280	2,940					
		300	0.8	~112	260	2,730					
		350	0.6	~112	220	2,160					
Mold steel (1.2311,P20) 30-36HRC	JC8050 (JC8118) SPNW14	~150	2	~112	300	3,780					
		200	1.8	~112	300	3,780					
		250	1.5	~112	280	2,940					
		300	0.8	~112	260	2,730					
		350	0.6	~112	220	2,160					
Mold steel (1.2311,P21) 38-43HRC	JC8118 (JC8050) SPNW14	~150	1.6	~112	200	2,100					
		200	1.4	~112	200	2,100					
		250	1.2	~112	200	2,100					
		300	0.7	~112	160	1,570					
		350	–	–	–	–					
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118 SPNW14	~150	1	~112	180	1,510					
		200	1	~112	180	1,260					
		250	0.8	~112	180	1,010					
		300	0.5	~112	140	690					
		350	–	–	–	–					
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8118 SPNW14	~150	2	~112	360	4,540					
		200	1.8	~112	360	4,540					
		250	1.5	~112	360	3,780					
		300	0.8	~112	320	3,360					
		350	0.6	~112	320	3,140					

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

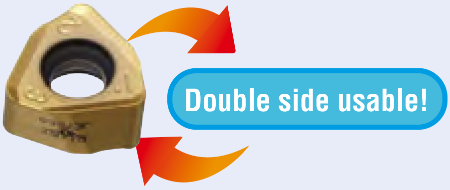
■ NOTE

1) The 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 Spindle speed and keep feed per tooth.
3) If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4) Use air blow.

SKS Extreme EXSKS TYPE

■ FEATURES

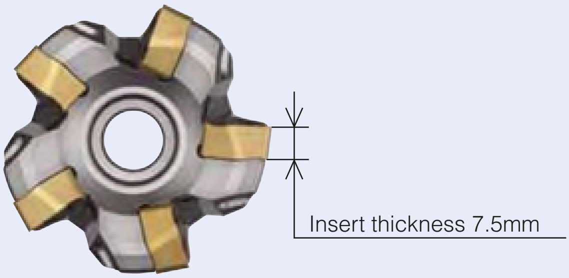
- **Achieve high metal removal rate by double side 6 cutting edges insert**



SKS Extreme

EXSKSTYPE

• Insert thickness 7.5mm gives 1.5 times stronger than conventional tools.

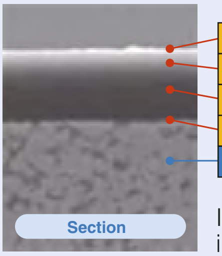


• Inclined dovetail seat prevents movement of insert.

• Stable high feed machining is possible even in case of L/Dc>6.

• High efficient pocket milling by excellent ramping and helical interpolation.

• PVD coated grade <JC7560> against thermal shock



- Ti based nitride layer with excellent welding resistance and low friction
- Al-Cr based nitride layer with oxidation and thermal resistance
- Ti-Al based nitride layer with wear and thermal resistance
- Adhesion layer
- Substrate with thermal crack resistance and thermal shock resistance

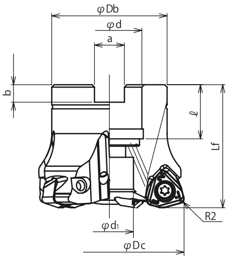
In case of rough milling, JC7560 improve heat fracture resistance and impact strength.

SKS Extreme EXSKSTYPE

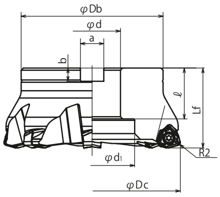
G-Body

Face Milling Pocket Milling Copy Milling Helical Interpolation Plunge Milling

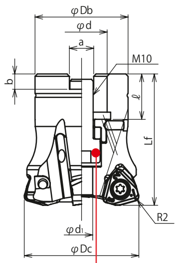
● Fig.1: Through coolant hole



● Fig. 2: Without coolant hole



● Fig. 3: Through coolant hole



Set bolt built into the cutter body

BODY

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)								Set Bolt		Weight (kg)	Fig.
				φDc	Lf	φDb	φd	φd1	a	b	ℓ				
Metric Bore	**EXSKS-4050R-22**	●	4	**50**	55	40	22	9.6	10.4	6.3	19	M10x1.5x25*	Head cap screw (JIS Standard)	0.3	3
	EXSKS-4052R-22	●	4	**52**	50	40	22	17	10.4	6.3	20	M10		0.4	1
	EXSKS-5063R-22	●	5	**63**	50	48	22	17	10.4	6.3	20	M10		0.5	1
	EXSKS-5063R-27	●	5	**63**	50	48	27	20	12.4	7	22	M12x1.75x30*		0.5	1
	EXSKS-5066R-27	●	5	**66**	50	48	27	20	12.4	7	22	M12x1.75x30*		0.5	1
	EXSKS-6080R-27	●	6	**80**	55	65	27	37	12.4	7	22	M12	Clamp bolt	0.9	2
	EXSKS-7100R-32	●	7	**100**	55	85	32	45	14.4	8	32	M16		1.7	2
	EXSKS-8125R-40	●	8	**125**	55	100	40	60	16.4	9	35	M20		2.7	2
	EXSKS-9160R-40	●	9	**160**	55	100	40	85	16.4	9	35	M20		3.9	2

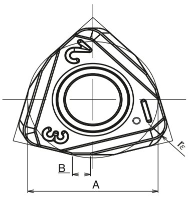
Note) 1. All cutters are supplied without inserts.
2. Please refer page C031-C032 for recommended cutting conditions.
3. ∗ mark shows: these cutter bodies are equipped with the set bolt because of the specified bolt size.
Except for these cutter bodies, please use the set bolt equipped with arbor.

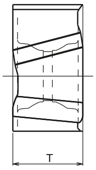
Clamp Screw	Recommended Torque (N·m)
CSW-513H	5.5

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

SKS Extreme EXSKSTYPE

INSERTS

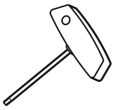




Cat. No.	Tolerance	Dimensions (mm)				PVD coated	
		A	T	B	rε	JC7560	JC8118
WNMU090720ZER-PM	**M**	14	7.66	1.94	2	●	●

10 inserts per case

PARTS

Clamp screw	**Wrench**
	
CSW-513H	A-20

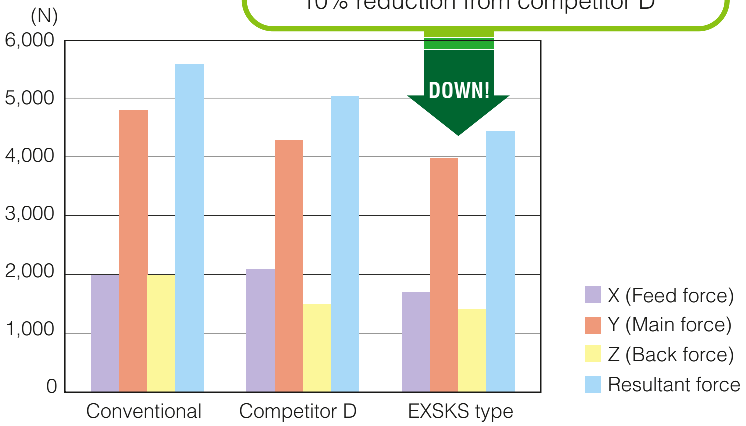
CUTTING PERFORMANCE

Cutting Force Comparison

Cutting condition

Mat'l: S50C (C50)
Tool dia.: φ63mm
Vc=150m/min, fz=1.5mm/t
ap=1.5mm, ae=40mm

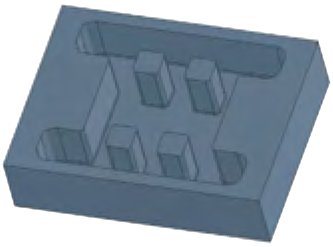
18% reduction from conventional tool
10% reduction from competitor D



■ CASE STUDIES

1. High feed machining on mold steel

Surface roughing

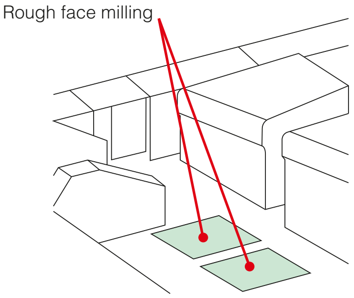


Result

EXSKS achieved high metal removal rate (Q=756cm^3/min) by 2.4 times compared with conventional tool and showed normal wear after machining 80min.

Work	Part name		Cavity mold
	Material		Mold steel (heat-treated)
	Hardness		30-34HRC
Tool	Tool No.		EXSKS-7100R
	Insert No.		WNMU090720ZER-PM (JC7560)
Cutting conditions	Cutting speed	n	325min^{-1}
		V_c	102m/min
	Feed speed	V_f	3,980mm/min
		f_z	1.75mm/t
	a_p (mm)		2.5mm
	a_e (mm)		76mm
	Coolant		Dry
	Machine		Vertical MC (24kW)

2. High feed machining on die structure part



Overhung length: 220mm

Result

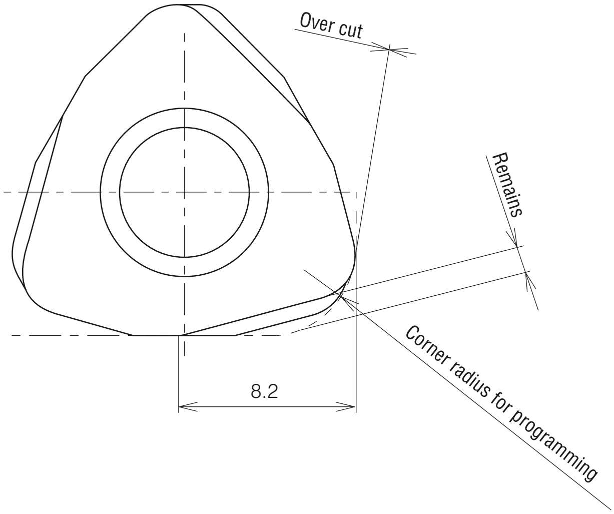
No chatter, very smooth cutting. Achieved high metal removal rate by 1.9 times and longer tool life by 1.5 times compared with competitor D. Able to machining for 5 hours.

Work	Part name		Die structure part
	Material		FC350 (GG35)
	Hardness		-
Tool	Tool No.		EXSKS-6080R
	Insert No.		WNMU090720ZER-PM (JC7560)
Cutting conditions	Cutting speed	n	500min^{-1}
		V_c	125m/min
	Feed speed	V_f	5,000mm/min
		f_z	1.66mm/t
	a_p (mm)		3mm
	a_e (mm)		47mm
	Coolant		Dry
	Machine		Double column MC

SKS Extreme

EXSKS TYPE

■ Definition of corner for programming

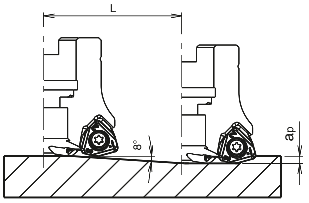


(mm)

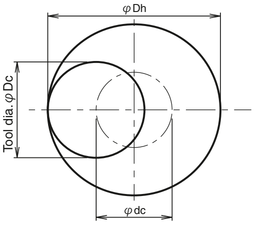
Corner radius for programming	Over cut	Remains
R3.0	0	1.41
R3.5	0	1.30
R4.0	0.025	1.19

■ Instructions for profile milling

● **Ramping**



● **Helical interpolation**



- ● Calculation of tool pass dia.

  φdc = φDh − φDc

  Tool pass dia. Bore dia. Tool dia.
- ● Depth of cut per one circle should not exceed max. depth of cut *a*p.
- ● 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 of cut ap (mm)	Ramping		Helical interpolation		Max. drilling depth (mm)
				Max.ramping angle θ°	Total cutting length L(m) at max. ap	Min. bore dia. *Dh* min (mm)	Max. bore dia. *Dh* max (mm)	
EXSKS-*050	50	33.7	3	2°24′	71.6	68	96	2
EXSKS-*052	52	35.7	3	2°24′	71.6	72	100	2
EXSKS-*063	63	46.7	3	3°	57.3	94	122	2
EXSKS-*066	66	49.7	3	2°42′	63.7	100	128	2
EXSKS-*080	80	63.6	3	2°18′	74.7	128	156	2
EXSKS-*100	100	83.6	3	1°42′	101.1	168	196	2
EXSKS-*125	125	108.5	3	1°18′	132.2	218	246	2
EXSKS-*160	160	143.5	3	1°	171.9	288	316	2

SKS Extreme

EXSKSTYPE

RECOMMENDED CUTTING CONDITIONS

Work materials	Grades	Tool dia. (mm)														
		50 /52					63 / 66					80				
		No of teeth 4N					No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel (C50,C55) Below 250HB	JC7560 (JC8118)	~150	2	950	7,600	12.4	~150	2	750	7,500	15.4	~150	2	600	7,200	18.7
		200	1.5	800	6,400	7.8	200	1.8	680	6,800	12.5	200	1.8	540	6,480	15.2
		250	1	650	3,900	3.2	250	1.5	600	6,000	9.2	250	1.8	480	5,760	13.5
		300	0.6	650	2,600	1.3	300	1	550	5,500	5.6	300	1.5	440	5,280	10.3
		350	—	—	—	—	350	0.6	550	4,125	2.5	350	1	440	5,280	6.9
		400	—	—	—	—	400	0.4	550	2,750	1.1	400	0.6	440	3,960	3.1
Die steel (1.2344,1.2379) Below 255HB	JC7560 (JC8118)	~150	2	950	7,600	12.4	~150	2	750	7,500	15.4	~150	2	600	7,200	18.7
		200	1.5	800	6,400	7.8	200	1.8	680	6,800	12.5	200	1.8	540	6,480	15.2
		250	1	650	3,900	3.2	250	1.5	600	6,000	9.2	250	1.8	480	5,760	13.5
		300	0.6	650	2,600	1.3	300	1	550	5,500	5.6	300	1.5	440	5,280	10.3
		350	—	—	—	—	350	0.6	550	4,125	2.5	350	1	440	5,280	6.9
		400	—	—	—	—	400	0.4	550	2,750	1.1	400	0.6	440	3,960	3.1
Mold steel (1.2311,P20) 30-36HRC	JC7560 (JC8118)	~150	2	830	6,640	12.3	~150	2	650	6,500	15.2	~150	2	520	6,240	18.5
		200	1.5	700	5,600	7.8	200	1.8	580	5,800	12.2	200	1.8	470	5,640	15.1
		250	1	570	3,420	3.2	250	1.5	520	5,200	9.1	250	1.8	420	5,040	13.5
		300	0.6	570	2,280	1.3	300	1	460	4,600	5.4	300	1.5	360	4,320	9.6
		350	—	—	—	—	350	0.6	460	3,450	2.4	350	1	360	4,320	6.4
		400	—	—	—	—	400	0.4	460	2,300	1.1	400	0.6	360	3,240	2.9
Mold steel (1.2311,P21) 38-43HRC	JC8118	~150	1.5	700	2,800	6.8	~150	1.5	550	2,750	8.4	~150	1.5	430	2,580	10.1
		200	1	600	2,400	3.9	200	1.2	500	2,500	6.1	200	1.2	390	2,340	7.3
		250	0.7	490	1,960	2.2	250	1	440	2,200	4.5	250	1.2	340	2,040	6.4
		300	0.4	490	980	0.6	300	0.7	380	1,900	2.7	300	1	300	1,800	4.7
		350	—	—	—	—	350	0.5	380	1,900	1.9	350	0.7	300	1,800	3.3
		400	—	—	—	—	400	—	—	—	—	400	0.4	300	1,800	1.9
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~150	1.5	510	2,040	6.6	~150	1.5	400	2,000	8.2	~150	1.5	320	1,920	10.0
		200	1	460	1,840	4.0	200	1.2	360	1,800	5.9	200	1.2	290	1,740	7.2
		250	0.7	420	1,680	2.5	250	1	320	1,600	4.4	250	1.2	260	1,560	6.5
		300	0.4	420	840	0.7	300	0.7	280	1,400	2.7	300	1	220	1,320	4.6
		350	—	—	—	—	350	0.5	280	1,400	1.9	350	0.7	220	1,320	3.2
		400	—	—	—	—	400	—	—	—	—	400	0.4	220	1,320	1.8
Grey cast iron (GG25, GG30) Below 300HB	JC8118 (JC7560)	~150	2.5	950	7,600	12.4	~150	2.5	750	7,500	15.4	~150	2.5	600	7,200	18.7
		200	2	800	6,400	8.3	200	2	680	6,800	11.1	200	2	540	6,480	13.5
		250	1.5	650	3,900	3.8	250	1.5	600	6,000	7.4	250	2	480	5,760	12.0
		300	1	650	2,600	1.7	300	1	550	5,500	4.5	300	1.5	440	5,280	8.2
		350	—	—	—	—	350	0.6	550	4,125	2.0	350	1	440	5,280	5.5
		400	—	—	—	—	400	0.4	550	2,750	0.9	400	0.6	440	3,960	2.5
Nodular cast iron (GGG50, GGG70) Below 300HB	JC8118	~150	2.5	950	7,600	12.4	~150	2.5	750	7,500	15.4	~150	2.5	600	7,200	18.7
		200	2	800	6,400	8.3	200	2	680	6,800	11.1	200	2	540	6,480	13.5
		250	1.5	650	3,900	3.8	250	1.5	600	6,000	7.4	250	2	480	5,760	12.0
		300	1	650	2,600	1.7	300	1	550	5,500	4.5	300	1.5	440	5,280	8.2
		350	—	—	—	—	350	0.6	550	4,125	2.0	350	1	440	5,280	5.5
		400	—	—	—	—	400	0.4	550	2,750	0.9	400	0.6	440	3,960	2.5
Stainless steel Below 250HB	JC7560	~150	2	950	5,700	14.8	~150	2	750	5,625	18.4	~150	2	600	5,400	22.5
		200	1.5	800	4,800	9.4	200	1.8	680	5,100	15.0	200	1.8	540	4,860	18.2
		250	1	650	2,600	3.4	250	1.5	600	4,500	11.1	250	1.8	480	4,320	16.2
		300	0.6	650	2,600	2.0	300	1	550	3,300	5.4	300	1.5	440	3,960	12.4
		350	—	—	—	—	350	0.6	550	2,750	2.7	350	1	440	3,168	6.6
		400	—	—	—	—	400	0.4	550	2,750	1.8	400	0.6	440	2,640	3.3

ℓ: Overhung length, a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

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 Spindle speed and keep feed per tooth.
3) If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4) Use air blow.

SKS Extreme EXSKSTYPE

RECOMMENDED CUTTING CONDITIONS

Work materials	Grades	Tool dia. (mm)														
		100					125					160				
		No. of teeth 7N					No. of teeth 8N					No. of teeth 9N				
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel (C50,C55) Below 250HB	JC7560 (JC8118)	~150	2	480	6,720	21.8	~150	2	380	6,080	24.7	~150	2	300	5,400	28.1
		200	2	430	6,020	19.6	200	2	340	5,440	22.1	200	2	270	4,860	25.3
		250	2	380	5,320	17.3	250	2	300	4,800	19.5	250	2	240	4,320	22.5
		300	1.5	350	4,900	11.9	300	2	280	4,480	18.2	300	2	220	3,960	20.6
		350	1.5	350	4,900	11.9	350	1.5	280	4,480	13.7	350	2	220	3,960	20.6
		400	1	350	4,900	8.0	400	1.5	280	4,480	13.7	400	1.5	220	3,960	15.4
Die steel (1.2344,1.2379) Below 255HB	JC7560 (JC8118)	~150	2	480	6,720	21.8	~150	2	380	6,080	24.7	~150	2	300	5,400	28.1
		200	2	430	6,020	19.6	200	2	340	5,440	22.1	200	2	270	4,860	25.3
		250	2	380	5,320	17.3	250	2	300	4,800	19.5	250	2	240	4,320	22.5
		300	1.5	350	4,900	11.9	300	2	280	4,480	18.2	300	2	220	3,960	20.6
		350	1.5	350	4,900	11.9	350	1.5	280	4,480	13.7	350	2	220	3,960	20.6
		400	1	350	4,900	8.0	400	1.5	280	4,480	13.7	400	1.5	220	3,960	15.4
Mold steel (1.2311,P20) 30-36HRC	JC7560 (JC8118)	~150	2	410	5,740	21.3	~150	2	330	5,280	24.5	~150	2	260	4,680	27.8
		200	2	370	5,180	19.2	200	2	300	4,800	22.3	200	2	230	4,140	24.6
		250	2	330	4,620	17.2	250	2	260	4,160	19.3	250	2	210	3,780	22.5
		300	1.5	280	3,920	10.9	300	2	230	3,680	17.1	300	2	180	3,240	19.3
		350	1.5	280	3,920	10.9	350	1.5	230	3,680	12.8	350	2	180	3,240	19.3
		400	1	280	3,920	7.3	400	1.5	230	3,680	12.8	400	1.5	180	3,240	14.4
Mold steel (1.2311,P21) 38-43HRC	JC8118	~150	1.5	350	2,450	11.9	~150	1.5	280	2,240	13.7	~150	1.5	220	1,980	15.4
		200	1.5	310	2,170	10.6	200	1.5	250	2,000	12.2	200	1.5	200	1,800	14.0
		250	1.2	280	1,960	7.6	250	1.5	220	1,760	10.7	250	1.5	180	1,620	12.6
		300	1	250	1,750	5.7	300	1.5	200	1,600	9.8	300	1.5	150	1,350	10.5
		350	1	250	1,750	5.7	350	1	200	1,600	6.5	350	1.5	150	1,350	10.5
		400	0.7	250	1,750	4.0	400	1	200	1,600	6.5	400	1	150	1,350	7.0
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~150	1.5	250	1,750	11.4	~150	1.5	200	1,600	13.0	~150	1.5	160	1,440	15.0
		200	1.5	230	1,610	10.5	200	1.5	180	1,440	11.7	200	1.5	150	1,350	14.0
		250	1.2	200	1,400	7.3	250	1.5	160	1,280	10.4	250	1.5	130	1,170	12.2
		300	1	180	1,260	5.5	300	1.5	140	1,120	9.1	300	1.5	110	990	10.3
		350	1	180	1,260	5.5	350	1	140	1,120	6.1	350	1.5	110	990	10.3
		400	0.7	180	1,260	3.8	400	1	140	1,120	6.1	400	1	110	990	6.9
Grey cast iron (GG25, GG30) Below 300HB	JC8118 (JC7560)	~150	2.5	480	6,720	21.8	~150	2.5	380	6,080	24.7	~150	2.5	300	5,400	28.1
		200	2.5	430	6,020	19.6	200	2.5	340	5,440	22.1	200	2.5	270	4,860	25.3
		250	2	380	5,320	13.8	250	2.5	300	4,800	19.5	250	2.5	240	4,320	22.5
		300	2	350	4,900	12.7	300	2	280	4,480	14.6	300	2.5	220	3,960	20.6
		350	1.5	350	4,900	9.6	350	1.5	280	4,480	10.9	350	2	220	3,960	16.5
		400	1	350	4,900	6.4	400	1.5	280	4,480	10.9	400	1.5	220	3,960	12.4
Nodular cast iron (GGG50, GGG70) Below 300HB	JC8118	~150	2.5	480	6,720	21.8	~150	2.5	380	6,080	24.7	~150	2.5	300	5,400	28.1
		200	2.5	430	6,020	19.6	200	2.5	340	5,440	22.1	200	2.5	270	4,860	25.3
		250	2	380	5,320	13.8	250	2.5	300	4,800	19.5	250	2.5	240	4,320	22.5
		300	2	350	4,900	12.7	300	2	280	4,480	14.6	300	2.5	220	3,960	20.6
		350	1.5	350	4,900	9.6	350	1.5	280	4,480	10.9	350	2	220	3,960	16.5
		400	1	350	4,900	6.4	400	1.5	280	4,480	10.9	400	1.5	220	3,960	12.4
Stainless steel Below 250HB	JC7560	~150	2	480	5,040	26.2	~150	2	380	4,560	29.6	~150	2	300	4,050	33.7
		200	2	430	4,515	23.5	200	2	340	4,080	26.5	200	2	270	3,645	30.3
		250	2	380	3,990	20.7	250	2	300	3,600	23.4	250	2	240	3,240	27.0
		300	1.5	350	3,675	14.3	300	2	280	3,360	21.8	300	2	220	2,970	24.7
		350	1.5	350	3,675	14.3	350	1.5	280	3,360	16.4	350	2	220	2,970	24.7
		400	1	350	3,675	9.6	400	1.5	280	3,360	16.4	400	1.5	220	2,970	18.5

ℓ: Overhung length, a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

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 Spindle speed and keep feed per tooth.
3) If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4) Use air blow.

High Feed Diemaster

SKSTYPE

SKS TYPE HIGH FEED DIEMASTER

ACHIEVED SUPER HIGH FEED UPTO 4mm PER TOOTH

Face Mill Type: φ40～φ160 | End Mill Type: φ16～φ50 | Modular Type : φ16～φ40

INCREASED PRODUCTIVITY
LOWER CUTTING FORCE !

● Face Mill Type

Face Milling | Pocket Milling | Copy Milling | Helical Interpolation | Plunge Milling

● End Mill Type/ Modular Type

Face Milling | Pocket Milling | Copy Milling | Helical Interpolation

G-Body

Adopted ultra-rigid "G-Body" improved body durability and tool life by 30% or more.

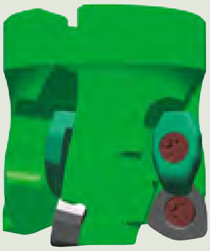
CARBIDE SHIM SKS-RSTYPE

•Carbide shim prevents body damage and improved security when insert was broken.
•Tool stability gives longer tool life.

■ FEATURES

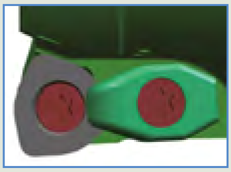
■ High efficient machining is possible with long overhung by controlling the cutting forces in case of deeper machining.

- Positive axial rake (+8 degree): Over φ20mm
- Adopted new double clamp system
- 3 cutting edges economical insert

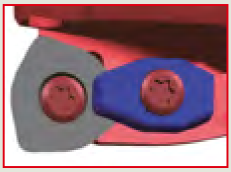


■ 10 type insert for severe interrupted cutting.

- Larger size Inserts version for severe interrupted cutting and large size cutter.
- In case of over 250mm overhung length and severe interrupted cutting, recommend to use 10 type insert.



WDMW080520ZTR



WDMW10X620ZTR

08 type insert (left) &
10 type insert (right)

High Feed Diemaster SKS TYPE

G-Body **Standard Type**

Face Milling Pocket Milling Copy Milling Helical Interpolation Plunge Milling

Fig.1 Through Coolant Hole

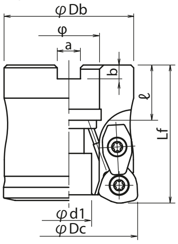


Fig.2 Without Coolant Hole

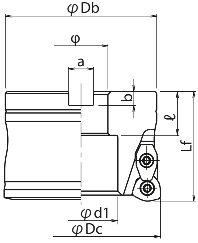
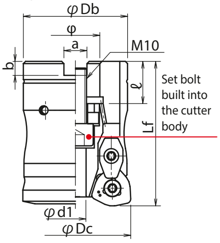


Fig.3 With Coolant Hole



■ BODY / FACE MILL TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)								Weight (kg)	Applicable Inserts	Fig.
				φDc	Lf	φDb	φd	φd1	a	b	ℓ			
Metric Bore	**SKS-3040R-06-16**	●	3	**40**	45	37	16	14	8.4	5.6	18	0.3	WD※※06...	1
	SKS-3050R-08-22	●	3	**50**	50	47	22	16.5	10.4	6.3	20	0.4	WD※※08...	1
	SKS-4050R-08-22	●	4	**50**	50	47	22	16.5	10.4	6.3	20	0.4		1
	SKS-4052R-08-22	●	4	**52**	50	47	22	17	10.4	6.3	20	0.4		1
	SKS-4063R-08-22	●	4	**63**	50	60	22	17	10.4	6.3	20	0.7		1
	SKS-4063R-08-27	●	4	**63**	50	60	27	20	12.4	7	22	0.7		1
	SKS-4066R-08-27	●	4	**66**	50	61	27	20	12.4	7	22	0.7		1
	SKS-5080R-08-27	●	5	**80**	55	76	27	37	12.4	7	22	1.6		2
	SKS-6100R-08-32	●	6	**100**	55	96	32	45	14.4	8	32	1.9		2
	SKS-3050R-10-22	☐	3	**50**	65	47	22	9.6	10.4	6.3	19	0.7	WD※※10...	3
	SKS-4063R-10-22	●	4	**63**	50	60	22	17	10.4	6.3	20	0.5		1
	SKS-4063R-10-27	●	4	**63**	50	60	27	20	12.4	7	22	0.5		1
	SKS-5080R-10-27	●	5	**80**	55	76	27	37	12.4	7	22	1.4		2
	SKS-6100R-10-32	●	6	**100**	55	96	32	45	14.4	8	32	1.7		2
	SKS-6125R-10-40	●	6	**125**	55	85	40	60	16.4	9	35	3.1		2
	SKS-7160R-10-40	●	7	**160**	55	120	40	85	16.4	9	35	4.6		2

Note) 1. All cutters are supplied without inserts.
2. Please refer page C027-C032 for recommended cutting conditions.
3. In case of using double clamp type please refer page C009.

Modular Head Type Please refer Page B012

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

High Feed Diemaster SKS TYPE

G-Body **Fine Pitch Type**

Face Milling | Pocket Milling | Copy Milling | Helical Interpolation | Plunge Milling

Fig.1 Through Coolant Hole

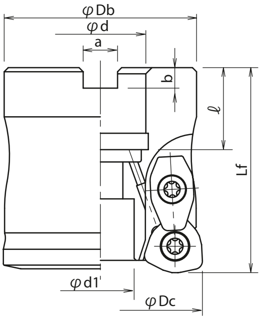
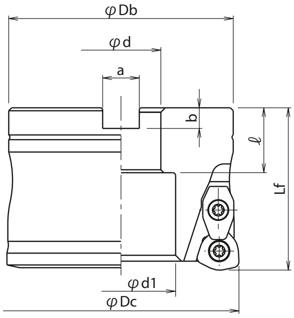


Fig.2 Without Coolant Hole



BODY/FACE MILL TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)								Weight (kg)	Applicable Inserts	Fig.
				φDc	Lf	φDb	φd	φd1	a	b	ℓ			
Metric Bore	**SKS-5050R-06-22**	●	5	**50**	50	47	22	16.5	10.4	6.3	20	0.4	WD※※06...	1
	SKS-5052R-06-22	●	5	**52**	50	47	22	17	10.4	6.3	20	0.6	WD※※06...	1
	SKS-5063R-08-22	●	5	**63**	50	60	22	17	10.4	6.3	20	0.7	WD※※08...	1
	SKS-5063R-08-27	●	5	**63**	50	60	27	20	12.4	7	22	0.7	WD※※08...	1
	SKS-5066R-08-27	●	5	**66**	50	61	27	20	12.4	7	22	0.7	WD※※08...	1
	SKS-6080R-08-27	●	6	**80**	55	76	27	37	12.4	7	22	1.2	WD※※08...	2

Note) 1. All cutters are supplied without inserts.
2. Please refer page C027-C032 for recommended cutting conditions.
3. In case of using double clamping mechanism type, please refer page C009.

Modular Head Type Please refer Page B012

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

High Feed Diemaster SKSTYPE

Through Coolant Hole

JCTMA 2007-045 ECO PRODUCT ★★★
(φ16, φ17)

Face Milling | Pocket Milling | Copy Milling | Helical Interpolation

Fig.1

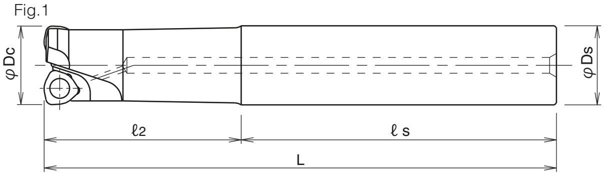
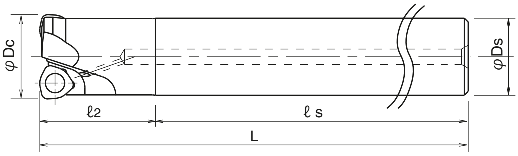


Fig.2



BODY/END MILL TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)					Applicable Inserts	Fig.
				φDc	ℓ2	ℓs	L	φDs		
Regular type	**SKS-2016-20-S15**	●	2	**16**	20	90	110	15	WO※※04...	2
	SKS-2016-50-S16	●	2	**16**	50	60	110	16		1
	SKS-2017-20-S16	●	2	**17**	20	90	110	16		2
	SKS-2020-50-S20	●	2	**20**	50	80	130	20	WD※※05...	1
	SKS-2021-50-S20	●	2	**21**	50	80	130	20		1
	SKS-2025-60-S25	●	2	**25**	60	80	140	25	WD※※06...	3
	SKS-2026-60-S25	●	2	**26**	60	80	140	25		3
	SKS-2032-70-S32	●	2	**32**	70	80	150	32	WD※※08...	3
	SKS-3032-70-S32	●	3	**32**	70	80	150	32	WD※※06...	3
Long type	**SKS-2016-20L-S15**	●	2	**16**	20	130	150	15	WO※※04...	2
	SKS-2016-70-S16	●	2	**16**	70	80	150	16		1
	SKS-2017-20L-S16	●	2	**17**	20	130	150	16		2
	SKS-2020-100-S20	●	2	**20**	100	80	180	20	WD※※05...	1
	SKS-2021-50L-S20	●	2	**21**	50	130	180	20		1
	SKS-2025-120-S25	●	2	**25**	120	80	200	25	WD※※06...	3
	SKS-2026-60L-S25	●	2	**26**	60	140	200	25		3

Note) 1. All cutters are supplied without inserts.
2. Please refer page C027-C029, C033-C034 for recommended cutting conditions.
3. In case of using double clamping mechanism type, please refer page C009.

Modular Head Type Please refer Page B012

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

High Feed Diemaster SKTYPE

Through Coolant Hole

Fig.3

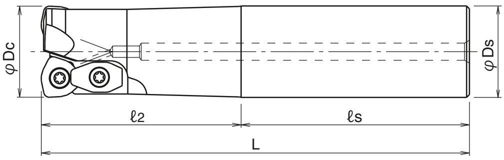
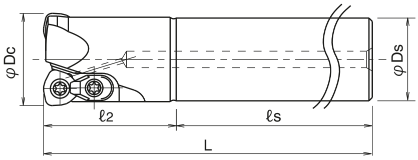


Fig.4



BODY/END MILL TYPE

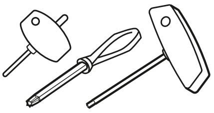
Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)					Applicable Inserts	Fig.
				φDc	ℓ2	ℓs	L	φDs		
Long type	**SKS-2032-120-S32**	●	2	**32**	120	80	200	32	WD※※08...	3
	SKS-3032-120-S32	●	3	**32**	120	80	200	32	WD※※06...	3
Extra Long	**SKS-2020-130-S20**	●	2	**20**	130	120	250	20	WD※※05...	1
	SKS-2021-50E-S20	□	2	**21**	50	200	250	20		1
	SKS-2025-180-S25	●	2	**25**	180	120	300	25	WD※※06...	3
	SKS-2026-60E-S25	□	2	**26**	60	240	300	25		3
	SKS-2032-180-S32	□	2	**32**	180	120	300	32	WD※※08...	3
	SKS-3032-180-S32	●	3	**32**	180	120	300	32	WD※※06...	3

Note) 1. All cutters are supplied without inserts.
2. Please refer page C027-C029, C033-C034 for recommended cutting conditions.
3. In case of using double clamping mechanism type, please refer page C009.

Modular Head Type Please refer Page B012

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

PARTS

Applicable Inserts	Clamp screw	Clamp set	Wrench
			
WO※※04...	TSW-2556H	–	A-08SD
WD※※05...	DSW-306H	–	A-10
WD※※06...	CSW-408H	DCM-18	A-15T FaceMillType A-15 EndMillType
WD※※08...	DSW-4510H	DCM-17	A-20 FaceMillType A-20SD EndMillType
WD※※10...	DSW-4512H	DCM-17	A-20

Clamp Screw	Recommended Torque (N·m)
TSW-2556H	0.9
DSW-306H	1.8
CSW-408H	3.6
DSW-4510H	6.0
DSW-4512H	6.0

High Feed Diemaster

SKSTYPE

INSERT WITHOUT CHIPBREAKER

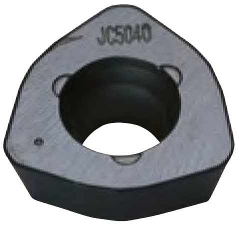


Fig.1

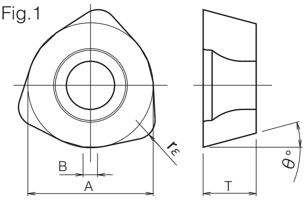


Fig.2

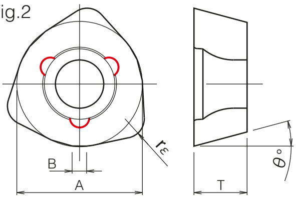


Fig.3

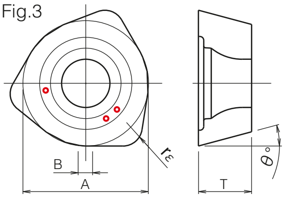


Fig.4

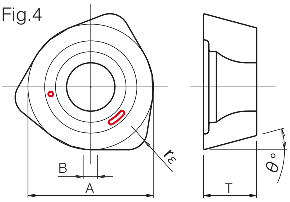


Fig.5

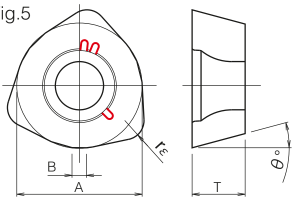


Fig.6

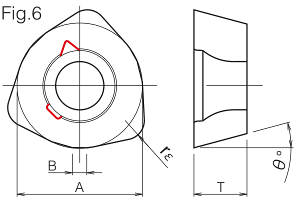


Fig.7

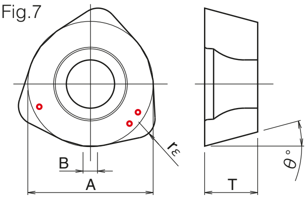
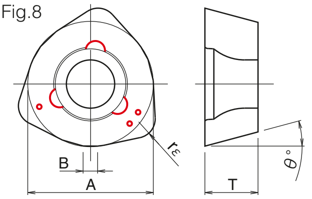


Fig.8



Cat.No.	Tolerance	Dimensions (mm)					PVD coated				
		A	T	B	rε	θ°	JC7560	JC8015	JC8050	JC8118	JC5040
WOMW04T215ZER	M	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		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
WDMW10X620ZER		16	6	2	2	15			● Fig.4		
WDMW10X620ZTR		16	6	2	2	15	● Fig.7	● Fig.7	● Fig.7	●	● Fig.8

10 inserts per case

◎ : First Choice, Good Condition ● : Standard stock items ☐ : Stock in Japan ○ : Soon to be deleted

High Feed Diemaster SKSTYPE

INSERT WITH CHIPBREAKER

PVD Coated

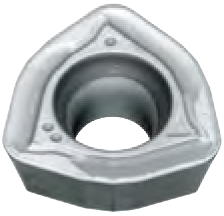


Fig.9

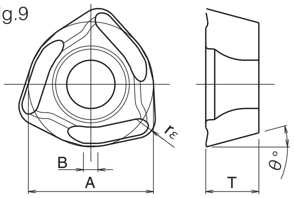


Fig.10

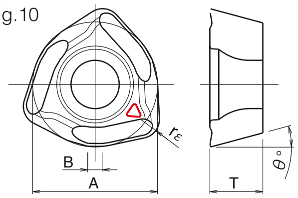
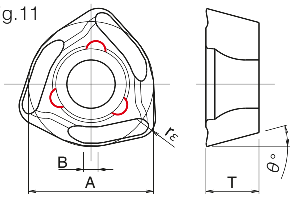


Fig.11



Cat. No.	Tolerance	Dimensions (mm)					PVD coated			
		A	T	B	rε	θ°	JC7560	JC8015	JC8050	JC8118
WOMT04T215ZER		6.5	2.8	0.8	1.5	13	● Fig.11	● Fig.9	● Fig.11	●
WDMT050316ZER		8	3.2	1	1.6	15	● Fig.10	● Fig.9	● Fig.10	●
WDMT06T320ZER	M	10	3.97	1.2	2	15	● Fig.10	● Fig.9	● Fig.10	●
WDMT080520ZER		13	5.5	1.5	2	15	● Fig.10	● Fig.9	● Fig.10	●
WDMT10X620ZER		16	6	2	2	15	● Fig.10	● Fig.9	● Fig.10	●

10 inserts per case

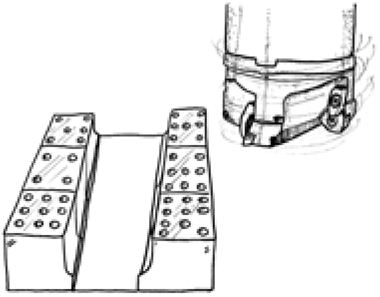
◎ : First Choice, Good Condition ● : Standard stock items ☐ : Stock in Japan ○ : Soon to be deleted

High Feed Diemaster SKSTYPE

CASE STUDIES

1. Machining tough die steel with bore for stamping die.

Overhung length: 200mm



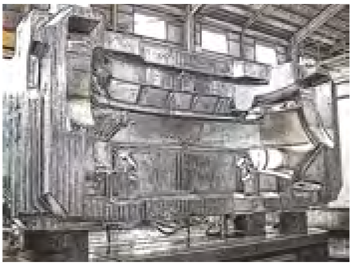
Result

Rough machining comparison among 3 competitors. Competitors got 60m & 90m tool life, SKS achieved 150m and was still able to continue.

Work	Part name	Stamping die
	Material	SKD11
	Hardness	Raw material
Tool	Tool No.	SKS-4063R-08
	Grade	WDMW080520ZTR, JC5040
Cutting conditions	Vc, (n)	178m/min (900min^{-1})
	Vf, (fz)	2,520mm/min (0.7mm/t)
	ap (mm)	1mm
	ae (mm)	40mm
	Coolant	Dry
	Machine	Vertical MC

2. Improved tool life on plastic mold.

Roughing
Metal removal rate: Q=115cm^3/
min Overhung length: 150mm



Result

Competitor‘s cutter (φ63-6N) got 80m tool life. After machining 160m, SKS showed normal wear (VB: only 0.09mm) and was still able to continue. SKS achieved over 2 times longer tool life compared with competitor‘s cutter.

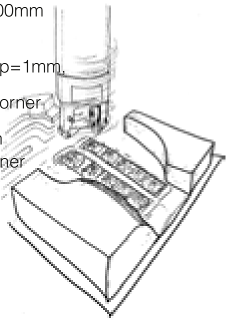
Work	Part name	Plasticmold
	Material	NAK80 Pre-hardened steel
	Hardness	39HRC
Tool	Tool No.	SKS-4063R-10-22 (4N)
	Grade	WDMW10X620ZER, JC5118
Cutting conditions	Vc, (n)	138m/min, (700min^{-1})
	Vf, (fz)	3,200mm/min, (1.14mm/t)
	ap (mm)	0.8mm
	ae (mm)	45mm
	Coolant	Air blow
	Machine	Horizontal MC

3. Improved efficiency & tool life on forging die by modular head + carbide shank.

Overhung length: 100mm

Radius cutter:
Vf=2,800mm/min, ap=1mm,
Q=70cc/min,
Tool life: 45-60min/corner

SKS:Q=122.5cc/min
Tool life: 190min/corner



Result

Improved the efficiency by 1.75 times and tool life by 3 times or more compared with radius cutter by combination of modular head + carbide shank.

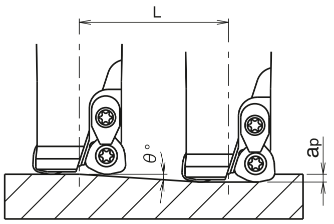
Work	Part name	Forging die
	Material	1.2714 Hot work tool steel
	Hardness	285HB
Tool	Tool No.	MSH-3032-M16 + MSN-M16-55-S32C
	Grade	WDMW06T320ZTR, JC5040
Cutting conditions	Vc, (n)	180m/min, ($1{,}790\text{min}^{-1}$)
	Vf, (fz)	7,000mm/min, (3.9mm/rev, 1.3mm/t)
	ap (mm)	0.7mm
	ae (mm)	25mm
	Coolant	Air blow
	Machine	Vertical MC 11kw

High Feed Diemaster

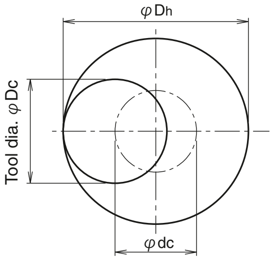
SKSTYPE

■ Instructions for profile milling

● Ramping



● Helical interpolation



- Calculation of tool pass dia.

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

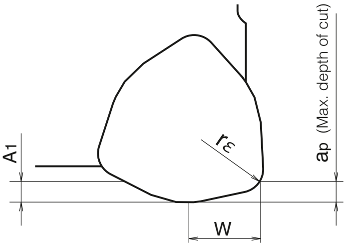
  Tool pass dia. Bore dia. Tool dia.
- Depth of cut per one circle should not exceed max. depth of cut ap.
- Down cutting is recommended & tool pass rotation should be counterclockwise.

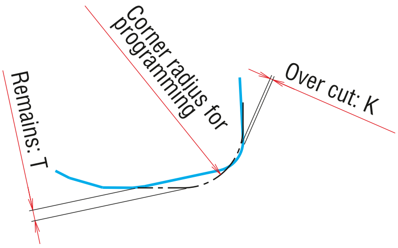
- In case of ramping and helical interpolation, apply 70% or less feed speed from standard cutting condition table.
- In case of drilling, apply 50% or less Z axis feed speed from standard cutting condition table.
- Long continous chips may come out in case of drilling, confirm the safe cutting conditions.

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Max. drilling depth (mm)
				Max. ramping angle θ°	Total cutting length L (mm) at max.ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
SKS-2016	16	10.5	0.8	2°30′	20.6	25	29	0.3
SKS-2017	17	11.5	0.8	2°	25.7	27	31	0.3
SKS-2020	20	12.7	1.2	3°	22.9	30	37	0.5
SKS-2021	21	13.7	1.2	2°30′	27.5	32	39	0.5
SKS-2025	25	15.9	1.5	4°	21.5	33	46	1
SKS-2026	26	16.9	1.5	3°30′	24.5	35	48	1
SKS-2030	30	20.9	1.5	2°30′	34.4	43	56	1
SKS-2032	32	20	2	4°	28.6	41	60	1.5
SKS-3032	32	22.8	1.5	2°15′	38.1	47	60	1
SKS-3040-06	40	30.8	1.5	1°36′	53.7	63	76	1
SKS-*050	50	38	2	2°	57.3	77	96	1.5
SKS-3050-*-10	50	35.1	2.3	2°18′	57.3	71	96	1.8
SKS-5050-06	50	40.8	1.5	1°09′	59.8	83	96	1
SKS-*052	52	40	2	2°	57.3	81	100	1.5
SKS-5052-06	52	42.8	1.5	1°06′	62.5	87	100	1
SKS-*063	63	51	2	1°30′	76.4	103	122	1.5
SKS-*063-10	63	48	2.3	2°24′	48.8	97	122	1.8
SKS-*066	66	54	2	1°42′	81.8	109	128	1.5
SKS-*080	80	68	2	1°12′	95.5	137	156	1.5
SKS-*080-10	80	65	2.3	2°	65.9	131	156	1.8
SKS-*100	100	88	2	1°	114.6	177	196	1.5
SKS-*100-10	100	85	2.3	1°30′	87.8	171	196	1.8
SKS-*125-10	125	110	2.3	1°12′	109.8	221	246	1.8
SKS-*160-10	160	145	2.3	0°54′	146.4	291	316	1.8

High Feed Diemaster SKTYPE

■ Definition of corner radius for programming





	Corner radius for programming	T	K	rε	W	ap	A1
04Type	R1.5 (Recommended)	0.29	0	1.5	2.7	0.8	0.8
	R2	0.19	0.04				
05Type	R2 (Recommended)	0.35	0	1.6	3.6	1.25	1.2
	R2.5	0.25	0.12				
06Type	R2.5 (Recommended)	0.44	0	2.0	4.5	1.5	1.5
	R3	0.34	0.1				
08Type	R3 (Recommended)	0.63	0	2.0	6.0	2.0	2.0
	R3.5	0.54	0.14				
	R4	0.45	0.32				
10Type	R3 (Recommended)	0.91	0	2.0	7.4	2.5	2.5
	R3.5	0.82	0.05				
	R4	0.72	0.19				

■ Guidelines for selection of the Inserts

Work Materials	Carbon steel S50C, S55C (C50, C55) Below 250HB			Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC			Mold steel NAK80, HPM1 (1.2311, P20) 38-43HRC		Die steel SKD61, SKD11 (1.2344,1.2379) Below 250HB		
Cat. No. / Grades	**JC5040**	**JC8050**	**JC7560**	**JC5118**	**JC8050**	**JC7560**	**JC5118**	**JC8015**	**JC5040**	**JC8050**	**JC7560**
WOMW04T215ZER	○	○	◎	◎	●	○	◎	○	○	○	◎
WOMT04T215ZER		☆	☆	☆	☆		☆	☆		☆	☆
WDMW050316ZTR	○	○	◎	○	●	○	○	○	○	○	◎
WDMW050316ZER		●		◎			◎			●	
WDMT050316ZER		☆	☆	☆	☆	☆	☆	☆		☆	☆
WDMW06T320ZTR	○	○	◎	○	●	○	○	○	○	○	◎
WDMW06T320ZER		●		◎			◎			●	
WDMT06T320ZER		☆	☆	☆	☆	☆	☆	☆		☆	☆
WDMW080520ZTR	○	○	◎	○	●	○	○	○	○	○	◎
WDMW080520ZER		●		◎			◎			●	
WDMT080520ZER		☆	☆	☆	☆	☆	☆	☆		☆	☆
WDMW10X620ZTR	○	○	◎	○	●	○	○	○	○	○	◎
WDMW10X620ZER		●		◎			◎			●	
WDMT10X620ZER		☆	☆	☆	☆	☆	☆	☆		☆	☆

High Feed Diemaster SKSTYPE

Work Materials	Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB			Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300 HB		Stainless steel SUS304 Below 250HB		
Cat. No. / Grades	**JC5118**	**JC8015**	**JC7560**	**JC5118**	**JC8015**	**JC8050**	**JC7560**	**JC5118**
WOMW04T215ZER	◎	○	○	◎	○	●		○
WOMT04T215ZER	☆	☆	☆	☆	☆	○	◎	
WDMW050316ZTR	●	○	○	●	○			
WDMW050316ZER	◎			◎		●		○
WDMT050316ZER	☆	☆	☆	☆	☆	○	◎	
WDMW06T320ZTR	●	○	○	●	○			
WDMW06T320ZER	◎			◎		●		○
WDMT06T320ZER	☆	☆	☆	☆	☆	○	◎	
WDMW080520ZTR	●	○	○	●	○			
WDMW080520ZER	◎			◎		●		○
WDMT080520ZER	☆	☆	☆	☆	☆	○	◎	
WDMW10X620ZTR	●	○	○	●	○			
WDMW10X620ZER	◎			◎		●		○
WDMT10X620ZER	☆	☆	☆	☆	☆	○	◎	

Work Materials	Hardened die steel SKD61, DAC, DHA (1.2344,1.2379) 40-50HRC	
Cat. No. / Grades	**JC5118**	**JC8015**
WOMW04T215ZER	◎	○
WOMT04T215ZER	×	×
WDMW050316ZTR	●	○
WDMW050316ZER	◎	
WDMT050316ZER	×	×
WDMW06T320ZTR	●	○
WDMW06T320ZER	◎	
WDMT06T320ZER	×	×
WDMW080520ZTR	●	○
WDMW080520ZER	◎	
WDMT080520ZER	×	×
WDMW10X620ZTR	●	○
WDMW10X620ZER	◎	
WDMT10X620ZER	×	×

- WD (O) MW Type: Without chipbreaker
- WD (O) MT Type: With chipbreaker

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

High Feed Diemaster SKTYPE

RECOMMENDED CUTTING CONDITIONS

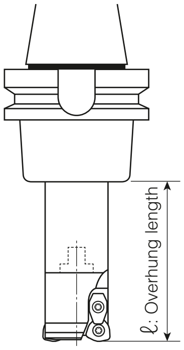
FACE MILL TYPE

Work Materials	Insert Grades	Over-hung Length ℓ (mm)	Tool dia. (mm)															
			40				50/52											
			No. of teeth 3N				No. of teeth 3N				No. of teeth 4N				No. of teeth 5N			
			a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S55C, S50C (C50, C55) Below 250HB	JC7560 (JC5040) (JC8050)	150	0.8	1,200	3,600	4.0	1.2	830	3,730	8	1.2	830	4,970	10.7	1	950	6,500	11.2
		200	0.6	800	3,000	2.5	1	700	3,150	5.6	1	700	4,200	7.5	0.8	950	6,000	8.3
		250	0.4	600	2,700	1.5	1	570	2,570	4.6	1	570	3,420	6.1	0.6	830	5,240	5.4
		300	–	–	–	–	0.6	570	3,420	3.7	0.6	570	3,990	4.3	0.4	760	4,800	3.3
		350	–	–	–	–	0.4	570	3,420	2.5	0.4	570	3,990	2.9	0.3	760	4,800	2.5
		400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-40HRC	JC5118 (JC7560) (Below 36HRC)	150	0.8	1,200	3,600	4.4	1.2	830	3,730	8.6	1.2	830	4,980	11.5	1	950	6,500	12.5
		200	0.6	800	3,000	2.8	1	700	3,150	6.1	1	700	4,200	8.1	0.8	950	6,000	9.2
		250	0.3	600	2,700	1.2	0.8	570	2,570	4	0.8	570	3,420	5.3	0.6	830	5,240	6
		300	–	–	–	–	0.5	570	2,900	2.8	0.5	570	3,420	3.3	0.4	760	4,800	3.7
		350	–	–	–	–	0.3	570	2,900	1.7	0.3	570	3,420	2	0.3	760	4,800	2.8
		400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC5040) (JC8050)	150	0.8	1,200	3,600	4.1	1.2	830	3,730	8	1.2	830	4,980	10.7	1	950	6,500	11.6
		200	0.6	800	3,000	2.6	1	700	3,150	5.6	1	700	4,200	7.5	0.8	950	6,000	8.6
		250	0.3	600	2,700	1.2	0.8	570	2,570	3.7	0.8	570	3,420	4.9	0.6	830	5,240	5.6
		300	–	–	–	–	0.5	570	2,900	2.6	0.5	570	3,420	3.1	0.4	760	4,800	3.4
		350	–	–	–	–	0.3	570	2,900	1.6	0.3	570	3,420	1.8	0.3	760	4,800	2.6
		400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8015	100	0.8	640	1,500	2.7	1	570	1,720	4.8	1	570	2,280	6.3	0.8	600	3,000	6.7
		150	0.6	500	1,200	1.6	0.8	450	1,340	3	0.8	450	1,800	4	0.6	480	2,160	3.6
		200	0.3	400	960	0.6	0.6	380	1,150	1.9	0.6	380	1,520	2.5	0.4	400	1,800	2
		250	–	–	–	–	0.4	380	920	1	0.4	380	1,220	1.4	0.3	400	1,800	1.5
		300	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118 JC8015 (JC7560)	150	1.2	1,000	4,500	5.5	1.5	830	4,480	8.6	1.5	830	5,980	11.5	1.2	950	7,600	11.7
		200	0.8	800	3,600	3.0	1.2	700	3,780	6.1	1.2	700	5,040	8.1	1	950	7,120	9.1
		250	0.5	600	2,700	1.4	1.2	570	3,080	4.7	1.2	570	4,100	6.3	1	830	6,220	8
		300	–	–	–	–	0.8	570	3,420	3.5	0.8	570	4,560	4.7	0.6	760	5,700	4.4
		350	–	–	–	–	0.6	570	3,420	2.6	0.6	570	4,560	3.5	0.5	760	5,700	3.7
		400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stainless steel SUS304 Below 250HB	JC7560 (JC5118) (JC8050)	150	0.8	1,200	3,600	4.4	1.2	950	3,730	8.6	1.2	950	4,980	11.5	1	950	6,000	11.5
		200	0.6	800	3,000	2.8	1.0	800	3,150	6.0	1.0	800	4,200	8.1	0.8	950	5,260	8.1
		250	0.3	600	2,250	1.0	0.8	570	2,250	3.5	0.8	570	3,000	4.6	0.6	830	4,600	5.3
		300	–	–	–	–	0.5	570	2,250	2.2	0.5	570	3,000	2.9	0.4	760	4,210	3.2
		350	–	–	–	–	0.3	570	2,250	1.3	0.3	570	3,000	1.7	0.3	760	4,210	2.4
		400	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case of 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 a_p, n, V_f.
6) In case of over 250mm overhung length and severe interrupted cutting, use 10 type insert cutter.
7) In case of unfavourable conditions, insert grade JC8050 is recommended.



High Feed Diemaster

SKTYPE

RECOMMENDED CUTTING CONDITIONS

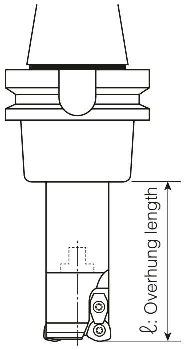
FACE MILL TYPE

Work Materials	Insert Grades	Over-hung Length ℓ (mm)	Tool dia. (mm)															
			63				63/66								80			
			No. of teeth 3N				No. of teeth 4N				No. of teeth 5N				No. of teeth 5N			
			a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S55C, S50C (C50, C55) Below 250HB	JC7560 (JC5040) (JC8050)	150	1.2	760	4,050	13.8	1.2	760	5,400	14.6	1	830	7,000	15.2	1.2	720	5,400	18.5
		200	1.2	680	3,060	9	1.2	680	4,090	11	1	830	6,200	13.5	1.2	600	4,500	15.4
		250	1	600	2,700	6.1	1	600	3,600	8.1	0.8	830	6,200	10.8	1.2	520	3,900	13.4
		300	1	460	2,050	5.1	1	460	2,730	6.8	0.6	610	4,560	5.9	1	440	3,300	9.4
		350	0.8	460	2,390	4.3	0.8	460	3,190	5.7	0.5	610	4,560	5	1	360	2,700	7.7
		400	0.4	460	2,730	2.5	0.4	460	3,640	3.3	0.3	610	4,560	3	0.6	360	2,700	4.6
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-40HRC	JC5118 (JC7560) (Below 36HRC)	150	1.2	760	3,420	9.9	1.2	760	4,560	13.3	1	830	6,200	15	1.2	600	4,500	16.6
		200	1.2	680	3,060	8.9	1.2	680	4,080	11.9	1	830	6,200	15	1.2	520	3,900	14.4
		250	1	600	2,700	6.5	1	600	3,600	8.7	0.8	830	6,200	12	1.2	440	3,300	12.2
		300	0.8	460	2,050	4	0.8	460	2,730	5.3	0.6	610	4,560	6.6	1	360	2,700	8.3
		350	0.6	460	2,390	3.5	0.6	460	3,090	4.5	0.5	610	4,560	5.5	0.8	360	2,700	6.6
		400	0.4	460	2,390	2.3	0.4	460	3,090	3	0.3	610	4,560	3.3	0.6	360	2,700	5
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC5040) (JC8050)	150	1.2	760	3,420	9.2	1.2	760	4,560	12.3	1	830	6,200	14	1.2	600	4,500	15.4
		200	1.2	680	3,060	8.3	1.2	680	4,080	11	1	830	6,200	14	1.2	520	3,900	13.4
		250	1	600	2,700	6.1	1	600	3,600	8.1	0.8	830	6,200	11.2	1.2	440	3,300	11.3
		300	0.8	460	2,050	3.7	0.8	460	2,730	4.9	0.6	610	4,560	6.2	1	360	2,700	7.7
		350	0.6	460	2,390	3.2	0.6	460	3,090	4.2	0.5	610	4,560	5.1	0.8	360	2,700	6.2
		400	0.4	460	2,390	2.2	0.4	460	3,090	2.8	0.3	610	4,560	3.1	0.6	360	2,700	4.6
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8015	100	1	450	1,350	4.7	1	450	1,800	6.3	0.8	480	2,400	6.7	1	360	1,800	8
		150	1	380	1,140	4	1	380	1,520	5.3	0.8	400	2,000	5.6	1	360	1,800	8
		200	0.8	380	1,140	3.2	0.8	380	1,520	4.3	0.6	400	2,000	4.2	1	300	1,500	6.7
		250	0.7	300	900	2.2	0.7	300	1,200	2.9	0.5	320	1,600	2.8	0.9	240	1,200	4.8
		300	0.5	300	720	1.3	0.5	300	960	1.7	0.4	320	1,280	1.8	0.7	240	960	3
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118 JC8015 (JC7560)	150	1.5	910	4,910	11.9	1.5	910	6,550	15.9	1.2	910	8,200	15.9	1.5	720	6,480	19.9
		200	1.5	680	3,670	8.9	1.5	680	4,900	11.9	1.2	910	7,500	14.5	1.5	600	5,400	16.6
		250	1.5	600	3,150	7.6	1.5	600	4,200	10.2	1.2	660	5,450	10.6	1.5	520	4,680	14.4
		300	1.2	460	2,480	4.8	1.2	460	3,310	6.4	1	600	4,950	8	1.5	440	3,960	12.2
		350	1	460	2,760	4.5	1	460	3,680	5.9	0.8	600	4,950	6.4	1.2	360	4,320	10.6
		400	0.6	460	2,760	2.7	0.6	460	3,680	3.6	0.5	600	4,950	4	0.8	360	4,320	7.1
Stainless steel SUS304 Below 250HB	JC7560 (JC5118) (JC8050)	150	1,2	760	3,000	8.7	1.2	760	4,000	11.6	1	830	5,440	13.2	1.2	600	3,900	14.4
		200	1,2	680	2.670	7.8	1.2	680	3,560	10.3	1	830	5,440	13.2	1.2	520	3,380	12.5
		250	1,0	600	2,350	5.7	1.0	600	3,130	7.6	0.8	830	5,440	10.5	1.2	440	2,860	10.5
		300	0.8	460	1,800	3.5	0.8	460	2,400	4.6	0.6	610	4,000	5.8	1.0	360	2,340	7.2
		350	0.6	460	1,800	2.6	0.6	460	2,400	3.5	0.5	610	4,000	4.8	0.8	360	2,340	5.8
		400	0.4	460	1,800	1.8	0.4	460	2,400	2.3	0.3	610	4,000	2.9	0.6	360	2,340	4.3

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case of 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 a_p, n, V_f.
6) In case of over 250mm overhung length and severe interrupted cutting, use 10 type insert cutter.
7) In case of unfavourable conditions, insert grade JC8050 is recommended.



High Feed Diemaster SKSTYPE

RECOMMENDED CUTTING CONDITIONS

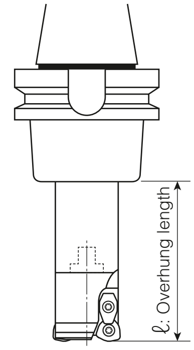
FACE MILL TYPE

Work Materials	Insert Grades	Over-hung Length ℓ (mm)	Tool dia.(mm)															
			80				100				125				160			
			No. of teeth 6N				No. of teeth 6N				No. of teeth 6N				No. of teeth 7N			
			a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S55C, S50C (C50, C55) Below 250HB	JC7560 (JC5040) (JC8050)	150	1	720	6,900	19.1	1.2	570	5,130	22	1.5	460	4,140	27.7	1.5	360	3,780	32.4
		200	1	720	6,400	17.7	1.2	480	4,320	18.5	1.5	460	4,140	27.7	1.5	360	3,780	32.4
		250	0.8	720	6,400	14.1	1.2	420	3,730	16	1.5	400	3,600	24.1	1.5	360	3,780	32.4
		300	0.6	480	4,270	7.1	1	350	3,150	11.3	1.5	380	3,420	22.9	1.5	320	3,360	28.8
		350	0.5	480	4,270	5.9	1	290	2,610	9.3	1.2	380	3,420	18.3	1.5	300	3,150	27
		400	0.3	480	4,270	3.5	0.6	290	2,610	5.6	1	380	3,420	15.3	1.2	300	3,150	21.6
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-40HRC	JC5118 (JC7560) (Below 36HRC)	150	1	720	6,400	19.7	1.2	480	4,320	19.9	1.5	400	3,000	21.6	1.5	320	2,800	25.8
		200	1	720	6,400	19.7	1.2	420	3,780	17.4	1.5	400	3,000	21.6	1.5	320	2,800	25.8
		250	0.8	720	6,400	15.8	1.2	350	3,150	14.5	1.5	380	2,850	20.6	1.5	320	2,800	25.8
		300	0.6	480	4,270	7.9	1	290	2,610	10	1.2	350	2,630	15.2	1.5	280	2,450	22.6
		350	0.5	480	4,270	6.6	0.8	290	2,610	8	1	350	2,630	12.6	1.2	280	2,450	18.1
		400	0.3	480	4,270	3.9	0.6	290	2,610	6	0.8	350	2,630	10.1	1	280	2,450	15.1
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC5040) (JC8050)	150	1	720	6,900	19.7	1.2	480	4,320	18.5	1.5	400	3,000	20.1	1.5	320	2,800	24
		200	1	720	6,400	18.3	1.2	420	3,780	16.2	1.5	400	3,000	20.1	1.5	320	2,800	24
		250	0.8	720	6,400	14.6	1.2	350	3,150	13.5	1.5	380	2,850	19.1	1.5	320	2,800	24
		300	0.6	480	4,270	7.3	1	290	2,610	9.3	1.2	350	2,630	14.1	1.5	280	2,450	21
		350	0.5	480	4,270	6.1	0.8	290	2,610	7.5	1	350	2,630	11.7	1.2	280	2,450	16.8
		400	0.3	480	4,270	3.7	0.6	290	2,610	5.6	0.8	350	2,630	9.4	1	280	2,450	14
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8015	100	0.8	380	2,280	8.1	1	290	1,740	9.7	1	230	1,380	9.6	1	180	1,260	11.2
		150	0.8	380	1,900	6.8	1	290	1,740	9.7	1	230	1,380	9.6	1	180	1,260	11.2
		200	0.7	380	1,900	5.9	1	240	1,440	8	1	230	1,380	9.6	1	180	1,260	11.2
		250	0.6	250	1,500	4	0.9	190	1,140	5.7	1	190	1,140	7.9	1	150	1,050	9.3
		300	0.5	250	1,200	2.7	0.7	190	910	3.5	0.8	190	1,140	6.3	0.8	150	1,050	7.4
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118 JC8015 (JC7560)	150	1.2	720	8,000	19.7	1.5	570	6,160	23.7	1.8	420	4,500	26	1.8	330	4,160	30.7
		200	1.2	720	7,130	17.6	1.5	480	5,180	19.9	1.8	420	4,500	26	1.8	330	4,160	30.7
		250	1.2	520	5,150	12.7	1.5	420	4,480	17.2	1.8	380	4,100	23.7	1.8	330	4,160	30.7
		300	1.2	470	4,650	11.4	1.5	350	3,780	14.5	1.5	380	4,100	19.7	1.8	300	3,780	27.9
		350	1	470	4,650	9.5	1.2	290	4,180	12.9	1.2	350	3,780	14.5	1.5	300	3,780	23.3
		400	0.6	470	4,650	5.7	0.8	290	4,180	8.6	1	350	3,780	12.1	1.2	270	3,400	16.7
Stainless steel SUS304 Below 250HB	JC7560 (JC5118) (JC8050)	150	1	720	5,550	17.1	1.2	480	3,750	17.3	1.5	380	2,850	20.6	1.5	300	2,630	24.3
		200	1	720	5,550	17.1	1.2	420	3,280	15.1	1.5	380	2,850	20.6	1.5	300	2,630	24.3
		250	0.8	720	5,550	13.7	1.2	350	2,730	12.6	1.5	350	2,630	19	1.5	300	2,630	24.3
		300	0.6	480	3,700	6.8	1.0	290	2,270	8.7	1.2	320	2,400	13.8	1.5	270	2,360	21.8
		350	0.5	480	3,700	5.7	0.8	290	2,270	7.0	1	320	2,400	11.5	1.2	270	2,360	17.4
		400	0.3	480	3,700	3.4	0.6	290	2,270	5.2	0.8	320	2,400	9.2	1	270	2,360	14.5

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case of 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 a_p, n, V_f.
6) In case of over 250mm overhung length and severe interrupted cutting, use 10 type insert cutter.
7) In case of unfavourable conditions, insert grade JC8050 is recommended.



High Feed Diemaster SKS TYPE

RECOMMENDED CUTTING CONDITIONS

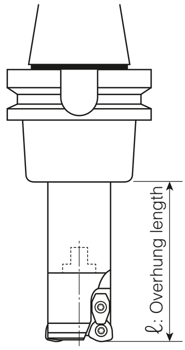
END MILL TYPE

Work Materials	Insert Grades	Tool dia. (mm)											
		16/17				20/21/22				25/26			
		No. of teeth 2N				No. of teeth 2N				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)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S55C, S50C (C50, C55) Below 250HB	JC7560 (JC5040) (JC8050)	30	0.6	3,580	3,580	70	0.7	2,850	4,600	70	0.7	2,300	4,600
		70	0.5	2,980	2,380	120	0.5	2,400	3,800	120	0.5	1,900	3,800
		100	0.4	2,580	1,550	190	0.3	1,250	1,500	220	0.3	1,000	1,600
Moldsteel HPM7, PX5, NAK80, P20 (1.2311,P20) 30-43HRC	JC5118 (JC7560) (Below 36HRC)	30	0.6	3,580	3,580	70	0.7	2,850	4,600	70	0.7	2,300	4,600
		70	0.5	2,980	2,380	120	0.5	2,400	3,800	120	0.5	1,900	3,800
		100	0.4	2,580	1,550	190	0.3	1,250	1,500	220	0.3	1,000	1,600
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC5040) (JC8050)	30	0.6	3,580	3,580	70	0.7	2,850	4,600	70	0.7	2,300	4,600
		70	0.5	2,980	2,380	120	0.5	2,400	3,800	120	0.5	1,900	3,800
		100	0.4	2,580	1,550	190	0.3	1,250	1,500	220	0.3	1,000	1,600
Stainless steel SUS304 Below 250HB	JC7560 (JC5118) (JC8050)	30	0.5	2,980	2,980	70	0.7	2,400	3,840	70	0.7	1,900	3,800
		70	0.3	2,980	2,380	120	0.5	2,400	3,840	120	0.5	1,900	3,800
		100	0.3	2,580	1,550	190	0.3	1,250	1,500	220	0.3	1,000	1,600
Hardened die steel SKD61, DAC, DHA (1.23441, 1.2379) 40-50HRC	JC5118 JC8015	30	0.3	2,380	2,380	70	0.5	1,100	1,100	70	0.6	1,000	1,400
		70	0.2	2,380	1,900	120	0.3	1,100	1,100	120	0.4	1,000	1,200
		100	–	–	–	190	–	–	–	220	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118 JC8015 (JC7560)	30	0.7	3,580	3,580	70	0.8	1,900	3,000	70	1	1,650	3,300
		70	0.6	2,980	2,380	120	0.6	1,750	2,800	120	0.8	1,400	2,800
		100	0.5	2,580	1,550	190	0.4	1,400	2,200	220	0.5	1,150	2,300

ℓ: Overhung length, a_p: 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. (In case of BT40 or below, recommend to use tool dia. below φ33)
2) In case of 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 a_p, n, V_f.
6) In case of unfavourable conditions, insert grade JC8050 is recommended.



High Feed Diemaster SKSTYPE

RECOMMENDED CUTTING CONDITIONS

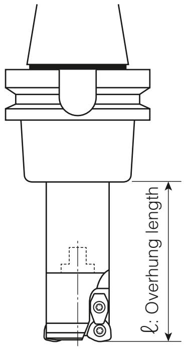
END MILL TYPE

Work Materials	Insert Grades	Tool dia. (mm)							
		32				32			
		No. of teeth 2N				No. of teeth 3N			
		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 S55C, S50C (C50, C55) Below 250HB	JC7560 (JC5040) (JC8050)	70	0.8	1,800	3,600	70	0.7	1,800	4,300
		120	0.6	1,000	3,000	120	0.5	1,500	3,600
		220	0.4	500	2,000	220	0.3	900	2,160
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC5118 (JC7560) (Below36HRC)	70	0.8	1,800	3,600	70	0.7	1,800	4,300
		120	0.6	1,000	3,000	120	0.5	1,500	3,600
		220	0.3	500	2,000	220	0.3	900	2,160
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC5040) (JC8050)	70	0.8	1,800	3,600	70	0.7	1,800	4,300
		120	0.6	1,000	3,000	120	0.5	1,500	3,600
		220	0.3	500	2,000	220	0.3	900	2,160
Stainless steel SUS304 Below 250HB	JC7560 (JC5118) (JC8050)	70	0.8	1,500	3,600	70	0.7	1,500	4,000
		120	0.6	1,250	3,000	120	0.5	1,250	3,400
		220	0.3	600	1,800	220	0.3	600	1,800
Hardened die steel SKD61, DAC, DHA (1.23441, 1.2379) 40-50HRC	JC5118 JC8015	70	0.8	800	1,300	70	0.6	800	1,680
		120	0.6	700	1,100	120	0.4	700	1,260
		220	0.3	500	800	220	0.2	500	900
Grey & Nodular cast iron FC, FCD (GG,GGG) Below 300HB	JC5118 JC8015 (JC7560)	70	1.2	1,300	3,900	70	1.0	1,300	4,300
		120	1	1,100	3,300	120	0.8	1,100	3,600
		220	0.6	900	2,200	220	0.5	900	2,500

ℓ: Overhung length, a_p: 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. (In case of BT40 or below, recommend to use tool dia. below φ33)
2) In case of 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 a_p, n, Vf.
6) In case of unfavourable conditions, insert grade JC8050 is recommended.

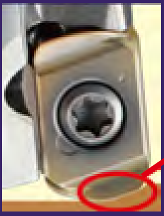


QM MAX G II GMXTYPE

Feature of product

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

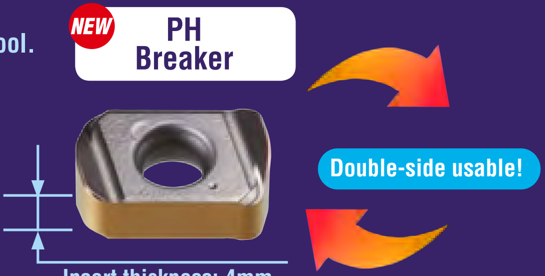
- Low cutting force inserts with optimum cutting edge for high feed machining.
  * Compared with conventional positive type cutter, chips thickness of QM MAX G II reduces by 14% (in case of ap=0.6mm).



Negative insert

Optimum cutting edge

- 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.



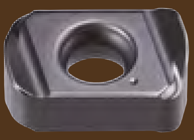
NEW **PH Breaker**

Double-side usable!

Insert thickness: 4mm

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

ISO	P					M					K				H		
	P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30	H01	H10	H20
Applicable range		NEW JC8118	JC8118	JC8118	JC8118		NEW JC8118	JC8118	JC8118			NEW JC8118	JC8118	JC8118		NEW JC8118	JC8118
				NEW JC7560	JC7560				NEW JC7560	JC7560							



<JC8118>

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

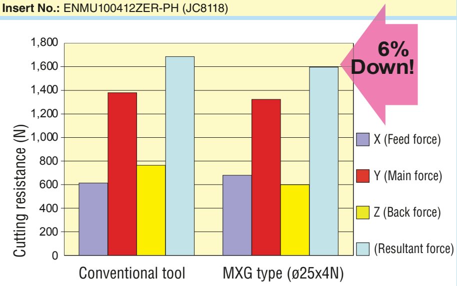
<JC7560>

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
Down 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 breaker**	○	○	○

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　GMXTYPE

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.

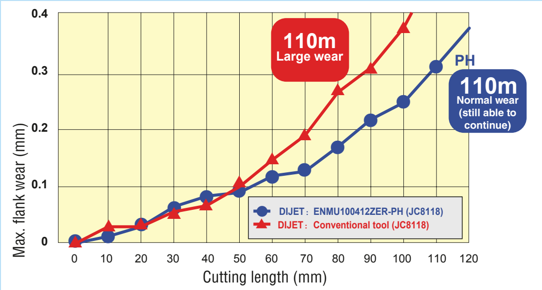
G-Body

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)



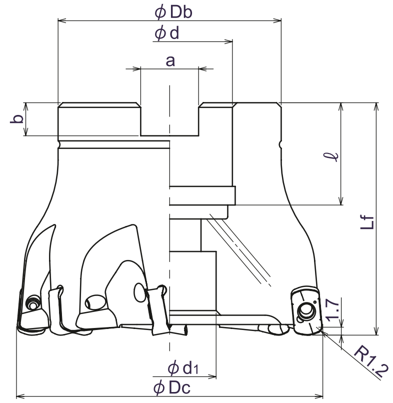
New strong edge type "PH breaker insert" supressed small chipping and achieved longer tool life compared with conventional tool.

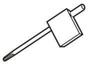
QM MAX G II

GMX TYPE

G-Body **Through Coolant Hole**

FACE MILL TYPE



Type	Cat. No.	Stock	No. of inserts	Dimensions (mm)								Applicable inserts	Parts
				φDc	Lf	φDb	φd	φd1	a	b	ℓ		
Metric Bore	**GMX-7050R-22**	●	7	**50**	50	40	22	17	10.4	6.3	20	ENMU100412 ZER-PH	Clamp screw  TSW-2567H Wrench  A-08
	GMX-7052R-22	●	7	**52**	50	40	22	17	10.4	6.3	20		
	GMX-7063R-22	●	7	**63**	50	48	22	17	10.4	6.3	20		
	GMX-7066R-22	●	7	**66**	50	48	22	17	10.4	6.3	20		
	GMX-7066R-27	●	7	**66**	50	48	27	20	12.4	7	22		

Note) All cutters are supplied without inserts.

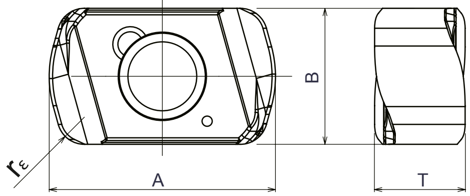
Modular Head Type **Please refer Page B080**

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

GMX TYPE

Inserts

NEW PH breaker



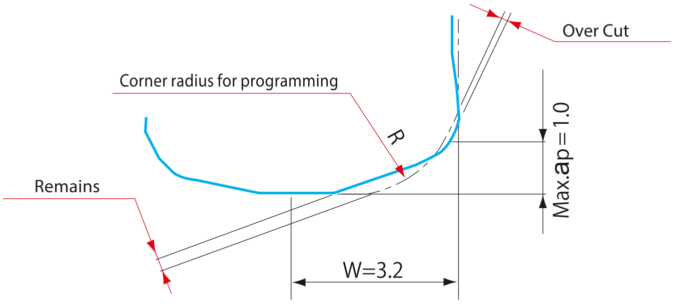
Cat. No.	Tolerance	PVD coated		Dimensions (mm)			
		NEW JC8118	NEW JC7560	A	T	B	rε
NEW **ENMU100412ZER-PH**	M	●	●	10	4	6	1.2

10 inserts per case

● : Standard stock items ○ : Soon to be deleted

QM MAX G II GMXTYPE

■ Definition of corner shape for programming

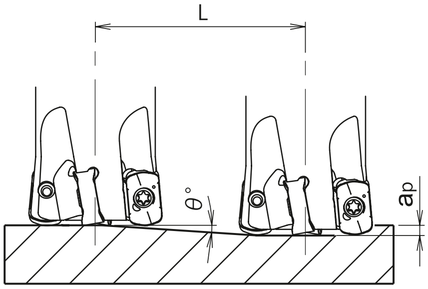


(mm)

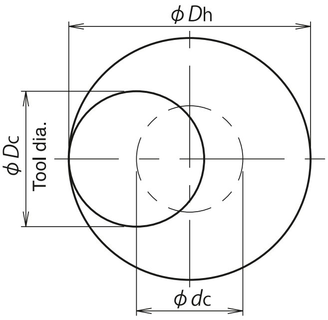
Corner radius for programming	Over cut	Remains
R1.0	0	0.52
R1.5 (Standard)	0	0.38
R2.0	0.08	0.24

■ Attention for profile milling

● Ramping



● Helical interpolation



- ● Calculation of tool 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.
- ● 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)
GMX-7050	50	43.8	1	0° 24’	143.2	90	98
GMX-7052	52	45.8	1	0° 24’	143.2	94	102
GMX-7063	63	56.8	1	0° 18’	190.9	116	124
GMX-7066	66	59.8	1	0° 18’	190.9	122	130

QM MAX G II

GMX TYPE

RECOMMENDED CUTTING CONDITIONS

● GMX type (facemill type)

Work Materials	Insert Grades	Over-hung Length ℓ (mm)	Tool dia. (mm)							
			50 / 52				63 / 66			
			No. of teeth 7N				No. of teeth 7N			
			a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel (C50, C55) Below 250HB	JC7560 (JC8118)	~150	1	~40	1,020	8,570	1	~50	810	6,800
		200	0.8	~40	1,020	8,570	0.8	~50	810	6,800
		250	0.6	~40	890	7,480	0.6	~50	710	5,960
		300	0.5	~40	830	6,970	0.5	~50	660	5,540
		350	0.4	~40	830	6,970	0.4	~50	660	5,540
Die steel (1.2344, 1.2379) Below 255HB	JC7560 (JC8118)	~150	1	~40	1,020	8,570	1	~50	810	6,800
		200	0.8	~40	1,020	8,570	0.8	~50	810	6,800
		250	0.6	~40	890	7,480	0.6	~50	710	5,960
		300	0.5	~40	830	6,970	0.5	~50	660	5,540
		350	0.4	~40	830	6,970	0.4	~50	660	5,540
Mold steel (1.2311, P20) 30-36HRC	JC7560 (JC8118)	~150	1	~40	1,020	8,570	1	~50	810	6,800
		200	0.8	~40	1,020	8,570	0.8	~50	810	6,800
		250	0.6	~40	890	7,480	0.6	~50	710	5,960
		300	0.5	~40	830	6,970	0.5	~50	660	5,540
		350	0.4	~40	830	6,970	0.4	~50	660	5,540
Mold steel (1.2311, P21) 38-43HRC	JC8118	~150	0.8	~40	540	4,160	0.8	~50	430	3,310
		200	0.6	~40	540	4,160	0.6	~50	430	3,310
		250	0.4	~40	510	3,210	0.4	~50	400	2,520
		300	0.3	~40	480	3,020	0.3	~50	380	2,390
		350	0.3	~40	480	2,690	0.3	~50	380	2,130
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~150	0.6	~40	540	4,160	0.6	~50	430	3,310
		200	0.4	~40	540	4,160	0.4	~50	430	3,310
		250	0.2	~40	510	3,210	0.2	~50	400	2,520
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Grey & Nodular cast iron (GG, GGG) Below 300HB	JC8118	~150	1	~40	1,150	12,080	1	~50	910	9,560
		200	0.8	~40	1,150	12,080	0.8	~50	910	9,560
		250	0.6	~40	1,020	10,710	0.6	~50	810	8,510
		300	0.5	~40	950	9,980	0.5	~50	760	7,980
		350	0.4	~40	950	7,980	0.4	~50	760	6,380
Stainless steel Below 250HB	JC7560 (JC8118)	~150	0.8	~40	760	5,320	0.8	~50	610	4,270
		200	0.6	~40	760	5,320	0.6	~50	610	4,270
		250	0.4	~40	640	4,480	0.4	~50	510	3,570
		300	0.3	~40	640	4,480	0.3	~50	510	3,570
		350	0.3	~40	640	3,580	0.3	~50	510	2,860

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

■ NOTE for EPMT/W type insert

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 Spindle speed and keep feed per tooth.
3) If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4) Use air blow.

QM MAX QXPTYPE

QM Quick & Mini MAX

G-Body

Low cutting force	Adopted unique 3D geometry inserts 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 in case of deep cavity milling.
Multi blades	Multi blades achieves Q=144cc/min. (In case of using of φ32 modular head type)
Vibration free	"QM MAX" MQX type can achieve high efficient machining and longer tool life by controlling the vibration with the combination of MSN carbide shank holder.

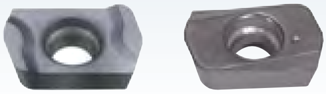
Insert variation

High feed and Shoulder milling is possible with the same body. By mounting "MIRROR INSERT", high efficient finishing of side & bottom face is possible.

High feed insert

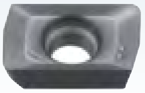
EPMT100312ZER

High feed insert for unfavorable condition



EPMW100312ZER EPMW100312ZTR

Shoulder milling insert



Deflection: Below 0.03mm

ZPMT1003…ZER (Corner Radius 0.4, 0.8, 2.0)

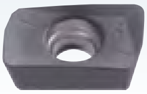
For high hardened steel insert

EPHW100316ZTR

"MIRROR INSERT" for finishing side & bottom face

YPHW1003…ZER-…

Shoulder milling insert (From semi-finishing to finishing)



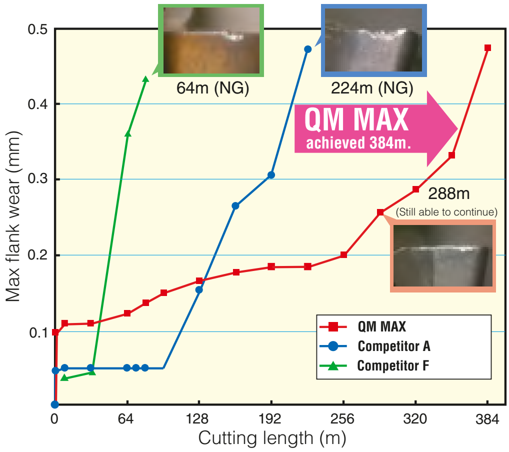
ZPMT100308ZER-PL

"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 speed machining. "JC8015" and cermet grade "CX75" are available for "MIRROR INSERT" YPHW type.

■ Cutting performance of QM MAX against competitor

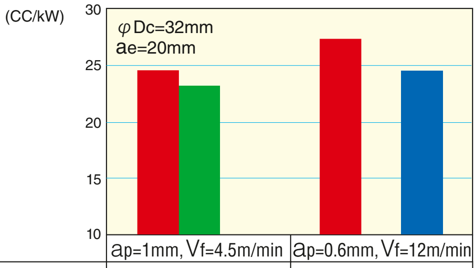
Tool life comparison

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
Overhung length: ℓ=100mm, Shoulder milling, Down cut, 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.

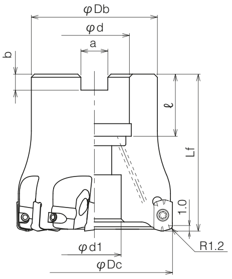
Power Saving Features

QM MAX QXPTYPE

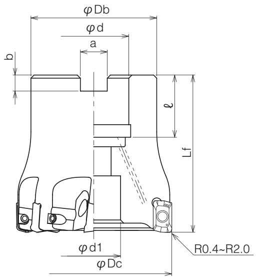
G-Body Through Coolant Hole

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

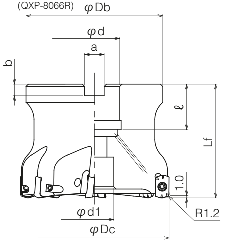
● For High Feed Milling



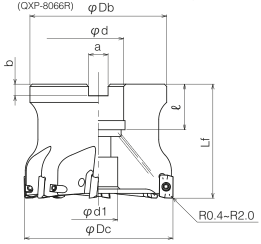
● For Shoulder Milling



● For High Feed Milling
(QXP-8066R)



● For Shoulder Milling
(QXP-8066R)



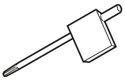
BODY/FACE MILL TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)								Inserts
				φD_c	L_f	φD_b	φd	φd_1	a	b	ℓ	
Metric Bore	**QXP-6040R-16**	●	6	**40**	45	35	16	14	8.4	5.6	18	EP**1003**Z*R ZPMT1003**ZER YPHW1003**ZER-**
	QXP-7040R-16	●	7	**40**	45	35	16	14	8.4	5.6	18	
	QXP-7050R-22	●	7	**50**	50	40	22	17	10.4	6.3	20	
	QXP-8050R-22	●	8	**50**	50	40	22	17	10.4	6.3	20	
	QXP-8052R-22	●	8	**52**	50	40	22	17	10.4	6.3	20	
	QXP-8063R-22	●	8	**63**	50	48	22	17	10.4	6.3	20	
	QXP-8066R-27	●	8	**66**	50	48	27	20	12.4	7	22	

Note) 1. All cutters are supplied without inserts.
2. Please refer page C038-C069 for recommended cutting conditions.

Modular Head Type Please refer Page B030

PARTS

Clamp Screw	Wrench
	
DSW-2563H	A-08

Clamp Screw	Recommended Torque N•m
DSW-2563H	0.9

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

QM MAX

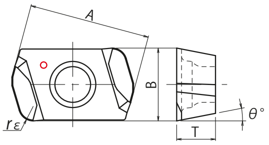
QXPTYPE

MQX/QXP TYPE

■ INSERTS

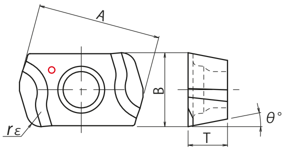
High feed insert (EPMT100312ZER)

Cutting condition C060-C062



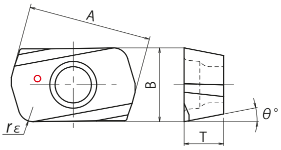
High feed insert for unfavorable condition (EPMW100312ZER)

Cutting condition C060-C062



High feed insert for unfavorable condition (EPMW100312ZTR)

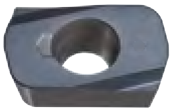
Cutting condition C060-C062

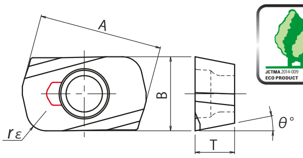


(JC7560)

High hardened steel (EPHW100316ZTR)

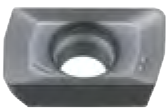
Cutting condition C063-C064

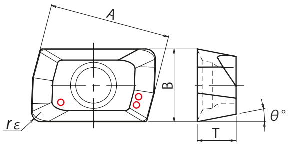




Shoulder milling insert (EPMT1003ZER)**

Cutting condition C065-C070

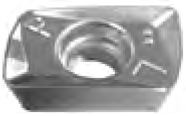


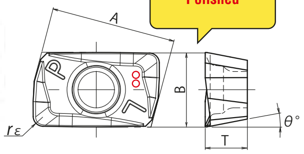


NEW **Shoulder milling insert for aluminum alloy**

Cutting condition C090

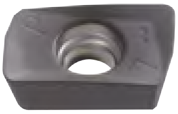
Polished

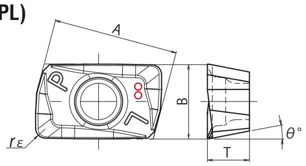




NEW **Shoulder milling insert (From semi-finishing to finishing) (ZPMT100308ZER-PL)**

Cutting condition C084-C089

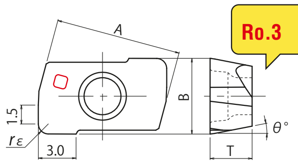




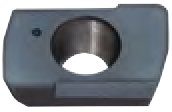
"MIRROR INSERT" for finishing side & bottom face (YPHW1003ZER-15) (YPHW100308ZTR-F1) (YPHW100308ZER-F)**

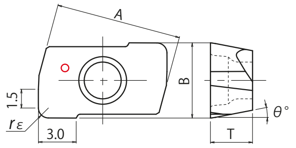
Cutting condition C071-C078

Ro.3

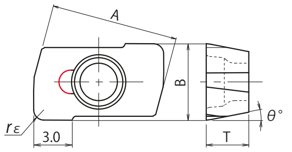


(YPHW100303ZER-15)





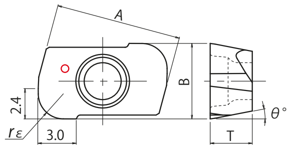
(YPHW100308ZER-15)



(YPHW100308ZER-F)

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

Cutting condition C079-C083



QM MAX

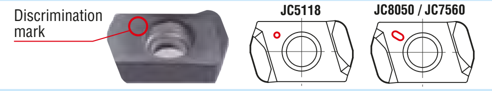
QXPTYPE

Type	Cat. No.	Tole-rance	PVD coated						Uncoated		Cermet	Dimensions (mm)				
			JC5118	JC8118	DH102	JC7560	JC8015	JC8050	FZ15	FC18	CX75	A	T	B	rε	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°
"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, but grade JBN795 insert is packed in 1 piece per case.

Discrimination of grade for MQX / QXP insert

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



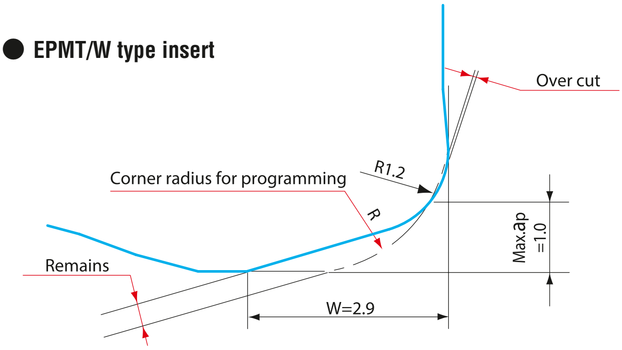
Type	Cat. No.	Tole-rance	PVD coated						Uncoated		Cermet	Dimensions (mm)				
			JC5118	JC8118	DH102	JC7560	JC8015	JC8050	FZ15	FC18	CX75	A	T	B	rε	θ°
Shoulder milling insert from semi-finishing to finishing	NEW ZPMT100304ZER-PL	M		●	●							10	3.4	6	0.4	11°
	ZPMT100308ZER-PL	M		●	●		○					10	3.4	6	0.8	11°
	NEW ZPMT100320ZER-PL	M		●	●							10	3.4	6	2.0	11°

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

QM MAX QXPTYPE

■ Definition of corner radius for programming

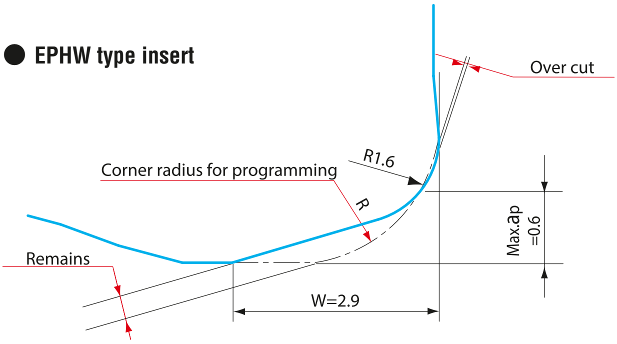
● EPMT/W type insert



(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

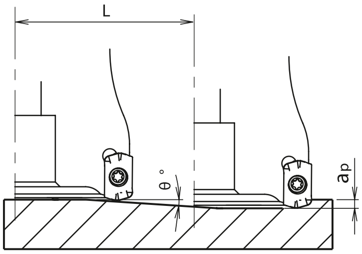


(mm)

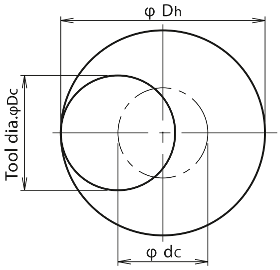
Corner radius for programming	Over cut	Remains
R1.0	0	0.42
R1.5 (Recommended)	0	0.33
R2.0	0.01	0.23
R2.5	0.17	0.14
R3.0	0.37	0.05

■ Instructions for profile milling with EMPT/W type insert

● Ramping



● Helical interpolation



- Calculation of tool pass dia.

$$\underset{\text{Tool pass dia.}}{\varphi dc} = \underset{\text{Bore dia.}}{\varphi Dh} - \underset{\text{Tool dia.}}{\varphi Dc}$$

- Depth of cut per one 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 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)
QXP-*040R-16	40	34.1	1	0°30′	114.6	70	80
QXP-*050R(-22)	50	44.1	1	0°24′	143.2	90	98
QXP-8052R-22	52	46.1	1	0°21′	163.7	94	102
QXP-8063R(-22)	63	57.1	1	0°18′	191	116	124
QXP-8066R(-27)	66	60.1	1	0°18′	191	122	130

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

QM MAX QXPTYPE

RECOMMENDED CUTTING CONDITIONS

● EPMT/W type insert

Work Materials	Insert Grades	Over-hung Length ℓ (mm)	Tool dia. (mm)							
			40							
			No. of teeth 6N				No. of teeth 7N			
			a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (JC5118)	~150	0.8	~32	1,250	6,000	0.8	~32	1,250	7,000
		200	0.6	~32	1,100	5,300	0.6	~32	1,100	6,200
		250	0.5	~32	1,000	4,800	0.5	~32	1,000	5,600
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC8050) (JC5118)	~150	0.8	~32	1,250	6,000	0.8	~32	1,250	7,000
		200	0.6	~32	1,100	5,300	0.6	~32	1,100	6,200
		250	0.5	~32	1,000	4,800	0.5	~32	1,000	5,600
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 (JC8050) (JC5118)	~150	0.8	~32	1,250	6,000	0.8	~32	1,250	7,000
		200	0.6	~32	1,100	5,300	0.6	~32	1,100	6,200
		250	0.5	~32	1,000	4,800	0.5	~32	1,000	5,600
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC5118)	~150	0.6	~32	680	2,850	0.6	~32	680	3,300
		200	0.4	~32	640	2,650	0.4	~32	640	3,100
		250	0.3	~32	600	2,500	0.3	~32	600	2,900
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC5118 (JC8050)	~150	0.4	~32	520	1,550	0.4	~32	520	1,800
		200	0.2	~32	520	1,550	0.2	~32	520	1,800
		250	—	—	—	—	—	—	—	—
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC5118 EPMW type	~150	0.15	~32	240	230	0.15	~32	240	270
		200	0.1	~32	220	210	0.1	~32	220	250
		250	—	—	—	—	—	—	—	—
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118 (JC7560)	~150	0.8	~32	1,100	6,600	0.8	~32	1,100	7,700
		200	0.6	~32	1,000	6,000	0.6	~32	1,000	7,000
		250	0.5	~32	900	5,400	0.5	~32	900	6,300
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Stain less steel SUS304 Below 250HB	JC7560 (JC8050)	~150	0.6	~32	1,200	5,400	0.6	~32	1,200	6,300
		200	0.4	~32	1,100	4,950	0.4	~32	1,100	5,800
		250	0.3	~32	1,000	4,450	0.3	~32	1,000	5,200
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050)	~150	0.6	~32	480	1,150	0.6	~32	480	1,350
		200	0.4	~32	440	1,050	0.4	~32	440	1,230
		250	0.3	~32	440	1,050	0.3	~32	440	1,230
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Inconel (INCO718)	JC5118 (JC8050) (JC7560)	~150	0.6	~32	240	430	0.6	~32	240	500
		200	0.4	~32	200	360	0.4	~32	200	420
		250	0.3	~32	200	360	0.3	~32	200	420
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—

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

■ NOTE

Please refer page C043.

QM MAX

QXPTYPE

RECOMMENDED CUTTING CONDITIONS

EPMT/W type insert

Work Materials	Insert Grades	Overhung Length ℓ (mm)	Tool dia. (mm)							
			50				50/52			
			No. of teeth 7N				No. of teeth 8N			
			a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (JC5118)	~150	1	~40	1,000	6,300	1	~40	1,000	7,200
		200	0.8	~40	1,000	5,950	0.8	~40	1,000	6,800
		250	0.6	~40	900	5,350	0.6	~40	900	6,100
		300	0.5	~40	800	4,750	0.5	~40	800	5,450
		350	0.4	~40	800	4,750	0.4	~40	800	5,450
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC8050) (JC5118)	~150	1	~40	1,000	6,300	1	~40	1,000	7,200
		200	0.8	~40	1,000	5,950	0.8	~40	1,000	6,800
		250	0.6	~40	900	5,350	0.6	~40	900	6,100
		300	0.5	~40	800	4,750	0.5	~40	800	5,450
		350	0.4	~40	800	4,750	0.4	~40	800	5,450
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 (JC8050) (JC5118)	~150	1	~40	1,000	6,300	1	~40	1,000	7,200
		200	0.8	~40	1,000	5,950	0.8	~40	1,000	6,800
		250	0.6	~40	900	5,350	0.6	~40	900	6,100
		300	0.5	~40	800	4,750	0.5	~40	800	5,450
		350	0.4	~40	800	4,750	0.4	~40	800	5,450
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC5118)	~150	0.8	~40	540	2,600	0.8	~40	540	3,000
		200	0.6	~40	540	2,600	0.6	~40	540	3,000
		250	0.4	~40	510	2,500	0.4	~40	510	2,850
		300	0.3	~40	480	2,350	0.3	~40	480	2,700
		350	0.3	~40	480	2,000	0.3	~40	480	2,300
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC5118 (JC8050)	~150	0.6	~40	400	1,400	0.6	~40	400	1,600
		200	0.4	~40	400	1,400	0.4	~40	400	1,600
		250	0.2	~40	400	1,400	0.2	~40	400	1,600
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC5118 EPMW- type	~150	0.15	~40	190	210	0.15	~40	190	240
		200	0.15	~40	170	190	0.15	~40	170	220
		250	0.1	~40	170	190	0.1	~40	170	220
		300	—	—	—	—	—	—	—	—
		350	—	—	—	—	—	—	—	—
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118 (JC7560)	~150	1	~40	900	7,500	1	~40	900	8,600
		200	0.8	~40	900	6,300	0.8	~40	900	7,200
		250	0.6	~40	850	5,950	0.6	~40	850	6,800
		300	0.5	~40	800	5,600	0.5	~40	800	6,400
		350	0.4	~40	800	5,600	0.4	~40	800	6,400
Stainless steel SUS304 Below 250HB	JC7560 (JC8050)	~150	0.8	~40	950	5,600	0.8	~40	950	6,400
		200	0.6	~40	950	5,000	0.6	~40	950	5,700
		250	0.4	~40	900	4,700	0.4	~40	900	5,400
		300	0.3	~40	900	4,700	0.3	~40	900	5,400
		350	0.3	~40	850	4,450	0.3	~40	850	5,100
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050)	~150	0.8	~40	380	1,050	0.8	~40	380	1,220
		200	0.6	~40	380	1,050	0.6	~40	380	1,220
		250	0.4	~40	350	980	0.4	~40	350	1,120
		300	0.3	~40	350	980	0.3	~40	350	1,120
		350	0.3	~40	320	890	0.3	~40	320	1,020
Inconel (INCO718)	JC5118 (JC8050) (JC7560)	~150	0.8	~40	190	390	0.8	~40	190	450
		200	0.6	~40	190	390	0.6	~40	190	450
		250	0.4	~40	160	330	0.4	~40	160	380
		300	0.3	~40	160	330	0.3	~40	160	380
		350	0.3	~40	130	270	0.3	~40	130	310

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

NOTE

Please refer page C043.

QM MAX   QXP TYPE

RECOMMENDED CUTTING CONDITIONS

● EPMT/W type insert

Work Materials	Insert Grades	Over-hung Length ℓ (mm)	Tool dia. (mm)							
			63/66							
			No. of teeth 8N							
			a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)				
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (JC5118)	~200	1	~50	800	5,750				
		250	0.8	~50	800	5,450				
		300	0.6	~50	720	4,900				
		350	0.5	~50	640	4,350				
		400	0.4	~50	640	4,350				
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC8050) (JC5118)	~200	1	~50	800	5,750				
		250	0.8	~50	800	5,450				
		300	0.6	~50	720	4,900				
		350	0.5	~50	640	4,350				
		400	0.4	~50	640	4,350				
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 (JC8050) (JC5118)	~200	1	~50	800	5,750				
		250	0.8	~50	800	5,450				
		300	0.6	~50	720	4,900				
		350	0.5	~50	640	4,350				
		400	0.4	~50	640	4,350				
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC5118)	~200	0.8	~50	430	2,400				
		250	0.6	~50	430	2,400				
		300	0.4	~50	410	2,300				
		350	0.3	~50	370	2,100				
		400	0.3	~50	370	1,800				
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC5118 (JC8050)	~200	0.6	~50	320	1,300				
		250	0.4	~50	320	1,300				
		300	0.2	~50	320	1,300				
		350	—	—	—	—				
		400	—	—	—	—				
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC5118 EPMW-type	~200	0.15	~50	150	190				
		250	0.15	~50	130	170				
		300	0.1	~50	130	170				
		350	—	—	—	—				
		400	—	—	—	—				
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118 (JC7560)	~200	1	~50	720	6,900				
		250	0.8	~50	720	5,750				
		300	0.6	~50	680	5,450				
		350	0.5	~50	640	5,100				
		400	0.4	~50	640	5,100				
Stainless steel SUS304 Below 250HB	JC7560 (JC8050)	~200	0.8	~50	750	5,050				
		250	0.6	~50	750	4,500				
		300	0.4	~50	710	4,250				
		350	0.3	~50	710	4,250				
		400	0.3	~50	670	4,000				
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050)	~200	0.8	~50	300	960				
		250	0.6	~50	300	960				
		300	0.4	~50	280	900				
		350	0.3	~50	280	900				
		400	0.3	~50	250	800				
Inconel (INCO718)	JC5118 (JC8050) (JC7560)	~200	0.8	~50	150	350				
		250	0.6	~50	150	350				
		300	0.4	~50	130	310				
		350	0.3	~50	130	310				
		400	0.3	~50	100	240				

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

NOTE

Please refer page C043.

QM MAX QXP TYPE

RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● EPHW type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		40					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)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	0.3	~32	720	3,460	~100	0.3	~32	720	4,030
		150	0.25	~32	650	2,500	150	0.25	~32	650	2,910
		200	0.20	~32	580	1,670	200	0.20	~32	580	1,950
		250	0.1	~32	580	1,670	250	0.1	~32	580	1,950
		300	—	—	—	—	300	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~100	0.2	~32	640	1,150	~100	0.2	~32	640	1,340
		150	0.15	~32	580	940	150	0.15	~32	580	1,100
		200	0.1	~32	510	740	200	0.1	~32	510	860
		250	—	—	—	—	250	—	—	—	—
		300	—	—	—	—	300	—	—	—	—

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

● EPHW type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		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)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	0.3	~40	570	3,190	~150	0.3	~40	570	3,650
		200	0.25	~40	510	2,280	200	0.25	~40	510	2,610
		250	0.20	~40	460	1,550	250	0.20	~40	460	1,770
		300	0.1	~40	460	1,550	300	0.1	~40	460	1,770
		350	—	—	—	—	350	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	0.2	~40	510	1,070	~150	0.2	~40	510	1,220
		200	0.15	~40	460	870	200	0.15	~40	460	990
		250	0.1	~40	410	690	250	0.1	~40	410	790
		300	—	—	—	—	300	—	—	—	—
		350	—	—	—	—	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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

EPHW type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		63/66									
		No. of teeth 8N									
		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	~200	0.3	~50	450	2,880					
		250	0.25	~50	410	2,100					
		300	0.2	~50	360	1,380					
		350	0.1	~50	360	1,380					
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~200	0.2	~50	400	960					
		250	0.15	~50	360	780					
		300	0.1	~50	320	610					
		350	—	—	—	—					

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 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.

NOTE for EPMT/W type insert

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 QXPTYPE

■ RECOMMENDED CUTTING CONDITIONS

● ZPMT type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		40									
		No. of teeth 6N					No. of teeth 7N				
		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 S55C, S50C (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
		200	~4.0	~10.0	1,010	610	200	~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
		200	~4.0	~10.0	950	320	200	~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
		200	~4.0	~10.0	760	360	200	~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
		200	~4.0	~12.0	950	570	200	~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
		200	~4.0	~10.0	950	320	200	~4.0	~10.0	950	370

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 of 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

QXPTYPE

RECOMMENDED CUTTING CONDITIONS

● ZPMT type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		No. of teeth 7N					No. of teeth 8N				
		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 S55C, S50C (C50, C55) Below 250HB	JC5118 (JC8050)	~150	~6.0	~35.0	1,020	860	~150	~6.0	~35.0	1,020	980
		200	~5.0	~25.0	920	710	200	~5.0	~25.0	920	810
		250	~4.0	~12.0	820	570	250	~4.0	~12.0	820	650
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~150	~6.0	~35.0	950	670	~150	~6.0	~35.0	950	760
		200	~5.0	~25.0	860	540	200	~5.0	~25.0	860	620
		250	~4.0	~12.0	760	430	250	~4.0	~12.0	760	490
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 (JC5118)	~150	~6.0	~35.0	760	530	~150	~6.0	~35.0	760	610
		200	~5.0	~25.0	680	430	200	~5.0	~25.0	680	490
		250	~4.0	~12.0	610	340	250	~4.0	~12.0	610	390
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~150	~6.0	~40.0	950	800	~150	~6.0	~40.0	950	910
		200	~5.0	~30.0	860	670	200	~5.0	~30.0	860	760
		250	~4.0	~15.0	760	530	250	~4.0	~15.0	760	610
Stainless steel SUS304 Below 250HB	JC8050	~150	~6.0	~35.0	950	670	~150	~6.0	~35.0	950	760
		200	~5.0	~25.0	860	540	200	~5.0	~25.0	860	620
		250	~4.0	~12.0	760	430	250	~4.0	~12.0	760	490

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 of 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 QXP TYPE

RECOMMENDED CUTTING CONDITIONS

● ZPMT type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		63/66									
		No. of teeth 8N									
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	V_f (mm/min)					
Carbon steel S55C, S50C (C50, C55) Below 250HB	JC5118 (JC8050)	~200	~6.0	~42.0	800	770					
		250	~5.0	~30.0	720	630					
		300	~4.0	~16.0	640	500					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~200	~6.0	~42.0	750	600					
		250	~5.0	~30.0	680	490					
		300	~4.0	~16.0	600	390					
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 (JC5118)	~200	~6.0	~42.0	600	480					
		250	~5.0	~30.0	540	390					
		300	~4.0	~16.0	480	300					
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~200	~6.0	~48.0	750	720					
		250	~5.0	~35.0	680	600					
		300	~4.0	~18.0	600	480					
Stainless steel SUS304 Below 250HB	JC8050	~200	~6.0	~42.0	750	600					
		250	~5.0	~30.0	680	490					
		300	~4.0	~16.0	600	390					

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 of 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 QXP TYPE

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

● ZPMT100320ZER insert

Work Materials	Insert Grades	Tool dia. (mm)									
		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)
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	0.3	~32	1,350	4,860	150	0.3	~32	1,350	5,670
		200	0.25	~32	1,220	3,940	200	0.25	~32	1,220	4,590
		250	0.15	~32	1,080	3,110	250	0.15	~32	1,080	3,630
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	0.3	~32	1,270	4,570	150	0.3	~32	1,270	5,330
		200	0.25	~32	1,140	3,700	200	0.25	~32	1,140	4,320
		250	0.15	~32	1,020	2,920	250	0.15	~32	1,020	3,410
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	0.3	~32	1,270	4,570	150	0.3	~32	1,270	5,330
		200	0.25	~32	1,140	3,700	200	0.25	~32	1,140	4,320
		250	0.15	~32	1,020	2,920	250	0.15	~32	1,020	3,410
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
		200	0.3	~32	1,070	4,050	200	0.3	~32	1,070	4,720
		250	0.2	~32	950	3,200	250	0.2	~32	950	3,730
Stainless steel SUS304 Below 250HB	JC8050	~100	0.4	~32	1,350	4,860	~100	0.4	~32	1,350	5,670
		150	0.3	~32	1,350	4,860	150	0.3	~32	1,350	5,670
		200	0.25	~32	1,220	3,940	200	0.25	~32	1,220	4,590
		250	0.15	~32	1,080	3,110	250	0.15	~32	1,080	3,630
Titanium alloy (Ti-6Al-4V)	JC5118 (JC8050)	~100	0.3	~32	480	1,150	~100	0.3	~32	480	1,340
		150	0.2	~32	480	1,150	150	0.2	~32	480	1,340
		200	0.15	~32	440	1,050	200	0.15	~32	440	1,220
		250	0.1	~32	440	1,050	250	0.1	~32	440	1,220
Inconel (INCO718)	JC5118 (JC8050)	~100	0.3	~32	240	430	~100	0.3	~32	240	500
		150	0.2	~32	240	430	150	0.2	~32	240	500
		200	0.15	~32	200	360	200	0.15	~32	200	420
		250	0.1	~32	200	360	250	0.1	~32	200	420

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 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS/LOW DEPTH OF CUT AND HIGH FEED

● ZPMT100320ZER insert

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	~150	0.4	~40	1,080	4,540	~150	0.4	~40	1,080	5,190
		200	0.3	~40	1,080	4,540	200	0.3	~40	1,080	5,190
		250	0.25	~40	970	3,680	250	0.25	~40	970	4,200
		300	0.2	~40	860	2,910	300	0.2	~40	860	3,320
		350	0.15	~40	860	2,910	350	0.15	~40	860	3,320
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~150	0.4	~40	1,020	4,280	~150	0.4	~40	1,020	4,890
		200	0.3	~40	1,020	4,280	200	0.3	~40	1,020	4,890
		250	0.25	~40	920	3,470	250	0.25	~40	920	3,960
		300	0.2	~40	820	2,740	300	0.2	~40	820	3,130
		350	0.15	~40	820	2,740	350	0.15	~40	820	3,130
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC5118)	~150	0.4	~40	1,020	4,280	~150	0.4	~40	1,020	4,890
		200	0.3	~40	1,020	4,280	200	0.3	~40	1,020	4,890
		250	0.25	~40	920	3,470	250	0.25	~40	920	3,960
		300	0.2	~40	820	2,740	300	0.2	~40	820	3,130
		350	0.15	~40	820	2,740	350	0.15	~40	820	3,130
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~150	0.4	~40	950	4,660	~150	0.4	~40	950	5,330
		200	0.35	~40	950	4,660	200	0.35	~40	950	5,330
		250	0.3	~40	860	3,770	250	0.3	~40	860	4,320
		300	0.25	~40	760	2,980	300	0.25	~40	760	3,410
		350	0.2	~40	760	2,980	350	0.2	~40	760	3,410
Stainless steel SUS304 Below 250HB	JC8050	~150	0.4	~40	1,080	4,540	~150	0.4	~40	1,080	5,190
		200	0.3	~40	1,080	4,540	200	0.3	~40	1,080	5,190
		250	0.25	~40	970	3,680	250	0.25	~40	970	4,200
		300	0.15	~40	970	3,680	300	0.15	~40	970	4,200
		350	0.15	~40	860	2,910	350	0.15	~40	860	3,320
Titanium alloy (Ti-6Al-4V)	JC5118 (JC8050)	~150	0.3	~40	380	1,050	~150	0.3	~40	380	1,220
		200	0.25	~40	380	1,050	200	0.25	~40	380	1,220
		250	0.15	~40	350	980	250	0.15	~40	350	1,120
		300	0.1	~40	350	980	300	0.1	~40	350	1,120
		350	0.1	~40	320	890	350	0.1	~40	320	1,020
Inconel (INCO718)	JC5118 (JC8050)	~150	0.3	~40	190	390	~150	0.3	~40	190	450
		200	0.25	~40	190	390	200	0.25	~40	190	450
		250	0.15	~40	160	330	250	0.15	~40	160	380
		300	0.1	~40	160	330	300	0.1	~40	160	380
		350	0.1	~40	130	270	350	0.1	~40	130	310

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 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.

RECOMMENDED CUTTING CONDITIONS / LOW DEPTH OF CUT AND HIGH FEED

● ZPMT100320ZER insert

Work Materials	Insert Grades	Tool dia. (mm)									
		63/66									
		No. of teeth 8N									
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)					
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5118 (JC8050)	~200	0.4	~50	860	4,130					
		250	0.3	~50	860	4,130					
		300	0.25	~50	770	3,350					
		350	0.2	~50	770	3,350					
		400	0.15	~50	640	2,640					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~200	0.4	~50	810	3,890					
		250	0.3	~50	810	3,890					
		300	0.25	~50	730	3,150					
		350	0.2	~50	730	3,150					
		400	0.15	~50	650	2,490					
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC5118)	~200	0.4	~50	810	3,890					
		250	0.3	~50	810	3,890					
		300	0.25	~50	730	3,150					
		350	0.2	~50	730	3,150					
		400	0.15	~50	650	2,490					
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~200	0.4	~50	760	4,260					
		250	0.35	~50	760	4,260					
		300	0.3	~50	680	3,450					
		350	0.25	~50	680	3,450					
		400	0.2	~50	610	2,730					
Stainless steel SUS304 Below 250HB	JC8050	~200	0.4	~50	860	4,130					
		250	0.3	~50	860	4,130					
		300	0.25	~50	770	3,350					
		350	0.2	~50	770	3,350					
		400	0.15	~50	640	2,640					
Titanium alloy (Ti-6Al-4V)	JC5118 (JC8050)	~200	0.3	~50	300	960					
		250	0.25	~50	300	960					
		300	0.2	~50	280	900					
		350	0.15	~50	280	900					
		400	0.1	~50	250	800					
Inconel (INCO718)	JC5118 (JC8050)	~200	0.3	~50	150	350					
		250	0.25	~50	150	350					
		300	0.2	~50	130	310					
		350	0.15	~50	130	310					
		400	0.1	~50	100	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 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS / UP & DOWN FINISHING

YPHW-15/-F type insert

Work Materials	Insert Grades	Tool dia. (mm)														
		40										50				
		No. of teeth 6N					No. of teeth 7N					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)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 (DH102)	~150	0.88	<0.2	3,580	3,870	~150	0.88	<0.2	3,580	4,520	~150	1	<0.2	2,860	3,600
		200	0.88	<0.2	3,580	3,870	200	0.88	<0.2	3,580	4,520	200	1	<0.2	2,860	3,600
		250	0.88	<0.2	3,580	3,220	250	0.88	<0.2	3,580	3,760	250	1	<0.2	2,860	3,600
		300	0.88	<0.2	2,790	2,010	300	0.88	<0.2	2,790	2,350	300	1	<0.2	2,860	3,000
		350	—	—	—	—	350	—	—	—	—	350	1	<0.2	2,860	3,000
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~150	0.88	<0.2	3,180	3,430	~150	0.88	<0.2	3,180	4,000	~150	1	<0.2	2,550	3,210
		200	0.88	<0.2	3,180	3,430	200	0.88	<0.2	3,180	4,000	200	1	<0.2	2,550	3,210
		250	0.88	<0.2	3,180	2,860	250	0.88	<0.2	3,180	3,340	250	1	<0.2	2,550	3,210
		300	0.88	<0.2	2,390	1,720	300	0.88	<0.2	2,390	2,010	300	1	<0.2	2,550	2,680
		350	—	—	—	—	350	—	—	—	—	350	1	<0.2	2,550	2,680
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~150	0.88	<0.2	2,790	2,510	~150	0.88	<0.2	2,790	2,930	~150	1	<0.2	2,230	2,340
		200	0.88	<0.2	2,790	2,510	200	0.88	<0.2	2,790	2,930	200	1	<0.2	2,230	2,340
		250	0.88	<0.2	2,790	2,010	250	0.88	<0.2	2,790	2,350	250	1	<0.2	2,230	2,340
		300	0.88	<0.2	1,990	1,190	300	0.88	<0.2	1,990	1,390	300	1	<0.2	2,230	1,870
		350	—	—	—	—	350	—	—	—	—	350	1	<0.2	2,230	1,870
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~150	0.88	<0.2	1,990	1,430	~150	0.88	<0.2	1,990	1,430	~150	1	<0.2	1,590	1,340
		200	0.88	<0.2	1,990	1,430	200	0.88	<0.2	1,990	1,430	200	1	<0.2	1,590	1,340
		250	0.88	<0.2	1,990	1,150	250	0.88	<0.2	1,990	1,150	250	1	<0.2	1,590	1,340
		300	0.88	<0.2	1,420	680	300	0.88	<0.2	1,420	680	300	1	<0.2	1,590	1,070
		350	—	—	—	—	350	—	—	—	—	350	1	<0.2	1,590	1,070
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~150	0.88	<0.15	1,350	810	~150	0.88	<0.15	1,350	950	~150	1	<0.15	1,080	760
		200	0.88	<0.15	1,350	810	200	0.88	<0.15	1,350	950	200	1	<0.15	1,080	760
		250	0.88	<0.15	1,350	650	250	0.88	<0.15	1,350	760	250	1	<0.15	1,080	760
		300	0.88	<0.15	960	390	300	0.88	<0.15	960	460	300	1	<0.15	1,080	610
		350	—	—	—	—	350	—	—	—	—	350	1	<0.15	1,080	610
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~150	0.88	<0.2	4,380	5,260	~150	0.88	<0.2	4,380	6,140	~150	1	<0.2	3,500	5,390
		200	0.88	<0.2	4,380	5,260	200	0.88	<0.2	4,380	6,140	200	1	<0.2	3,500	5,390
		250	0.88	<0.2	3,580	4,300	250	0.88	<0.2	3,580	5,020	250	1	<0.2	3,500	5,390
		300	0.88	<0.2	3,580	3,220	300	0.88	<0.2	3,580	3,760	300	1	<0.2	2,860	4,000
		350	—	—	—	—	350	—	—	—	—	350	1	<0.2	2,860	4,000

ℓ: Overhunglength, 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS/UP & DOWN FINISHING

YPHW-15/-F type insert

Work Materials	Insert Grades	Tool dia. (mm)														
		50/52					63/66									
		No. of teeth 8N					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	JC8015 (DH102)	~150	1	<0.2	2,860	4,110	~200	1.12	<0.2	2,270	3,260					
		200	1	<0.2	2,860	4,110	250	1.12	<0.2	2,270	3,260					
		250	1	<0.2	2,860	4,110	300	1.12	<0.2	2,270	3,260					
		300	1	<0.2	2,860	3,430	350	1.12	<0.2	2,270	2,720					
		350	1	<0.2	2,860	3,430	400	1.12	<0.2	2,270	2,720					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~150	1	<0.2	2,550	3,670	~200	1.12	<0.2	2,020	2,910					
		200	1	<0.2	2,550	3,670	250	1.12	<0.2	2,020	2,910					
		250	1	<0.2	2,550	3,670	300	1.12	<0.2	2,020	2,910					
		300	1	<0.2	2,550	3,060	350	1.12	<0.2	2,020	2,420					
		350	1	<0.2	2,550	3,060	400	1.12	<0.2	2,020	2,420					
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~150	1	<0.2	2,230	2,670	~200	1.12	<0.2	1,770	2,120					
		200	1	<0.2	2,230	2,670	250	1.12	<0.2	1,770	2,120					
		250	1	<0.2	2,230	2,670	300	1.12	<0.2	1,770	2,120					
		300	1	<0.2	2,230	2,140	350	1.12	<0.2	1,770	1,700					
		350	1	<0.2	2,230	2,140	400	1.12	<0.2	1,770	1,700					
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~150	1	<0.2	1,590	1,530	~200	1.12	<0.2	1,260	1,210					
		200	1	<0.2	1,590	1,530	250	1.12	<0.2	1,260	1,210					
		250	1	<0.2	1,590	1,530	300	1.12	<0.2	1,260	1,210					
		300	1	<0.2	1,590	1,220	350	1.12	<0.2	1,260	970					
		350	1	<0.2	1,590	1,220	400	1.12	<0.2	1,260	970					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~150	1	<0.15	1,080	870	~200	1.12	<0.15	860	690					
		200	1	<0.15	1,080	870	250	1.12	<0.15	860	690					
		250	1	<0.15	1,080	870	300	1.12	<0.15	860	690					
		300	1	<0.15	1,080	700	350	1.12	<0.15	860	550					
		350	1	<0.15	1,080	700	400	1.12	<0.15	860	550					
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~150	1	<0.2	3,500	6,160	~200	1.12	<0.2	2,780	4,890					
		200	1	<0.2	3,500	6,160	250	1.12	<0.2	2,780	4,890					
		250	1	<0.2	3,500	6,160	300	1.12	<0.2	2,780	4,890					
		300	1	<0.2	2,860	4,570	350	1.12	<0.2	2,270	3,630					
		350	1	<0.2	2,860	4,570	400	1.12	<0.2	2,270	3,630					

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 QXP TYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● YPHW-15/-F type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~150	1.5	<0.2	5,170	4,650	~150	1.5	<0.2	5,170	5,430
		200	1.5	<0.2	5,170	4,650	200	1.5	<0.2	5,170	5,430
		250	1	<0.2	3,580	2,580	250	1	<0.2	3,580	3,010
		300	0.7	<0.2	3,580	2,360	300	0.7	<0.2	3,580	2,750
		350	—	—	—	—	350	—	—	—	—
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~150	1.5	<0.2	3,580	3,220	~150	1.5	<0.2	3,580	3,760
		200	1.5	<0.2	3,580	3,220	200	1.5	<0.2	3,580	3,760
		250	1	<0.2	2,790	2,010	250	1	<0.2	2,790	2,350
		300	0.7	<0.2	2,790	1,670	300	0.7	<0.2	2,790	1,950
		350	—	—	—	—	350	—	—	—	—
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~150	1.5	<0.2	3,580	3,220	~150	1.5	<0.2	3,580	3,760
		200	1.5	<0.2	3,580	3,220	200	1.5	<0.2	3,580	3,760
		250	1	<0.2	2,790	2,010	250	1	<0.2	2,790	2,350
		300	0.7	<0.2	2,790	1,670	300	0.7	<0.2	2,790	1,950
		350	—	—	—	—	350	—	—	—	—
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~150	1.5	<0.2	3,180	2,290	~150	1.5	<0.2	3,180	2,670
		200	1.5	<0.2	3,180	2,290	200	1.5	<0.2	3,180	2,670
		250	1	<0.2	2,790	1,670	250	1	<0.2	2,790	1,950
		300	0.7	<0.2	2,790	1,340	300	0.7	<0.2	2,790	1,560
		350	—	—	—	—	350	—	—	—	—
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~150	1.5	<0.2	1,590	950	~150	1.5	<0.2	1,590	1,110
		200	1.5	<0.2	1,590	950	200	1.5	<0.2	1,590	1,110
		250	1	<0.2	1,350	650	250	1	<0.2	1,350	760
		300	0.7	<0.2	1,350	650	300	0.7	<0.2	1,350	760
		350	—	—	—	—	350	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	1	<0.2	1,430	860	~150	1	<0.2	1,430	1,000
		200	1	<0.2	1,430	860	200	1	<0.2	1,430	1,000
		250	0.7	<0.2	1,190	570	250	0.7	<0.2	1,190	670
		300	0.5	<0.2	1,190	360	300	0.5	<0.2	1,190	420
		350	—	—	—	—	350	—	—	—	—
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~150	1.5	<0.2	4,380	3,940	~150	1.5	<0.2	4,380	4,600
		200	1.5	<0.2	4,380	3,940	200	1.5	<0.2	4,380	4,600
		250	1	<0.2	3,580	2,580	250	1	<0.2	3,580	3,010
		300	0.7	<0.2	3,580	2,150	300	0.7	<0.2	3,580	2,510
		350	—	—	—	—	350	—	—	—	—
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~150	1.5	<0.2	3,580	3,220	~150	1.5	<0.2	3,580	3,760
		200	1.5	<0.2	3,580	3,220	200	1.5	<0.2	3,580	3,760
		250	1	<0.2	2,790	2,010	250	1	<0.2	2,790	2,350
		300	0.7	<0.2	2,790	1,670	300	0.7	<0.2	2,790	1,950
		350	—	—	—	—	350	—	—	—	—
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~150	1.5	<0.2	720	520	~150	1.5	<0.2	720	610
		200	1.5	<0.2	720	520	200	1.5	<0.2	720	610
		250	1	<0.2	560	340	250	1	<0.2	560	400
		300	0.7	<0.2	560	270	300	0.7	<0.2	560	320
		350	—	—	—	—	350	—	—	—	—

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 of 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● YPHW-15/-F type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~150	2	<0.2	4,140	4,350	~150	2	<0.2	4,140	4,970
		200	2	<0.2	4,140	4,350	200	2	<0.2	4,140	4,970
		250	2	<0.2	4,140	4,350	250	2	<0.2	4,140	4,970
		300	1.5	<0.2	2,860	2,400	300	1.5	<0.2	2,860	2,740
		350	1.5	<0.2	2,860	2,400	350	1.5	<0.2	2,860	2,740
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~150	2	<0.2	2,860	3,000	~150	2	<0.2	2,860	3,430
		200	2	<0.2	2,860	3,000	200	2	<0.2	2,860	3,430
		250	2	<0.2	2,860	3,000	250	2	<0.2	2,860	3,430
		300	1.5	<0.2	2,860	2,400	300	1.5	<0.2	2,860	2,740
		350	1.5	<0.2	2,860	2,400	350	1.5	<0.2	2,860	2,740
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~150	2	<0.2	2,860	3,000	~150	2	<0.2	2,860	3,430
		200	2	<0.2	2,860	3,000	200	2	<0.2	2,860	3,430
		250	2	<0.2	2,860	3,000	250	2	<0.2	2,860	3,430
		300	1.5	<0.2	2,860	2,400	300	1.5	<0.2	2,860	2,740
		350	1.5	<0.2	2,860	2,400	350	1.5	<0.2	2,860	2,740
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~150	2	<0.2	2,550	2,140	~150	2	<0.2	2,550	2,450
		200	2	<0.2	2,550	2,140	200	2	<0.2	2,550	2,450
		250	2	<0.2	2,550	2,140	250	2	<0.2	2,550	2,450
		300	1.5	<0.2	2,230	1,560	300	1.5	<0.2	2,230	1,780
		350	1.5	<0.2	2,230	1,560	350	1.5	<0.2	2,230	1,780
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~150	1.5	<0.2	1,270	890	~150	1.5	<0.2	1,270	1,020
		200	1.5	<0.2	1,270	890	200	1.5	<0.2	1,270	1,020
		250	1.5	<0.2	1,270	890	250	1.5	<0.2	1,270	1,020
		300	1.2	<0.2	1,080	600	300	1.2	<0.2	1,080	690
		350	1.2	<0.2	1,080	600	350	1.2	<0.2	1,080	690
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	1.5	<0.2	1,150	810	~150	1.5	<0.2	1,150	930
		200	1.5	<0.2	1,150	810	200	1.5	<0.2	1,150	930
		250	1.5	<0.2	1,150	810	250	1.5	<0.2	1,150	930
		300	1	<0.2	950	530	300	1	<0.2	950	610
		350	1	<0.2	950	530	350	1	<0.2	950	610
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~150	2	<0.2	3,500	3,680	~150	2	<0.2	3,500	4,210
		200	2	<0.2	3,500	3,680	200	2	<0.2	3,500	4,210
		250	2	<0.2	3,500	3,680	250	2	<0.2	3,500	4,210
		300	1.5	<0.2	2,860	2,400	300	1.5	<0.2	2,860	2,740
		350	1.5	<0.2	2,860	2,400	350	1.5	<0.2	2,860	2,740
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~150	2	<0.2	2,860	3,000	~150	2	<0.2	2,860	3,430
		200	2	<0.2	2,860	3,000	200	2	<0.2	2,860	3,430
		250	2	<0.2	2,860	3,000	250	2	<0.2	2,860	3,430
		300	1.5	<0.2	2,860	2,400	300	1.5	<0.2	2,860	2,740
		350	1.5	<0.2	2,860	2,400	350	1.5	<0.2	2,860	2,740
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~150	2	<0.2	570	480	~150	2	<0.2	570	550
		200	2	<0.2	570	480	200	2	<0.2	570	550
		250	2	<0.2	570	480	250	2	<0.2	570	550
		300	1.5	<0.2	450	320	300	1.5	<0.2	450	370
		350	1.5	<0.2	450	320	350	1.5	<0.2	450	370

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 of 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

QXP TYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● YPHW-15/-F type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		63/66									
		No. of teeth 8N									
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)					
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~200	2	<0.2	3,290	3,950					
		250	2	<0.2	3,290	3,950					
		300	2	<0.2	3,290	3,950					
		350	1.5	<0.2	2,270	2,180					
		400	1.5	<0.2	2,270	2,180					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~200	2	<0.2	2,270	2,720					
		250	2	<0.2	2,270	2,720					
		300	2	<0.2	2,270	2,720					
		350	1.5	<0.2	2,270	2,180					
		400	1.5	<0.2	2,270	2,180					
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~200	2	<0.2	2,270	2,720					
		250	2	<0.2	2,270	2,720					
		300	2	<0.2	2,270	2,720					
		350	1.5	<0.2	2,270	2,180					
		400	1.5	<0.2	2,270	2,180					
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~200	2	<0.2	2,020	1,940					
		250	2	<0.2	2,020	1,940					
		300	2	<0.2	2,020	1,940					
		350	1.5	<0.2	1,770	1,410					
		400	1.5	<0.2	1,770	1,410					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~200	1.5	<0.2	1,010	810					
		250	1.5	<0.2	1,010	810					
		300	1.5	<0.2	1,010	810					
		350	1.2	<0.2	860	550					
		400	1.2	<0.2	860	550					
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~200	1.5	<0.2	910	740					
		250	1.5	<0.2	910	740					
		300	1.5	<0.2	910	740					
		350	1	<0.2	750	480					
		400	1	<0.2	750	480					
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~200	2	<0.2	2,780	3,340					
		250	2	<0.2	2,780	3,340					
		300	2	<0.2	2,780	3,340					
		350	1.5	<0.2	2,270	2,180					
		400	1.5	<0.2	2,270	2,180					
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~200	2	<0.2	2,270	2,720					
		250	2	<0.2	2,270	2,720					
		300	2	<0.2	2,270	2,720					
		350	1.5	<0.2	2,270	2,180					
		400	1.5	<0.2	2,270	2,180					
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~200	2	<0.2	450	440					
		250	2	<0.2	450	440					
		300	2	<0.2	450	440					
		350	1.5	<0.2	360	300					
		400	1.5	<0.2	360	300					

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 of 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

YPHW-15 type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (DH102)	~150	0.2	20~40	2,100	3,150	~150	0.2	20~38	2,100	3,680
		200	0.2	20~40	2,100	3,150	200	0.2	20~38	2,100	3,680
		250	0.2	20~40	1,570	1,890	250	0.2	20~38	1,570	2,200
		300	0.2	20~22	1,360	1,640	300	0.2	20~22	1,360	1,900
		350	—	—	—	—	350	—	—	—	—
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (DH102)	~150	0.2	20~40	1,890	2,830	~150	0.2	20~38	1,890	3,300
		200	0.2	20~40	1,890	2,830	200	0.2	20~38	1,890	3,300
		250	0.2	20~40	1,410	1,700	250	0.2	20~38	1,410	1,980
		300	0.2	20~22	1,220	1,470	300	0.2	20~22	1,220	1,710
		350	—	—	—	—	350	—	—	—	—
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	DH102	~150	0.2	20~40	1,750	2,100	~150	0.2	20~38	1,750	2,450
		200	0.2	20~40	1,750	2,100	200	0.2	20~38	1,750	2,450
		250	0.2	20~40	1,300	1,400	250	0.2	20~38	1,300	1,650
		300	0.2	20~22	1,150	1,150	300	0.2	20~22	1,150	1,350
		350	—	—	—	—	350	—	—	—	—
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102	~150	0.2	20~40	1,600	1,150	~150	0.2	20~38	1,600	1,350
		200	0.2	20~40	1,600	1,150	200	0.2	20~38	1,600	1,350
		250	0.2	20~40	1,200	720	250	0.2	20~38	1,200	840
		300	0.2	20~22	1,050	630	300	0.2	20~22	1,050	740
		350	—	—	—	—	350	—	—	—	—
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102	~150	0.2	20~40	800	480	~150	0.2	20~38	800	560
		200	0.2	20~40	800	480	200	0.2	20~38	800	560
		250	0.2	20~40	640	380	250	0.2	20~38	640	440
		300	0.2	20~22	400	120	300	0.2	20~22	400	140
		350	—	—	—	—	350	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	0.2	20~40	560	240	~150	0.2	20~38	560	280
		200	0.2	20~40	560	240	200	0.2	20~38	560	240
		250	0.2	20~40	400	120	250	0.2	20~38	400	140
		300	0.2	20~22	400	120	300	0.2	20~22	400	140
		350	—	—	—	—	350	–	—	—	—
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	DH102	~150	0.2	20~40	1,590	1,910	~150	0.2	20~38	1,590	2,230
		200	0.2	20~40	1,590	1,910	200	0.2	20~38	1,590	2,230
		250	0.2	20~40	1,190	1,070	250	0.2	20~38	1,190	1,250
		300	0.2	20~22	1,030	620	300	0.2	20~22	1,030	720
		350	—	—	—	—	350	—	—	—	—
Stainless steel SUS304 Below 250HB	DH102	~150	0.2	20~40	1,430	1,290	~150	0.2	20~38	1,430	1,500
		200	0.2	20~40	1,430	1,290	200	0.2	20~38	1,430	1,500
		250	0.2	20~40	1,030	740	250	0.2	20~38	1,030	870
		300	0.2	20~22	800	480	300	0.2	20~22	800	560
		350	—	—	—	—	350	—	—	—	—
Titanium alloy (Ti-6Al-4V)	DH102	~150	0.2	20~40	400	360	~150	0.2	20~38	400	420
		200	0.2	20~40	400	360	200	0.2	20~38	400	420
		250	0.2	20~40	240	140	250	0.2	20~22	240	160
		300	0.2	20~22	240	140	300	0.2	20~22	240	160
		350	—	—	—	—	350	—	—	—	—

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 of 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 QXPTYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

● YPHW-15 type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		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	CX75 (DH102)	~150	0.2	25~50	1,700	2,970	~150	0.2	25~48	1,700	3,390
		200	0.2	25~50	1,700	2,970	200	0.2	25~48	1,700	3,390
		250	0.2	25~50	1,700	2,700	250	0.2	25~48	1,700	3,080
		300	0.2	25~50	1,280	1,790	300	0.2	25~48	1,280	2,040
		350	0.2	25~28	1,280	1,790	350	0.2	25~28	1,280	2,040
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (DH102)	~150	0.2	25~50	1,530	2,670	~150	0.2	25~48	1,530	3,050
		200	0.2	25~50	1,530	2,670	200	0.2	25~48	1,530	3,050
		250	0.2	25~50	1,530	2,430	250	0.2	25~48	1,530	2,770
		300	0.2	25~50	1,150	1,600	300	0.2	25~48	1,150	1,830
		350	0.2	25~28	1,150	1,600	350	0.2	25~28	1,150	1,830
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	DH102	~150	0.2	25~50	1,400	1,950	~150	0.2	25~48	1,400	2,200
		200	0.2	25~50	1,400	1,950	200	0.2	25~48	1,400	2,200
		250	0.2	25~50	1,400	1,750	250	0.2	25~48	1,400	2,000
		300	0.2	25~50	1,050	1,250	300	0.2	25~48	1,050	1,400
		350	0.2	25~28	1,050	1,250	350	0.2	25~28	1,050	1,400
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102	~150	0.2	25~50	1,250	1,050	~150	0.2	25~48	1,250	1,200
		200	0.2	25~50	1,250	1,050	200	0.2	25~48	1,250	1,200
		250	0.2	25~50	1,250	880	250	0.2	25~48	1,250	1,000
		300	0.2	25~50	950	660	300	0.2	25~48	950	750
		350	0.2	25~28	950	660	350	0.2	25~28	950	750
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102	~150	0.2	25~50	510	360	~150	0.2	25~48	510	410
		200	0.2	25~50	510	360	200	0.2	25~48	510	410
		250	0.2	25~50	510	340	250	0.2	25~48	510	390
		300	0.2	25~50	380	270	300	0.2	25~48	380	310
		350	0.2	25~28	380	270	350	0.2	25~28	380	310
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	0.2	25~50	380	190	~150	0.2	25~48	380	220
		200	0.2	25~50	380	190	200	0.2	25~48	380	220
		250	0.2	25~50	380	160	250	0.2	25~48	380	180
		300	0.2	25~50	320	130	300	0.2	25~48	320	150
		350	0.2	25~28	320	130	350	0.2	25~28	320	150
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	DH102	~150	0.2	25~50	1,270	1,780	~150	0.2	25~48	1,270	2,030
		200	0.2	25~50	1,270	1,780	200	0.2	25~48	1,270	2,030
		250	0.2	25~50	1,270	1,560	250	0.2	25~48	1,270	1,780
		300	0.2	25~50	950	1,000	300	0.2	25~48	950	1,140
		350	0.2	25~28	950	1,000	350	0.2	25~28	950	1,140
Stainless steel SUS304 Below 250HB	DH102	~150	0.2	25~50	1,150	1,210	~150	0.2	25~48	1,150	1,380
		200	0.2	25~50	1,150	1,210	200	0.2	25~48	1,150	1,380
		250	0.2	25~50	1,150	1,090	250	0.2	25~48	1,150	1,250
		300	0.2	25~50	830	700	300	0.2	25~48	830	800
		350	0.2	25~28	830	700	350	0.2	25~28	830	800
Titanium alloy (Ti-6Al-4V)	DH102	~150	0.2	25~50	320	340	~150	0.2	25~48	320	390
		200	0.2	25~50	320	340	200	0.2	25~48	320	390
		250	0.2	25~50	320	300	250	0.2	25~48	320	340
		300	0.2	25~50	190	160	300	0.2	25~48	190	180
		350	0.2	25~28	190	160	350	0.2	25~28	190	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 of 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

YPHW-15 type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		63/66									
		No. of teeth 8N									
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)					
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (DH102)	~200	0.2	31~63	1,350	2,700					
		250	0.2	31~63	1,350	2,700					
		300	0.2	31~63	1,350	2,450					
		350	0.2	31~63	1,020	1,630					
		400	0.2	31~35	1,020	1,630					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (DH102)	~200	0.2	31~63	1,210	2,420					
		250	0.2	31~63	1,210	2,420					
		300	0.2	31~63	1,210	2,190					
		350	0.2	31~63	910	1,450					
		400	0.2	31~35	910	1,450					
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	DH102	~200	0.2	31~63	1,110	1,750					
		250	0.2	31~63	1,110	1,750					
		300	0.2	31~63	1,110	1,580					
		350	0.2	31~63	830	1,110					
		400	0.2	31~35	830	1,110					
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102	~200	0.2	31~63	1,000	960					
		250	0.2	31~63	1,000	960					
		300	0.2	31~63	1,000	800					
		350	0.2	31~63	750	590					
		400	0.2	31~35	750	590					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102	~200	0.2	31~63	400	320					
		250	0.2	31~63	400	320					
		300	0.2	31~63	400	300					
		350	0.2	31~63	300	250					
		400	0.2	31~35	300	250					
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~200	0.2	31~63	300	170					
		250	0.2	31~63	300	170					
		300	0.2	31~63	300	140					
		350	0.2	31~63	250	120					
		400	0.2	31~35	250	120					
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	DH102	~200	0.2	31~63	1,000	1,600					
		250	0.2	31~63	1,000	1,600					
		300	0.2	31~63	1,000	1,400					
		350	0.2	31~63	750	900					
		400	0.2	31~35	750	900					
Stainless steel SUS304 Below 250HB	DH102	~200	0.2	31~63	910	1,090					
		250	0.2	31~63	910	1,090					
		300	0.2	31~63	910	990					
		350	0.2	31~63	660	640					
		400	0.2	31~35	660	640					
Titanium alloy (Ti-6Al-4V)	DH102	~200	0.2	31~63	250	300					
		250	0.2	31~63	250	300					
		300	0.2	31~63	250	270					
		350	0.2	31~63	150	140					
		400	0.2	31~35	150	140					

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 of 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 **QXP**TYPE

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

● YPHW-F/-24 type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	~150	0.2	20~40	1,590	1,430	~150	0.2	20~38	1,590	1,670
		200	0.2	20~40	1,590	1,430	200	0.2	20~38	1,590	1,670
		250	0.2	20~40	1,190	860	250	0.2	20~38	1,190	1,000
		300	0.2	20~22	1,030	620	300	0.2	20~22	1,030	720
		350	—	—	—	—	350	—	—	—	—
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	~150	0.2	20~40	1,430	1,290	~150	0.2	20~38	1,430	1,500
		200	0.2	20~40	1,430	1,290	200	0.2	20~38	1,430	1,500
		250	0.2	20~40	1,030	740	250	0.2	20~38	1,030	870
		300	0.2	20~22	800	480	300	0.2	20~22	800	560
		350	—	—	—	—	350	—	—	—	—
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015	~150	0.2	20~40	1,270	920	~150	0.2	20~38	1,270	1,070
		200	0.2	20~40	1,270	920	200	0.2	20~38	1,270	1,070
		250	0.2	20~40	950	570	250	0.2	20~38	950	670
		300	0.2	20~22	720	430	300	0.2	20~22	720	500
		350	—	—	—	—	350	—	—	—	—
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015	~150	0.2	20~40	1,030	740	~150	0.2	20~38	1,030	870
		200	0.2	20~40	1,030	740	200	0.2	20~38	1,030	870
		250	0.2	20~40	870	520	250	0.2	20~38	870	610
		300	0.2	20~22	640	380	300	0.2	20~22	640	440
		350	—	—	—	—	350	—	—	—	—
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015	~150	0.2	20~40	800	480	~150	0.2	20~38	800	560
		200	0.2	20~40	800	480	200	0.2	20~38	800	560
		250	0.2	20~40	640	380	250	0.2	20~38	640	440
		300	0.2	20~22	400	120	300	0.2	20~22	400	140
		350	—	—	—	—	350	—	—	—	—
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	~150	0.2	20~40	1,590	1,910	~150	0.2	20~38	1,590	2,230
		200	0.2	20~40	1,590	1,910	200	0.2	20~38	1,590	2,230
		250	0.2	20~40	1,190	1,070	250	0.2	20~38	1,190	1,250
		300	0.2	20~22	1,030	620	300	0.2	20~22	1,030	720
		350	—	—	—	—	350	—	—	—	—
Stainless steel SUS304 Below 250HB	JC8015	~150	0.2	20~40	1,430	1,290	~150	0.2	20~38	1,430	1,500
		200	0.2	20~40	1,430	1,290	200	0.2	20~38	1,430	1,500
		250	0.2	20~40	1,030	740	250	0.2	20~38	1,030	870
		300	0.2	20~22	800	480	300	0.2	20~22	800	560
		350	—	—	—	—	350	—	—	—	—
Titanium alloy (Ti-6Al-4V)	JC8015	~150	0.2	20~40	400	360	~150	0.2	20~38	400	420
		200	0.2	20~40	400	360	200	0.2	20~38	400	420
		250	0.2	20~40	240	140	250	0.2	20~38	240	160
		300	0.2	20~22	240	140	300	0.2	20~22	240	160
		350	—	—	—	—	350	—	—	—	—

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 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING AT LOW FEED SPEED

● YPHW-F/-24 type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	~150	0.2	25~50	1,270	1,330	~150	0.2	25~48	1,270	1,530
		200	0.2	25~50	1,270	1,330	200	0.2	25~48	1,270	1,530
		250	0.2	25~50	1,270	1,200	250	0.2	25~48	1,270	1,380
		300	0.2	25~50	950	800	300	0.2	25~48	950	910
		350	0.2	25~28	950	800	350	0.2	25~28	950	910
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	~150	0.2	25~50	1,150	1,210	~150	0.2	25~48	1,150	1,380
		200	0.2	25~50	1,150	1,210	200	0.2	25~48	1,150	1,380
		250	0.2	25~50	1,150	1,090	250	0.2	25~48	1,150	1,250
		300	0.2	25~50	830	700	300	0.2	25~48	830	800
		350	0.2	25~28	830	700	350	0.2	25~28	830	800
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015	~150	0.2	25~50	1,020	860	~150	0.2	25~48	1,020	980
		200	0.2	25~50	1,020	860	200	0.2	25~48	1,020	980
		250	0.2	25~50	1,020	770	250	0.2	25~48	1,020	880
		300	0.2	25~50	760	530	300	0.2	25~48	760	610
		350	0.2	25~28	760	530	350	0.2	25~28	760	610
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015	~150	0.2	25~50	830	700	~150	0.2	25~48	830	800
		200	0.2	25~50	830	700	200	0.2	25~48	830	800
		250	0.2	25~50	830	630	250	0.2	25~48	830	720
		300	0.2	25~50	700	490	300	0.2	25~48	700	560
		350	0.2	25~28	700	490	350	0.2	25~28	700	560
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015	~150	0.2	25~50	510	360	~150	0.2	25~48	510	410
		200	0.2	25~50	510	360	200	0.2	25~48	510	410
		250	0.2	25~50	510	340	250	0.2	25~48	510	390
		300	0.2	25~50	380	270	300	0.2	25~48	380	310
		350	0.2	25~28	380	270	350	0.2	25~28	380	310
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	~150	0.2	25~50	1,270	1,780	~150	0.2	25~48	1,270	2,030
		200	0.2	25~50	1,270	1,780	200	0.2	25~48	1,270	2,030
		250	0.2	25~50	1,270	1,560	250	0.2	25~48	1,270	1,780
		300	0.2	25~50	950	1,000	300	0.2	25~48	950	1,140
		350	0.2	25~28	950	1,000	350	0.2	25~28	950	1,140
Stainless steel SUS304 Below 250HB	JC8015	~150	0.2	25~50	1,150	1,210	~150	0.2	25~48	1,150	1,380
		200	0.2	25~50	1,150	1,210	200	0.2	25~48	1,150	1,380
		250	0.2	25~50	1,150	1,090	250	0.2	25~48	1,150	1,250
		300	0.2	25~50	830	700	300	0.2	25~48	830	800
		350	0.2	25~28	830	700	350	0.2	25~28	830	800
Titanium alloy (Ti-6Al-4V)	JC8015	~150	0.2	25~50	320	340	~150	0.2	25~48	320	390
		200	0.2	25~50	320	340	200	0.2	25~48	320	390
		250	0.2	25~50	320	300	250	0.2	25~48	320	340
		300	0.2	25~50	190	160	300	0.2	25~48	190	180
		350	0.2	25~28	190	160	350	0.2	25~28	190	180

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 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING AT LOW FEED SPEED

● YPHW-F/-24 type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		63/66									
		No. of teeth 8N									
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)					
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	~200	0.2	31~63	1,000	1,200					
		250	0.2	31~63	1,000	1,200					
		300	0.2	31~63	1,000	1,080					
		350	0.2	31~63	750	720					
		400	0.2	31~35	750	720					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	~200	0.2	31~63	910	1,090					
		250	0.2	31~63	910	1,090					
		300	0.2	31~63	910	990					
		350	0.2	31~63	660	640					
		400	0.2	31~35	660	640					
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015	~200	0.2	31~63	800	770					
		250	0.2	31~63	800	770					
		300	0.2	31~63	800	690					
		350	0.2	31~63	600	480					
		400	0.2	31~35	600	480					
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015	~200	0.2	31~63	650	620					
		250	0.2	31~63	650	620					
		300	0.2	31~63	650	560					
		350	0.2	31~63	550	440					
		400	0.2	31~35	550	440					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015	~200	0.2	31~63	400	320					
		250	0.2	31~63	400	320					
		300	0.2	31~63	400	300					
		350	0.2	31~63	300	250					
		400	0.2	31~35	300	250					
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	~200	0.2	31~63	1,000	1,600					
		250	0.2	31~63	1,000	1,600					
		300	0.2	31~63	1,000	1,400					
		350	0.2	31~63	750	900					
		400	0.2	31~35	750	900					
Stainless steel SUS304 Below 250HB	JC8015	~200	0.2	31~63	910	1,090					
		250	0.2	31~63	910	1,090					
		300	0.2	31~63	910	990					
		350	0.2	31~63	660	640					
		400	0.2	31~35	660	640					
Titanium alloy (Ti-6Al-4V)	JC8015	~200	0.2	31~63	250	300					
		250	0.2	31~63	250	300					
		300	0.2	31~63	250	270					
		350	0.2	31~63	150	140					
		400	0.2	31~35	150	140					

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 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS / CONTOURING MILLING

● YPHW-24 type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		40					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)
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
		200	0.2	<17	1,750	2,620	200	0.2	<17	1,750	3,060
		250	0.15	<17	1,750	2,620	250	0.15	<17	1,750	3,060
		300	-	-	-	-	300	-	-	-	-
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
		200	0.15	<17	1,270	1,900	200	0.15	<17	1,270	2,220
		250	0.1	<17	1,270	1,900	250	0.1	<17	1,270	2,220
		300	-	-	-	-	300	-	-	-	-
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
		200	0.1	<13	800	960	200	0.1	<13	800	1,120
		250	-	-	-	-	250	-	-	-	-
		300	-	-	-	-	300	-	-	-	-

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		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)
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~150	0.4	<21	1,400	2,450	~100	0.4	<21	1,400	2,800
		200	0.3	<21	1,400	2,450	150	0.3	<21	1,400	2,800
		250	0.2	<21	1,400	2,450	200	0.2	<21	1,400	2,800
		300	0.15	<21	1,400	2,450	250	0.15	<21	1,400	2,800
		350	-	-	-	-	300	-	-	-	-
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~150	0.25	<21	1,020	1,780	~100	0.25	<21	1,020	2,040
		200	0.2	<21	1,020	1,780	150	0.2	<21	1,020	2,040
		250	0.15	<21	1,020	1,780	200	0.15	<21	1,020	2,040
		300	0.1	<21	1,020	1,780	250	0.1	<21	1,020	2,040
		350	-	-	-	-	300	-	-	-	-
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	0.2	<17	640	900	~100	0.2	<17	640	1,030
		200	0.15	<17	640	900	150	0.15	<17	640	1,030
		250	0.1	<17	640	900	200	0.1	<17	640	1,030
		300	-	-	-	-	250	-	-	-	-
		350	-	-	-	-	300	-	-	-	-

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 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS / CONTOURING MILLING

YPHW-24 type insert

Work Materials	Insert Grades	Tool dia. (mm)									
		63/66									
		No. of teeth 8N									
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)					
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~150	0.4	<26	1,110	2,220					
		200	0.4	<26	1,110	2,220					
		250	0.3	<26	1,110	2,220					
		300	0.2	<26	1,110	2,220					
		350	0.15	<26	1,110	2,220					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~150	0.25	<26	810	1,620					
		200	0.25	<26	810	1,620					
		250	0.2	<26	810	1,620					
		300	0.15	<26	810	1,620					
		350	0.1	<26	810	1,620					
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	0.2	<21	500	800					
		200	0.2	<21	500	800					
		250	0.15	<21	500	800					
		300	0.1	<21	500	800					
		350	—	—	—	—					

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 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

QXP TYPE

RECOMMENDED CUTTING CONDITIONS / SIDE FINISHING

ZPMT＊-PL-type inserts (facemill type)

Work Materials	Insert Grades	Tool dia. (mm)									
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015)	~150	≦5.0	＜0.20	2,550	4,590	~150	≦5.0	＜0.20	2,550	5,350
		200	≦3.0	＜0.15	2,040	2,940	200	≦3.0	＜0.15	2,040	3,430
		250	≦2.5	＜0.10	1,530	1,650	250	≦2.5	＜0.10	1,530	1,930
		300	≦2.5	＜0.10	1,530	1,650	300	≦2.5	＜0.10	1,530	1,930
		350	–	–	–	–	350	–	–	–	–
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015)	~150	≦5.0	＜0.20	2,400	3,600	~150	≦5.0	＜0.20	2,400	4,200
		200	≦3.0	＜0.15	1,920	2,300	200	≦3.0	＜0.15	1,920	2,690
		250	≦2.5	＜0.10	1,440	1,300	250	≦2.5	＜0.10	1,440	1,510
		300	≦2.5	＜0.10	1,440	1,300	300	≦2.5	＜0.10	1,440	1,510
		350	–	–	–	–	350	–	–	–	–
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~150	≦5.0	＜0.20	2,400	3,600	~150	≦5.0	＜0.20	2,400	4,200
		200	≦3.0	＜0.15	1,920	2,300	200	≦3.0	＜0.15	1,920	2,690
		250	≦2.5	＜0.10	1,440	1,300	250	≦2.5	＜0.10	1,440	1,510
		300	≦2.5	＜0.10	1,440	1,300	300	≦2.5	＜0.10	1,440	1,510
		350	–	–	–	–	350	–	–	–	–
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~150	≦4.0	＜0.20	2,000	3,000	~150	≦4.0	＜0.20	2,000	3,500
		200	≦2.5	＜0.15	1,600	1,920	200	≦2.5	＜0.15	1,600	2,240
		250	≦2.0	＜0.10	1,200	1,080	250	≦2.0	＜0.10	1,200	1,260
		300	≦2.0	＜0.10	1,200	1,080	300	≦2.0	＜0.10	1,200	1,260
		350	–	–	–	–	350	–	–	–	–
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~150	≦3.5	＜0.20	1,670	2,000	~150	≦3.5	＜0.20	1,670	2,340
		200	≦2.5	＜0.15	1,340	1,290	200	≦2.5	＜0.15	1,340	1,500
		250	≦1.5	＜0.10	1,000	720	250	≦1.5	＜0.10	1,000	840
		300	–	–	–	–	300	–	–	–	–
		350	–	–	–	–	350	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	≦2.5	＜0.15	1,430	1,290	~150	≦2.5	＜0.15	1,430	1,500
		200	≦2.0	＜0.12	1,140	820	200	≦2.0	＜0.12	1,140	960
		250	≦1.0	＜0.10	860	460	250	≦1.0	＜0.10	860	540
		300	–	–	–	–	300	–	–	–	–
		350	–	–	–	–	350	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~150	≦5.0	＜0.20	2,230	4,010	~150	≦5.0	＜0.20	2,230	4,680
		200	≦3.0	＜0.15	1,780	2,560	200	≦3.0	＜0.15	1,780	2,990
		250	≦2.5	＜0.10	1,340	1,450	250	≦2.5	＜0.10	1,340	1,690
		300	≦2.5	＜0.10	1,340	1,450	300	≦2.5	＜0.10	1,340	1,690
		350	–	–	–	–	350	–	–	–	–
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~150	≦5.0	＜0.20	2,400	3,600	~150	≦5.0	＜0.20	2,400	4,200
		200	≦3.0	＜0.15	1,920	2,300	200	≦3.0	＜0.15	1,920	2,690
		250	≦2.5	＜0.10	1,440	1,300	250	≦2.5	＜0.10	1,440	1,510
		300	≦2.5	＜0.10	1,440	1,300	300	≦2.5	＜0.10	1,440	1,510
		350	–	–	–	–	350	–	–	–	–
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~150	≦5.0	＜0.20	720	1,080	~150	≦5.0	＜0.20	720	1,260
		200	≦3.0	＜0.15	580	700	200	≦3.0	＜0.15	580	810
		250	≦2.5	＜0.10	430	390	250	≦2.5	＜0.10	430	450
		300	≦2.5	＜0.10	430	390	300	≦2.5	＜0.10	430	450
		350	–	–	–	–	350	–	–	–	–

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 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 QXPTYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FINISHING

● ZPMT＊-PL-type inserts (facemill type)

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		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	CX75 (JC8015)	~150	≦5.0	＜0.20	2,230	4,680	~150	≦5.0	＜0.20	2,230	5,350
		200	≦5.0	＜0.20	2,230	4,680	200	≦5.0	＜0.20	2,230	5,350
		250	≦3.0	＜0.15	1,780	2,990	250	≦3.0	＜0.15	1,780	3,420
		300	≦3.0	＜0.15	1,780	2,990	300	≦3.0	＜0.15	1,780	3,420
		350	≦2.5	＜0.10	1,340	1,690	350	≦2.5	＜0.10	1,340	1,930
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015)	~150	≦5.0	＜0.20	1,910	3,340	~150	≦5.0	＜0.20	1,910	3,820
		200	≦5.0	＜0.20	1,910	3,340	200	≦5.0	＜0.20	1,910	3,820
		250	≦3.0	＜0.15	1,530	2,140	250	≦3.0	＜0.15	1,530	2,450
		300	≦3.0	＜0.15	1,530	2,140	300	≦3.0	＜0.15	1,530	2,450
		350	≦2.5	＜0.10	1,150	1,210	350	≦2.5	＜0.10	1,150	1,380
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~150	≦5.0	＜0.20	1,910	3,340	~150	≦5.0	＜0.20	1,910	3,820
		200	≦5.0	＜0.20	1,910	3,340	200	≦5.0	＜0.20	1,910	3,820
		250	≦3.0	＜0.15	1,530	2,140	250	≦3.0	＜0.15	1,530	2,450
		300	≦3.0	＜0.15	1,530	2,140	300	≦3.0	＜0.15	1,530	2,450
		350	≦2.5	＜0.10	1,150	1,210	350	≦2.5	＜0.10	1,150	1,380
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~150	≦4.0	＜0.20	1,600	2,800	~150	≦4.0	＜0.20	1,600	3,200
		200	≦4.0	＜0.20	1,600	2,800	200	≦4.0	＜0.20	1,600	3,200
		250	≦2.5	＜0.15	1,280	1,790	250	≦2.5	＜0.15	1,280	2,050
		300	≦2.5	＜0.15	1,280	1,790	300	≦2.5	＜0.15	1,280	2,050
		350	≦2.0	＜0.10	960	1,010	350	≦2.0	＜0.10	960	1,150
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~150	≦3.0	＜0.20	1,340	1,880	~150	≦3.0	＜0.20	1,340	2,140
		200	≦3.0	＜0.20	1,340	1,880	200	≦3.0	＜0.20	1,340	2,140
		250	≦2.5	＜0.15	1,070	1,200	250	≦2.5	＜0.15	1,070	1,370
		300	≦2.5	＜0.15	1,070	1,200	300	≦2.5	＜0.15	1,070	1,370
		350	≦1.5	＜0.10	800	670	350	≦1.5	＜0.10	800	770
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	≦2.5	＜0.15	1,150	1,210	~150	≦2.5	＜0.15	1,150	1,380
		200	≦2.5	＜0.15	1,150	1,210	200	≦2.5	＜0.15	1,150	1,380
		250	≦2.0	＜0.12	920	770	250	≦2.0	＜0.12	920	880
		300	≦2.0	＜0.12	920	770	300	≦2.0	＜0.12	920	880
		350	≦1.0	＜0.10	690	440	350	≦1.0	＜0.10	690	500
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~150	≦5.0	＜0.20	1,780	3,740	~150	≦5.0	＜0.20	1,780	4,270
		200	≦5.0	＜0.20	1,780	3,740	200	≦5.0	＜0.20	1,780	4,270
		250	≦3.0	＜0.15	1,420	2,390	250	≦3.0	＜0.15	1,420	2,730
		300	≦3.0	＜0.15	1,420	2,390	300	≦3.0	＜0.15	1,420	2,730
		350	≦2.5	＜0.10	1,070	1,350	350	≦2.5	＜0.10	1,070	1,540
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~150	≦5.0	＜0.20	1,910	3,340	~150	≦5.0	＜0.20	1,910	3,820
		200	≦5.0	＜0.20	1,910	3,340	200	≦5.0	＜0.20	1,910	3,820
		250	≦3.0	＜0.15	1,530	2,140	250	≦3.0	＜0.15	1,530	2,450
		300	≦3.0	＜0.15	1,530	2,140	300	≦3.0	＜0.15	1,530	2,450
		350	≦2.5	＜0.10	1,150	1,210	350	≦2.5	＜0.10	1,150	1,380
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~150	≦5.0	＜0.20	570	1,000	~150	≦5.0	＜0.20	570	1,140
		200	≦5.0	＜0.20	570	1,000	200	≦5.0	＜0.20	570	1,140
		250	≦3.0	＜0.15	460	650	250	≦3.0	＜0.15	460	740
		300	≦3.0	＜0.15	460	650	300	≦3.0	＜0.15	460	740
		350	≦2.5	＜0.10	340	360	350	≦2.5	＜0.10	340	410

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 QXPTYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FINISHING

● ZPMT＊-PL-type inserts (facemill type)

Work Materials	Insert Grades	Tool dia. (mm)									
		63 / 66									
		No. of teeth 8N									
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)					
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015)	~200	≦5.0	＜0.20	1,620	3,890					
		250	≦5.0	＜0.20	1,620	3,890					
		300	≦3.0	＜0.15	1,300	2,500					
		350	≦3.0	＜0.15	1,300	2,500					
		400	≦2.5	＜0.10	970	1,400					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015)	~200	≦5.0	＜0.20	1,520	3,040					
		250	≦5.0	＜0.20	1,520	3,040					
		300	≦3.0	＜0.15	1,220	1,950					
		350	≦3.0	＜0.15	1,220	1,950					
		400	≦2.5	＜0.10	910	1,090					
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~200	≦5.0	＜0.20	1,520	3,040					
		250	≦5.0	＜0.20	1,520	3,040					
		300	≦3.0	＜0.15	1,220	1,950					
		350	≦3.0	＜0.15	1,220	1,950					
		400	≦2.5	＜0.10	910	1,090					
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~200	≦4.0	＜0.20	1,260	2,520					
		250	≦4.0	＜0.20	1,260	2,520					
		300	≦2.5	＜0.15	1,010	1,620					
		350	≦2.5	＜0.15	1,010	1,620					
		400	≦2.0	＜0.10	760	910					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~200	≦3.5	＜0.20	1,060	1,700					
		250	≦3.5	＜0.20	1,060	1,700					
		300	≦2.5	＜0.15	850	1,090					
		350	≦2.5	＜0.15	850	1,090					
		400	≦1.5	＜0.10	640	610					
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~200	≦2.5	＜0.15	910	1,090					
		250	≦2.5	＜0.15	910	1,090					
		300	≦2.0	＜0.12	730	700					
		350	≦2.0	＜0.12	730	700					
		400	≦1.0	＜0.10	550	400					
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~200	≦5.0	＜0.20	1,410	3,380					
		250	≦5.0	＜0.20	1,410	3,380					
		300	≦3.0	＜0.15	1,130	2,170					
		350	≦3.0	＜0.15	1,130	2,170					
		400	≦2.5	＜0.10	850	1,220					
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~200	≦5.0	＜0.20	1,520	3,040					
		250	≦5.0	＜0.20	1,520	3,040					
		300	≦3.0	＜0.15	1,220	1,950					
		350	≦3.0	＜0.15	1,220	1,950					
		400	≦2.5	＜0.10	910	1,090					
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~200	≦5.0	＜0.20	450	900					
		250	≦5.0	＜0.20	450	900					
		300	≦3.0	＜0.15	360	580					
		350	≦3.0	＜0.15	360	580					
		400	≦2.5	＜0.10	270	320					

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 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

QXPTYPE

■ RECOMMENDED CUTTING CONDITIONS / FOR BOTTOM FACE FINISHING

● ZPMT＊-PL-type inserts (facemill type)

Work Materials	Insert Grades	Tool dia. (mm)									
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015)	~150	≦0.20	13~38	1,400	1,260	~150	≦0.20	13~38	1,400	1,470
		200	≦0.15	13~38	1,050	760	200	≦0.15	13~38	1,050	880
		250	≦0.10	13~38	1,050	760	250	≦0.10	13~38	1,050	880
		300	≦0.10	13~24	700	420	300	≦0.10	13~24	700	490
		350	–	–	–	–	350	–	–	–	–
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015)	~150	≦0.20	13~38	1,300	1,170	~150	≦0.20	13~38	1,300	1,360
		200	≦0.15	13~38	980	710	200	≦0.15	13~38	980	820
		250	≦0.10	13~38	980	710	250	≦0.10	13~38	980	820
		300	≦0.10	13~24	650	390	300	≦0.10	13~24	650	450
		350	–	–	–	–	350	–	–	–	–
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~150	≦0.20	13~38	1,300	1,170	~150	≦0.20	13~38	1,300	1,360
		200	≦0.15	13~38	980	710	200	≦0.15	13~38	980	820
		250	≦0.10	13~38	980	710	250	≦0.10	13~38	980	820
		300	≦0.10	13~24	650	390	300	≦0.10	13~24	650	450
		350	–	–	–	–	350	–	–	–	–
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~150	≦0.20	13~38	1,110	1,000	~150	≦0.20	13~38	1,110	1,160
		200	≦0.15	13~38	830	600	200	≦0.15	13~38	830	700
		250	≦0.10	13~38	830	600	250	≦0.10	13~38	830	700
		300	≦0.10	13~24	560	340	300	≦0.10	13~24	560	390
		350	–	–	–	–	350	–	–	–	–
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~150	≦0.20	13~38	800	580	~150	≦0.20	13~38	800	670
		200	≦0.15	13~38	600	360	200	≦0.15	13~38	600	420
		250	≦0.10	13~38	600	360	250	≦0.10	13~38	600	420
		300	≦0.10	13~24	400	190	300	≦0.10	13~24	400	220
		350	–	–	–	–	350	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	≦0.15	13~38	560	340	~150	≦0.15	13~38	560	390
		200	≦0.12	13~38	420	200	200	≦0.12	13~38	420	230
		250	≦0.10	13~38	420	200	250	≦0.10	13~38	420	230
		300	≦0.10	13~24	280	100	300	≦0.10	13~24	280	120
		350	–	–	–	–	350	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~150	≦0.20	13~38	1,400	1,510	~150	≦0.20	13~38	1,400	1,760
		200	≦0.15	13~38	1,050	950	200	≦0.15	13~38	1,050	1,100
		250	≦0.10	13~38	1,050	950	250	≦0.10	13~38	1,050	1,100
		300	≦0.10	13~24	700	500	300	≦0.10	13~24	700	590
		350	–	–	–	–	350	–	–	–	–
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~150	≦0.20	13~38	1,300	1,170	~150	≦0.20	13~38	1,300	1,360
		200	≦0.15	13~38	980	710	200	≦0.15	13~38	980	820
		250	≦0.10	13~38	980	710	250	≦0.10	13~38	980	820
		300	≦0.10	13~24	650	390	300	≦0.10	13~24	650	450
		350	–	–	–	–	350	–	–	–	–
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	0,25 Pt	≦0.20	13~38	400	290	~150	≦0.20	13~38	400	340
		200	≦0.15	13~38	300	200	200	≦0.15	13~38	300	230
		250	≦0.10	13~38	300	200	250	≦0.10	13~38	300	230
		300	≦0.10	13~24	200	120	300	≦0.10	13~24	200	140
		350	–	–	–	–	350	–	–	–	–

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 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 QXPTYPE

■ RECOMMENDED CUTTING CONDITIONS / FOR BOTTOM FACE FINISHING

● ZPMT＊-PL-type inserts (facemill type)

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015)	~150	≦0.20	16~48	1,150	1,210	~150	≦0.20	16~48	1,150	1,380
		200	≦0.20	16~48	1,150	1,210	200	≦0.20	16~48	1,150	1,380
		250	≦0.15	16~48	860	720	250	≦0.15	16~48	860	820
		300	≦0.15	16~48	860	720	300	≦0.15	16~48	860	820
		350	≦0.10	16~30	580	410	350	≦0.10	16~30	580	460
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015)	~150	≦0.20	16~48	1,020	1,070	~150	≦0.20	16~48	1,020	1,220
		200	≦0.20	16~48	1,020	1,070	200	≦0.20	16~48	1,020	1,220
		250	≦0.15	16~48	770	650	250	≦0.15	16~48	770	740
		300	≦0.15	16~48	770	650	300	≦0.15	16~48	770	740
		350	≦0.10	16~30	510	360	350	≦0.10	16~30	510	410
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~150	≦0.20	16~48	1,020	1,070	~150	≦0.20	16~48	1,020	1,220
		200	≦0.20	16~48	1,020	1,070	200	≦0.20	16~48	1,020	1,220
		250	≦0.15	16~48	770	650	250	≦0.15	16~48	770	740
		300	≦0.15	16~48	770	650	300	≦0.15	16~48	770	740
		350	≦0.10	16~30	510	360	350	≦0.10	16~30	510	410
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~150	≦0.20	16~48	890	930	~150	≦0.20	16~48	890	1,070
		200	≦0.20	16~48	890	930	200	≦0.20	16~48	890	1,070
		250	≦0.15	16~48	670	560	250	≦0.15	16~48	670	640
		300	≦0.15	16~48	670	560	300	≦0.15	16~48	670	640
		350	≦0.10	16~30	450	320	350	≦0.10	16~30	450	360
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~150	≦0.20	16~48	640	540	~150	≦0.20	16~48	640	610
		200	≦0.20	16~48	640	540	200	≦0.20	16~48	640	610
		250	≦0.15	16~48	480	340	250	≦0.15	16~48	480	380
		300	≦0.15	16~48	480	340	300	≦0.15	16~48	480	380
		350	≦0.10	16~30	320	180	350	≦0.10	16~30	320	200
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	≦0.15	16~48	450	320	~150	≦0.15	16~48	450	360
		200	≦0.15	16~48	450	320	200	≦0.15	16~48	450	360
		250	≦0.12	16~48	340	190	250	≦0.12	16~48	340	220
		300	≦0.12	16~48	340	190	300	≦0.12	16~48	340	220
		350	≦0.10	16~30	220	90	350	≦0.10	16~30	220	100
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~150	≦0.20	16~48	1,150	1,450	~150	≦0.20	16~48	1,150	1,660
		200	≦0.20	16~48	1,150	1,450	200	≦0.20	16~48	1,150	1,660
		250	≦0.15	16~48	860	900	250	≦0.15	16~48	860	1,030
		300	≦0.15	16~48	860	900	300	≦0.15	16~48	860	1,030
		350	≦0.10	16~30	580	490	350	≦0.10	16~30	580	560
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~150	≦0.20	16~48	1,020	1,070	~150	≦0.20	16~48	1,020	1,220
		200	≦0.20	16~48	1,020	1,070	200	≦0.20	16~48	1,020	1,220
		250	≦0.15	16~48	770	650	250	≦0.15	16~48	770	740
		300	≦0.15	16~48	770	650	300	≦0.15	16~48	770	740
		350	≦0.10	16~30	510	360	350	≦0.10	16~30	510	410
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~150	≦0.20	16~48	320	270	~150	≦0.20	16~48	320	310
		200	≦0.20	16~48	320	270	200	≦0.20	16~48	320	310
		250	≦0.15	16~48	240	180	250	≦0.15	16~48	240	210
		300	≦0.15	16~48	240	180	300	≦0.15	16~48	240	210
		350	≦0.10	16~30	160	130	350	≦0.10	16~30	160	150

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

■ 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 QXPTYPE

■ RECOMMENDED CUTTING CONDITIONS / FOR BOTTOM FACE FINISHING

● ZPMT＊-PL-type inserts (facemill type)

Work Materials	Insert Grades	Tool dia. (mm)									
		63 / 66									
		No. of teeth 8N									
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)					
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015)	~200	≦0.20	23~61	910	1,090					
		250	≦0.20	23~61	910	1,090					
		300	≦0.15	23~61	680	650					
		350	≦0.15	23~61	680	650					
		400	≦0.10	23~38	460	370					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015)	~200	≦0.20	23~61	810	970					
		250	≦0.20	23~61	810	970					
		300	≦0.15	23~61	610	590					
		350	≦0.15	23~61	610	590					
		400	≦0.10	23~38	410	330					
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~200	≦0.20	23~61	810	970					
		250	≦0.20	23~61	810	970					
		300	≦0.15	23~61	610	590					
		350	≦0.15	23~61	610	590					
		400	≦0.10	23~38	410	330					
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~200	≦0.20	23~61	710	850					
		250	≦0.20	23~61	710	850					
		300	≦0.15	23~61	530	510					
		350	≦0.15	23~61	530	510					
		400	≦0.10	23~38	360	290					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~200	≦0.20	23~61	510	490					
		250	≦0.20	23~61	510	490					
		300	≦0.15	23~61	380	300					
		350	≦0.15	23~61	380	300					
		400	≦0.10	23~38	260	170					
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~200	≦0.15	23~61	350	280					
		250	≦0.15	23~61	350	280					
		300	≦0.12	23~61	260	170					
		350	≦0.12	23~61	260	170					
		400	≦0.10	23~38	180	90					
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~200	≦0.20	23~61	910	1,310					
		250	≦0.20	23~61	910	1,310					
		300	≦0.15	23~61	680	820					
		350	≦0.15	23~61	680	820					
		400	≦0.10	23~38	460	440					
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~200	≦0.20	23~61	810	970					
		250	≦0.20	23~61	810	970					
		300	≦0.15	23~61	610	590					
		350	≦0.15	23~61	610	590					
		400	≦0.10	23~38	410	330					
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~200	≦0.20	23~61	250	240					
		250	≦0.20	23~61	250	240					
		300	≦0.15	23~61	190	170					
		350	≦0.15	23~61	190	170					
		400	≦0.10	23~38	130	110					

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 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 QXPTYPE

RECOMMENDED CUTTING CONDITIONS

● ZPMT-NL-type inserts (facemill type)

Work Materials	Insert Grades	Tool dia. (mm)									
		40									
		No. of teeth 6N					No. of teeth 7N				
		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)
Aluminium alloy 50-110HB	FZ15 FC18	~150	~5.0	~80.0	4,800	4,320	~150	~5.0	~80.0	4,800	5,040
		200	~3.5	~20.0	3,600	2,160	200	~3.5	~20.0	3,600	2,520
		250	~2.0	~10.0	2,400	1,440	250	~2.0	~10.0	2,400	1,680

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		No. of teeth 7N					No. of teeth 8N				
		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)
Aluminium alloy 50-110HB	FZ15 FC18	~200	~5.0	~100.0	3,820	4,010	~200	~5.0	~100.0	3,820	4,580
		250	~3.5	~25.0	2,870	2,010	250	~3.5	~25.0	2,870	2,300
		300	~2.0	~12.5	1,910	1,340	300	~2.0	~12.5	1,910	1,530

Work Materials	Insert Grades	Tool dia. (mm)									
		63/66									
		No. of teeth 8N									
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	V_f (mm/min)					
Aluminium alloy 50-110HB	FZ15 FC18	~300	~5.0	~120.0	3,050	3,660					
		350	~3.5	~32.0	2,280	1,820					
		400	~2.0	~16.0	1,520	1,220					

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 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

QXP TYPE

■ 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) Below255HB				Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC				Mold steel 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 & Nodular cast iron 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				◎				◎								

Work Materials	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 chipbreaker
- EPHW type: Without chipbreaker
- EPMT type: With chipbreaker

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

QM Mill PMETYPE

QM MILL Quick & Mini

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

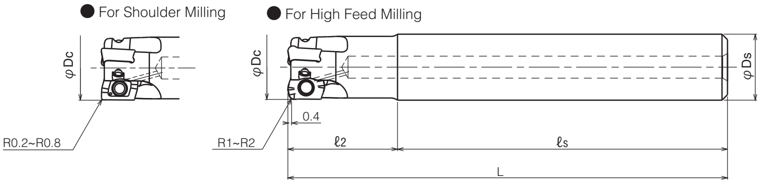
Low cutting force

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

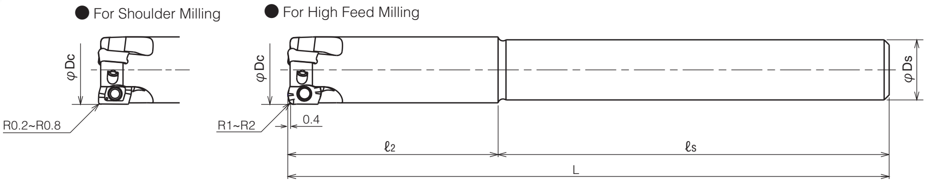
Multi blades

Diameter 10 mm: 2 flutes and diameter 14 mm: 3 flutes

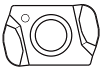
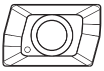
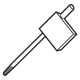
■ PME type



■ PME-LStype



■ BODY

Type	Cat. No.	Stock	No. of inserts	Coolant hole	Dimensions (mm)					Applicable inserts	Parts	
					φDc	ℓ_2	ℓ_s	L	φDs	 	Clamp screw 	Wrench 
Regular type	**PME2010S10**	●	2	With	**10**	20	60	80	10	EO**0602**Z*R ZOMT0602**ZER	DSW-1840H	A-06
	PME3012S12	●	3		**12**	20	60	80	12			
	PME3014S12	●	3		**14**	20	60	80	12			
Long shank type	**PME2011S10-LS**	●	2	Without	**11**	33	87	120	10			
	PME3013S12-LS	●	3		**13**	39	81	120	12			
	PME3014S12-LS	☐	3		**14**	42	78	120	12			

Note) 1. All cutters are supplied without inserts.
2. Please refer page C095-C098 for recommended cutting conditions.

Modular Head Type Please refer Page B090

Clamp Screw	Recommended Torque N•m
DSW-1840H	0.4

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

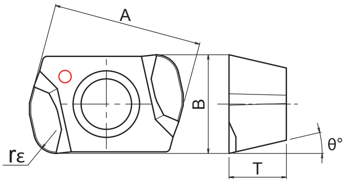
QM Mill PMETYPE

MPM / PME TYPE

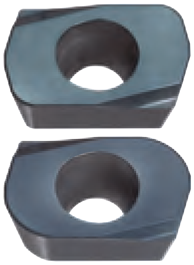
INSERTS

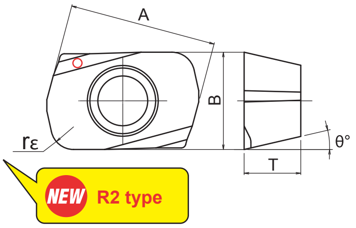
High feed insert

Grade (JC7560)



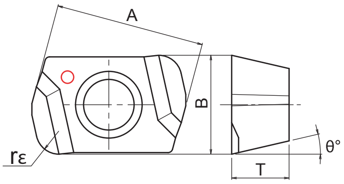
High hardened steel



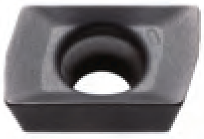


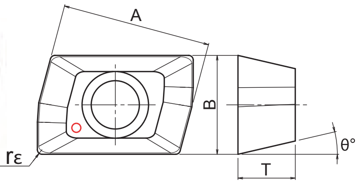
High feed insert for unfavourable condition

Grade (JC7560)

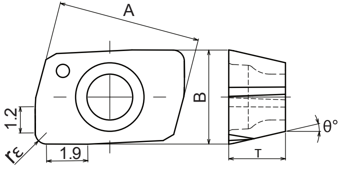


Shoulder milling insert





NEW “MIRROR INSERT” for finishing side & bottom face



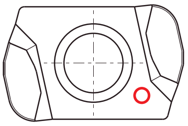
Type	Cat. No.	Tole-rance	PVD coated					Dimensions (mm)				
			JC5118	DH102	JC7560	JC8015	JC8050	A	T	B	rε	θ°
High feed insert	EOMT060210ZER	M	●		●		●	6.5	2.5	4.3	1.0	13°
	EOMT060220ZER	M	●				●	6.5	2.5	4.3	2.0	13°
High feed insert for unfavourable condition	EOMW060210ZER	M	●		●		●	6.5	2.5	4.3	1.0	13°
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.

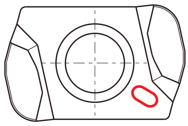
Identification of grade for QM MILL insert

Identification for the grades has been defined by different mark.

JC5118



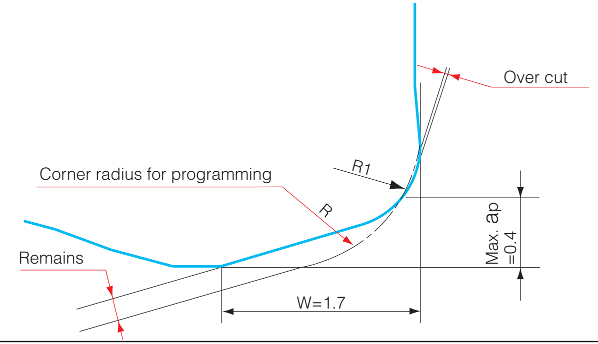
JC8050 / JC7560



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

QM Mill PMETYPE

■ Definition of corner radius for programming



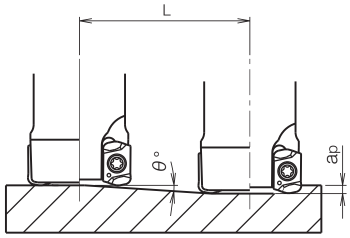
(mm)

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

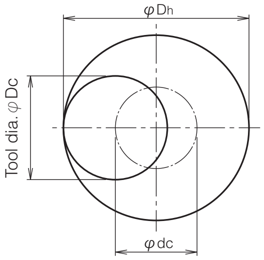
Note) In case of setting corner radius for programming to R2, recommend to use EOMT060220ZER or EOHW060220ZTR.

■ Instructions for profile milling with EO※※ type insert

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

$$\underset{\text{Tool pass dia.}}{\varphi dc} = \underset{\text{Bore dia.}}{\varphi Dh} - \underset{\text{Tool dia.}}{\varphi Dc}$$

● 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 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 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)
PME2010S10	10	6.6	0.3	2°18′	7.5	15	18
PME2011S10-LS	11	7.6	0.3	1°54′	9	17	20
PME30125S	12	8.5	0.3	1°36′	10.7	19	22
PME3013S-LS	13	9.5	0.3	1°24′	12.3	21	24
PME3014S(-LS)	14	10.5	0.3	1°18′	13.2	23	26

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

QM Mill **PME**TYPE

RECOMMENDED CUTTING CONDITIONS

EOMT/W and EOHW type insert

Work Materials	Insert Grades	Tool dia. (mm)														
		10/11					12/13					14				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 3N				
		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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (JC5118)	~30	0.3	~6	3,820	4,580	~35	0.3	~8	3,180	5,720	~35	0.3	~10	2,730	6,550
		30~50	0.25	~6	3,440	3,720	35~50	0.25	~8	2,860	4,630	35~50	0.25	~10	2,460	4,720
		50~70	0.15	~5	3,060	2,940	50~70	0.2	~7	2,540	3,660	55~70	0.2	~8	2,180	3,730
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 (JC8050) (JC5118)	~30	0.3	~6	3,500	4,200	~35	0.3	~8	2,920	5,260	~35	0.3	~10	2,500	6,010
		30~50	0.25	~6	3,150	3,400	35~50	0.25	~8	2,630	4,260	35~50	0.25	~10	2,250	4,810
		50~70	0.15	~5	2,800	2,690	50~70	0.2	~7	2,340	3,370	55~70	0.2	~8	2,000	3,420
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 (JC8050) (JC5118)	~30	0.3	~6	3,500	4,200	~35	0.3	~8	2,920	5,260	~35	0.3	~10	2,500	6,010
		30~50	0.25	~6	3,150	3,400	35~50	0.25	~8	2,630	4,260	35~50	0.25	~10	2,250	4,810
		50~70	0.15	~5	2,800	2,690	50~70	0.2	~7	2,340	3,370	55~70	0.2	~8	2,000	3,420
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC5118)	~30	0.3	~6	2,860	3,150	~35	0.3	~8	2,390	3,940	~35	0.3	~10	2,050	3,690
		30~50	0.25	~6	2,570	2,540	35~50	0.25	~8	2,150	3,190	35~50	0.25	~10	1,850	2,950
		50~70	0.15	~5	2,290	2,010	50~70	0.2	~7	1,910	2,520	55~70	0.2	~8	1,660	2,360
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 EOHWtype	~30	0.2	~6	2,860	2,860	~35	0.2	~7	2,390	3,590	~35	0.2	~9	2,050	3,080
		30~50	0.15	~6	2,570	2,060	35~50	0.15	~7	2,150	2,580	35~50	0.15	~9	1,850	2,220
		50~70	0.1	~5	2,290	1,370	50~70	0.1	~6	1,910	1,720	50~70	0.1	~7	1,660	1,490
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102 EOHWtype	~30	0.15	~6	2,550	1,530	~35	0.15	~7	2,120	1,900	~35	0.15	~9	1,820	1,640
		30~50	0.1	~6	2,300	1,240	35~50	0.1	~7	1,910	1,550	35~50	0.1	~9	1,640	1,330
		50~70	–	–	–	–	50~70	–	–	–	–	50~70	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118 (JC7560)	~30	0.3	~6	4,780	5,740	~35	0.3	~8	3,980	7,160	~35	0.3	~10	3,410	8,190
		30~50	0.25	~6	4,300	4,640	35~50	0.25	~8	3,580	5,800	35~50	0.25	~10	3,070	6,550
		50~70	0.15	~5	3,820	3,670	50~70	0.2	~7	3,180	4,580	55~70	0.2	~8	2,760	4,970
Stainless steel SUS304 Below 250HB	JC7560 (JC8050)	~30	0.3	~6	3,820	4,580	~35	0.3	~8	3,180	5,720	~35	0.3	~10	2,730	6,550
		30~50	0.25	~6	3,440	3,720	35~50	0.2	~8	2,860	4,630	35~50	0.2	~10	2,460	5,240
		50~70	0.15	~5	3,060	2,940	50~70	0.2	~7	2,540	3,660	55~70	0.2	~8	2,180	3,920
Titanium alloy (Ti-6Al-4V)	JC7560 (JC5118) (JC8050)	~30	0.3	~6	1,910	1,910	~35	0.3	~8	1,590	2,380	~35	0.3	~10	1,360	2,040
		30~50	0.25	~6	1,720	1,550	35~50	0.2	~8	1,430	1,930	35~50	0.2	~10	1,230	1,630
		50~70	0.15	~5	1,530	1,220	50~70	0.2	~7	1,270	1,520	55~70	0.2	~8	1,090	1,280
Inconel (INCO718)	JC5118 (JC8050) (JC7560)	~30	0.3	~6	950	760	~35	0.3	~8	800	960	~35	0.3	~10	680	820
		30~50	0.25	~6	850	620	35~50	0.2	~8	720	780	35~50	0.2	~10	610	660
		50~70	0.15	~5	760	610	50~70	0.2	~7	640	610	55~70	0.2	~8	550	520

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 chips out.

QM Mill

PMETYPE

RECOMMENDED CUTTING CONDITIONS

ZOMTtype insert

Work Materials	Insert Grades	Tool dia. (mm)														
		10/11					12/13					14				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 3N				
		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)	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)	~30	~4.0	~6.0	5,090	810	~35	~4.0	~8.0	4,240	1,020	~35	~4.0	~8.0	3,640	870
		30~50	~1.2	~1.8	4,580	640	35~50	~1.7	~2.6	3,820	800	35~50	~1.7	~2.6	3,280	700
		50~70	~0.5	~0.8	4,070	490	50~70	~0.6	~1.2	3,390	610	50~70	~0.6	~1.2	2,910	520
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5118 (JC8050)	~30	~4.0	~6.0	4,780	570	~35	~4.0	~8.0	3,980	720	~35	~4.0	~8.0	3,410	620
		30~50	~1.2	~1.8	4,300	430	35~50	~1.7	~2.6	3,580	540	35~50	~1.7	~2.6	3,070	460
		50~70	~0.5	~0.8	3,820	310	50~70	~0.6	~1.2	3,180	380	50~70	~0.6	~1.2	2,730	330
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 (JC5118)	~30	~3.0	~4.0	3,820	460	~35	~3.0	~4.5	3,180	570	~35	~3.0	~4.5	2,730	490
		30~50	~1.2	~1.6	3,440	340	35~50	~1.3	~1.8	2,860	430	35~50	~1.3	~1.8	2,450	370
		50~70	~0.5	~0.8	3,060	240	50~70	~0.6	~1.0	2,540	300	50~70	~0.6	~1.0	2,180	260
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC5118	~30	~4.0	~6.0	4,780	760	~35	~4.0	~8.0	3,980	960	~35	~4.0	~8.0	3,410	820
		30~50	~1.2	~1.8	4,300	600	35~50	~1.7	~2.6	3,580	750	35~50	~1.7	~2.6	3,070	650
		50~70	~0.5	~0.8	3,980	480	50~70	~0.6	~1.2	3,180	570	50~70	~0.6	~1.2	2,720	490
Stainless steel SUS304 Below 250HB	JC8050	~30	~4.0	~6.0	4,780	570	~35	~4.0	~8.0	3,980	720	~35	~4.0	~8.0	3,410	620
		30~50	~1.2	~1.8	4,300	430	35~50	~1.7	~2.6	3,580	540	35~50	~1.7	~2.6	3,070	460
		50~70	~0.5	~0.8	3,820	310	50~70	~0.6	~1.2	3,180	380	50~70	~0.6	~1.2	2,720	320

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 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.

RECOMMENDED CUTTING CONDITIONS

● YOHW-type inserts (side face finishing)

Work Materials	Insert Grades	Tool dia. (mm)														
		10/11					12/13					14				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 3N				
		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)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 (DH102)	~30	≦1.2	≦0.10	12.600	3.780	~35	≦1.2	≦0.10	10.600	4.770	~35	≦1.2	≦0.10	9.090	4.090
		30~50	≦0.8	≦0.08	8.820	2.120	35~50	≦0.8	≦0.08	7.420	2.670	35~50	≦0.8	≦0.08	6.360	2.290
		50~70	≦0.6	≦0.08	8.820	1.760	50~70	≦0.6	≦0.08	7.420	2.230	50~70	≦0.6	≦0.08	6.360	1.910
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~30	≦1.0	≦0.10	11.400	3.420	~35	≦1.0	≦0.10	9.550	4.300	~35	≦1.0	≦0.10	8.180	3.680
		30~50	≦0.7	≦0.08	7.980	1.920	35~50	≦0.7	≦0.08	6.690	2.400	35~50	≦0.7	≦0.08	5.730	2.060
		50~70	≦0.5	≦0.08	7.980	1.600	50~70	≦0.5	≦0.08	6.690	2.000	50~70	≦0.5	≦0.08	5.730	1.720
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~30	≦1.0	≦0.10	11.400	3.420	~35	≦1.0	≦0.10	9.550	4.300	~35	≦1.0	≦0.10	8.180	3.680
		30~50	≦0.7	≦0.08	7.980	1.920	35~50	≦0.7	≦0.08	6.690	2.400	35~50	≦0.7	≦0.08	5.730	2.060
		50~70	≦0.5	≦0.08	7.980	1.600	50~70	≦0.5	≦0.08	6.690	2.000	50~70	≦0.5	≦0.08	5.730	1.720
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~30	≦1.0	≦0.10	8.880	2.130	~35	≦1.0	≦0.10	7.430	2.670	~35	≦1.0	≦0.10	6.370	2.290
		30~50	≦0.7	≦0.08	6.180	1.240	35~50	≦0.7	≦0.08	5.200	1.560	35~50	≦0.7	≦0.08	4.460	1.340
		50~70	≦0.5	≦0.08	6.180	990	50~70	≦0.5	≦0.08	5.200	1.250	50~70	≦0.5	≦0.08	4.460	1.070
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~30	≦0.8	≦0.10	6.360	1.270	~35	≦0.8	≦0.10	5.300	1.590	~35	≦0.8	≦0.10	4.550	1.370
		30~50	≦0.5	≦0.08	4.440	710	35~50	≦0.5	≦0.08	3.710	890	35~50	≦0.5	≦0.08	3.180	760
		50~70	–	–	–	–	50~70	–	–	–	–	50~70	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~30	≦0.5	≦0.10	4.740	950	~35	≦0.5	≦0.10	3.980	1.190	~35	≦0.5	≦0.10	3.410	1.020
		30~50	≦0.3	≦0.08	3.300	530	35~50	≦0.3	≦0.08	2.790	670	35~50	≦0.3	≦0.08	2.390	570
		50~70	–	–	–	–	50~70	–	–	–	–	50~70	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~30	≦1.2	≦0.12	12.600	3.780	~35	≦1.2	≦0.12	10.600	4.770	~35	≦1.2	≦0.12	9.090	4.090
		30~50	≦0.8	≦0.10	8.820	2.120	35~50	≦0.8	≦0.10	7.420	2.670	35~50	≦0.8	≦0.10	6.360	2.290
		50~70	≦0.6	≦0.08	8.820	1.760	50~70	≦0.6	≦0.08	7.420	2.230	50~70	≦0.6	≦0.08	6.360	1.910
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~30	≦1.0	≦0.10	11.400	3.420	~35	≦1.0	≦0.10	9.550	4.300	~35	≦1.0	≦0.10	8.180	3.680
		30~50	≦0.7	≦0.08	7.980	1.920	35~50	≦0.7	≦0.08	6.690	2.400	35~50	≦0.7	≦0.08	5.730	2.060
		50~70	≦0.5	≦0.08	7.980	1.600	50~70	≦0.5	≦0.08	6.690	2.000	50~70	≦0.5	≦0.08	5.730	1.720
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~30	≦1.0	≦0.10	2.520	600	~35	≦1.0	≦0.10	2.120	760	~35	≦1.0	≦0.10	1.820	660
		30~50	≦0.7	≦0.08	1.740	350	35~50	≦0.7	≦0.08	1.480	450	35~50	≦0.7	≦0.08	1.270	380
		50~70	≦0.5	≦0.08	1.740	280	50~70	≦0.5	≦0.08	1.480	360	50~70	≦0.5	≦0.08	1.270	300

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 chips out.

QM Mill PMETYPE

RECOMMENDED CUTTING CONDITIONS

● YOHW-type inserts (for bottom face finishing)

Work Materials	Insert Grades	Tool dia. (mm)														
		10/11					12/13					14				
		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 S50C, S55C (C50, C55) Below 250HB	JC8015 (DH102)	~30	≦0.12	5~10	7.920	3.170	~35	≦0.12	6~12	6.630	3.980	~35	≦0.12	7~14	5.680	3.410
		30~50	≦0.10	5~10	5.940	1.900	35~50	≦0.10	6~12	4.970	2.380	35~50	≦0.10	7~14	4.260	2.040
		50~70	≦0.06	5~8	5.100	1.430	50~70	≦0.06	6~10	4.300	1.800	50~70	≦0.06	7~11	3.690	1.550
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~30	≦0.12	5~10	7.320	2.640	~35	≦0.12	6~12	6.100	3.290	~35	≦0.12	7~14	5.230	2.820
		30~50	≦0.10	5~10	5.460	1.580	35~50	≦0.10	6~12	4.580	1.980	35~50	≦0.10	7~14	3.920	1.690
		50~70	≦0.06	5~8	4.740	1.190	50~70	≦0.06	6~10	3.960	1.500	50~70	≦0.06	7~11	3.400	1.280
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~30	≦0.12	5~10	7.320	2.640	~35	≦0.12	6~12	6.100	3.290	~35	≦0.12	7~14	5.230	2.820
		30~50	≦0.10	5~10	5.460	1.580	35~50	≦0.10	6~12	4.580	1.980	35~50	≦0.10	7~14	3.920	1.690
		50~70	≦0.06	5~8	4.740	1.190	50~70	≦0.06	6~10	3.960	1.500	50~70	≦0.06	7~11	3.400	1.280
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 (JC8015)	~30	≦0.12	5~10	6.360	1.530	~35	≦0.12	6~12	5.300	1.910	~35	≦0.12	7~14	4.550	1.640
		30~50	≦0.10	5~10	4.800	920	35~50	≦0.10	6~12	3.980	1.150	35~50	≦0.10	7~14	3.410	980
		50~70	≦0.06	5~8	4.140	700	50~70	≦0.06	6~10	3.450	870	50~70	≦0.06	7~11	2.960	740
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~30	≦0.10	5~10	3.840	770	~35	≦0.10	6~12	3.180	960	~35	≦0.10	7~14	2.730	820
		30~50	≦0.08	5~10	2.880	460	35~50	≦0.08	6~12	2.380	570	35~50	≦0.08	7~14	2.050	490
		50~70	–	–	–	–	50~70	–	–	–	–	50~70	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~30	≦0.10	5~10	2.220	350	~35	≦0.10	6~12	1.860	450	~35	≦0.10	7~14	1.590	380
		30~50	≦0.08	5~10	1.680	210	35~50	≦0.08	6~12	1.400	270	35~50	≦0.08	7~14	1.190	230
		50~70	–	–	–	–	50~70	–	–	–	–	50~70	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~30	≦0.15	5~10	6.360	1.910	~35	≦0.15	6~12	5.300	2.380	~35	≦0.15	7~14	4.550	2.050
		30~50	≦0.12	5~10	4.800	1.150	35~50	≦0.12	6~12	3.980	1.430	35~50	≦0.12	7~14	3.410	1.230
		50~70	≦0.10	5~8	4.140	810	50~70	≦0.10	6~10	3.450	1.010	50~70	≦0.10	7~11	2.960	860
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~30	≦0.12	5~10	7.320	2.640	~35	≦0.12	6~12	6.100	3.290	~35	≦0.12	7~14	5.230	2.820
		30~50	≦0.12	5~10	5.460	1.580	35~50	≦0.12	6~12	4.580	1.980	35~50	≦0.12	7~14	3.920	1.690
		50~70	≦0.10	5~8	4.740	1.190	50~70	≦0.10	6~10	3.960	1.500	50~70	≦0.10	7~11	3.400	1.280
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~30	≦0.12	5~10	1.560	370	~35	≦0.12	6~12	1.330	480	~35	≦0.12	7~14	1.140	410
		30~50	≦0.10	5~10	1.200	230	35~50	≦0.10	6~12	1.000	290	35~50	≦0.10	7~14	850	250
		50~70	≦0.06	5~8	1.020	170	50~70	≦0.06	6~10	860	220	50~70	≦0.06	7~11	740	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 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.

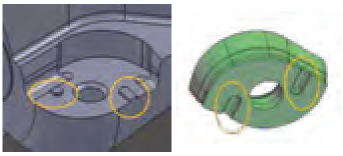
Wild Radius WDRTYPE

WILD RADIUS

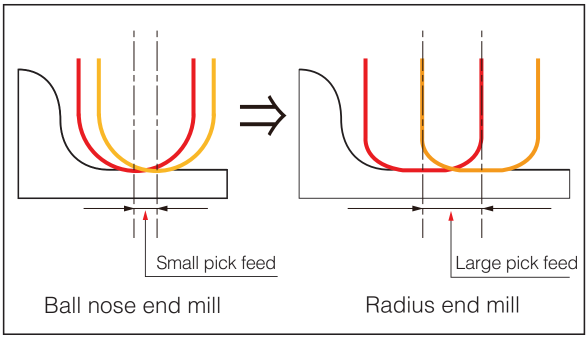
High efficient roughing is possible even if material has uneven removal stock.

Max. depth of cut 18mm

- **Double key on body and insert prevents movement of insert.**



- **Large pick feed achieves higher efficient machining than ball nose end mill.**

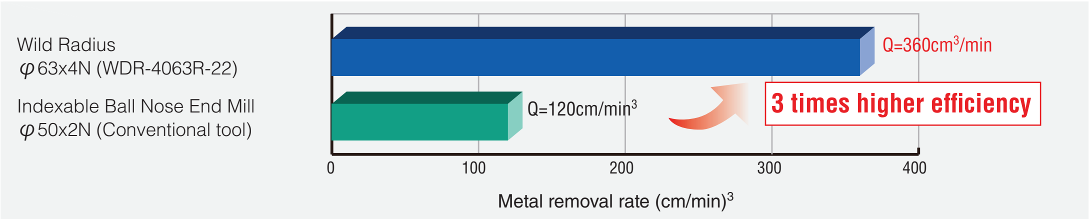


CUTTING PERFORMANCE

Metal Removal Rate Comparison

Cutting condition

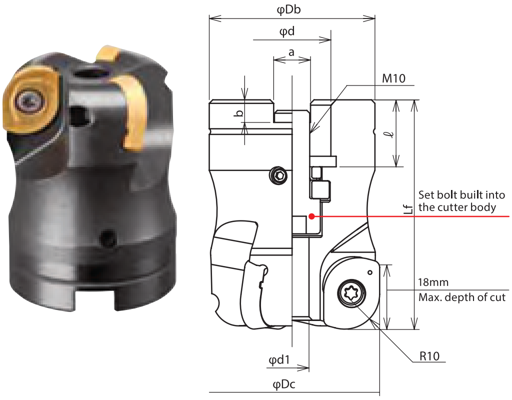
Wild Radius	Indexable Ball Nose End Mill
Mat'l: Cast iron	Mat'l: Cast iron
Vc=150m/min (n=750min^{-1})	Vc=235m/min (n=1,500min^{-1})
Vf=3,000mm/min (fz=1mm/t)	Vf=1,200mm/min (fz=0.4mm/t)
ap=3mm, ae=40mm	ap=10mm, ae=10mm



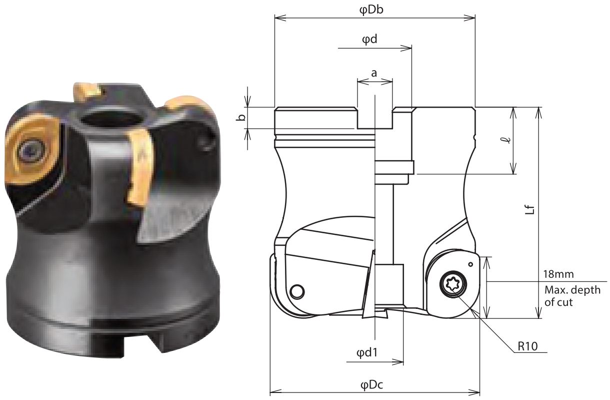
Wild Radius WDRTYPE

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

● Fig 1. Without coolant hole



● Fig 2. Without coolant hole



■ BODY/FACE MILL TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)								Set Bolt	Weight (kg)	Fig.
				φDc	Lf	φDb	φd	φd1	a	b	ℓ			
Metric Bore	**WDR-3050R-22**	●	3	**50**	65	47	22	9.6	10.4	6.3	19	M10x1.5x25*	0.7	1
	WDR-4063R-22	●	4	**63**	63	60	22	17	10.4	6.3	20	M10x1.5x50*	1.1	2
	WDR-4063R-27	●	4	**63**	63	60	27	20	12.4	7	22	M12x1.75x40*	1.1	2
	WDR-5080R-27	☐	5	**80**	63	76	27	20	12.4	7	22	M12x1.75x40*	1.7	2
	WDR-6100R-32	☐	6	**100**	63	96	32	26	14.4	8	32	M16	2.8	2
	WDR-6125R-40	☐	6	**125**	63	100	40	32	16.4	9	32	M20x2.5x45*	4.0	2

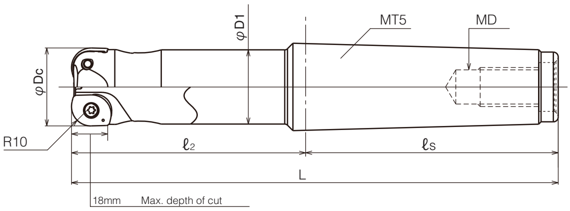
Note) 1. All cutters are supplied without inserts.
2. Please refer page C104-C105 for recommended cutting conditions.
3. ∗ mark shows: these cutter bodies are equipped with the set bolt because of the specified bolt size.
Except for these cutter bodies, please use the set bolt equipped with arbor.

Clamp Screw	Recommended Torque N•m
CSW-513H	5.5

Wild Radius

WDR TYPE

Face Milling Pocket Milling Shoulder Milling Copy Milling Helical Interpolation

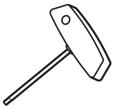


BODY/END MILL TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)						Weight (kg)
				φDc	ℓ2	ℓs	L	φD1	MD	
MT shank type	**WDR-2040-120-MT5-M20**	●	2	**40**	120	130	249.5	38	M20X2.5	2.2

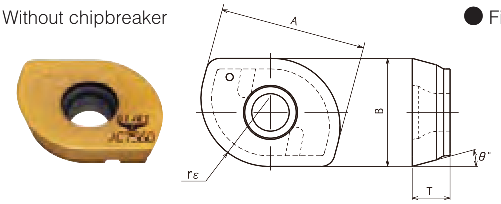
Note) All cutters are supplied without inserts

PARTS

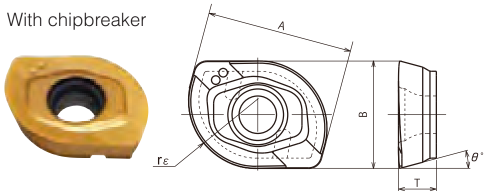
Clamps crew	**Wrench**
	
CSW-513H	A-20

INSERT

● Fig 1. Without chipbreaker



● Fig 2. With chipbreaker



Cat. No.	Tolerance	PVD coated		Dimensions (mm)					Fig.
		JC7560	JC8118	A	T	B	rε	θ°	
YDMW1505100ZTR	**M**	●	●	21.5	5.56	15.875	10	15°	1
YDMT1505100ZER	**M**	●	●	21.5	5.56	15.875	10	15°	2

10 inserts per case

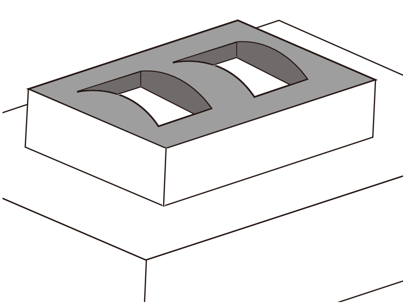
● : Standard stock items ☐ : Stock in Japan ○ : Soon to be deleted

Wild Radius WDRTYPE

CASE STUDIES

Improved tool life in machining on cast steel

Work size: 1,500x2,000



Result

Improved tool life by 2 times compared with competitor A.
Showed normal wear after machining 3 hours.

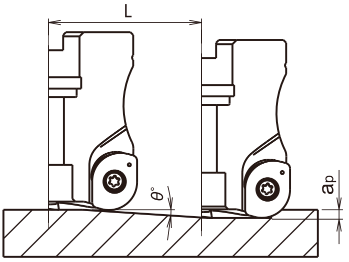
Work	Part name		Stamping die
	Material		Cast steel
	Hardness		-
Tool	Tool No.		WDR-4063R-22
	Insert No.		YDMT1505100ZER (JC7560)
Cutting conditions	Cutting speed	n	710min^{-1}
		V_c	140m/min
	Feed speed	V_f	2,500mm/min
		f_z	0.88mm/t
	a_p (mm)		1.5mm
	a_e (mm)		20-40mm
	Coolant		Dry
	Machine		Vertical MC

Wild Radius

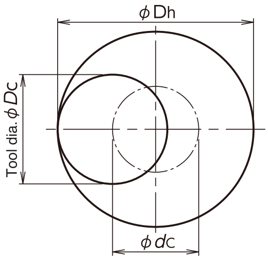
WDRTYPE

■ Instructions for profile milling

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

$$\underset{\text{Tool pass dia.}}{\varphi dc} = \underset{\text{Bore dia.}}{\varphi Dh} - \underset{\text{Tool dia.}}{\varphi Dc}$$

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

● Down cutting is recommended & 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 continous chips may come out in case of drilling, confirm the safe cutting conditions.

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Ramping (at ap=3mm)	Helical interpolation		Max. drilling depth Z (mm)
			Max. ramping angle θ°	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
WDR-2040	40	20.1	4°24′	56	78	2
WDR-3050	50	30.7	2°48′	76	98	2
WDR-4063	63	43.4	1°48′	102	124	2
WDR-5080	80	60.3	1°12′	136	158	2
WDR-6100	100	80.2	0°54′	176	198	2
WDR-6125	125	104.7	0°36′	226	248	2

Note) For tool dia. φ40-φ63mm, recommended ramping angle is 1° or less.
For tool dia. φ80-φ125mm, recommended ramping angle is 0°30' or less.

Wild Radius

WDRTYPE

■ RECOMMENDED CUTTING CONDITIONS

● Face mill & end mill type

Work materials	Grades	Tool dia. (mm)														
		40					50					63				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S50C, S55C (C50,C55) Below 250HB	JC7560 (JC8118)	~150	3	1,200	1,680	6.7	~150	3	960	2,020	10.1	~150	3	910	2,550	16.1
		200	—	—	—	—	200	3	830	1,500	7.5	200	3	760	2,130	13.4
		250	—	—	—	—	250	2.5	640	1,150	4.8	250	3	660	1,590	10.0
		300	—	—	—	—	300	2	580	870	2.9	300	2.5	510	1,220	6.4
		350	—	—	—	—	350	1.5	580	870	2.2	350	2	510	1,020	4.3
		400	—	—	—	—	400	1.5	580	670	1.7	400	2	510	820	3.4
Die steel SKD61,SKD11 (1.2344,1.2379) Below 255HB	JC7560 (JC8118)	~150	3	1,200	1,680	6.7	~150	3	960	2,020	10.1	~150	3	910	2,550	16.1
		200	—	—	—	—	200	3	830	1,500	7.5	200	3	760	2,130	13.4
		250	—	—	—	—	250	2.5	640	1,150	4.8	250	3	660	1,590	10.0
		300	—	—	—	—	300	2	580	870	2.9	300	2.5	510	1,220	6.4
		350	—	—	—	—	350	1.5	580	870	2.2	350	2	510	1,020	4.3
		400	—	—	—	—	400	1.5	580	670	1.7	400	2	510	820	3.4
Mold steel HPM7,PX5,P20 (1.2311,P20) 30-36HRC	JC7560 (JC8118)	~150	3	1,200	1,680	7.6	~150	3	960	2,020	11.4	~150	3	910	2,550	18.1
		200	—	—	—	—	200	3	830	1,500	8.4	200	3	760	2,130	15.1
		250	—	—	—	—	250	2.5	640	1,150	5.4	250	3	660	1,590	11.3
		300	—	—	—	—	300	2	580	870	3.3	300	2.5	510	1,220	7.2
		350	—	—	—	—	350	1.5	580	870	2.4	350	2	510	1,020	4.8
		400	—	—	—	—	400	1.5	580	670	1.9	400	2	510	820	3.9
Mold steel NAK80, HPM1, P21 (1.2311,P21) 38-43HRC	JC8118	~150	2	960	860	4.6	~150	2	760	1,370	9.1	~150	2	610	1,100	9.2
		200	—	—	—	—	200	2	660	1,200	8.0	200	2	510	920	7.7
		250	—	—	—	—	250	1.5	500	900	4.5	250	2	440	800	6.7
		300	—	—	—	—	300	1.5	460	860	4.3	300	1.5	360	650	4.1
		350	—	—	—	—	350	1	460	860	2.9	350	1.2	360	650	3.3
		400	—	—	—	—	400	0.5	460	660	1.1	400	1	360	550	2.3
Hardened die steel SKD61 DAC DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	1.5	640	320	1.6	~150	1.5	510	380	2.4	~150	1.5	400	400	3.2
		200	—	—	—	—	200	1.5	430	320	2.1	200	1.5	330	330	2.7
		250	—	—	—	—	250	1	370	280	1.2	250	1.5	290	290	2.3
		300	—	—	—	—	300	1	260	200	0.9	300	1	200	200	1.1
		350	—	—	—	—	350	0.5	260	200	0.4	350	0.8	200	200	0.9
		400	—	—	—	—	400	0.3	260	190	0.2	400	0.5	200	200	0.5
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	JC8118 (JC7560)	~150	3	1,200	1,920	5.8	~150	3	960	2,300	8.6	~150	3	910	2,910	13.7
		200	—	—	—	—	200	3	830	1,750	6.6	200	3	760	2,280	10.8
		250	—	—	—	—	250	2.5	640	1,250	3.9	250	3	660	1,720	8.1
		300	—	—	—	—	300	2	580	1,050	2.6	300	2.5	510	1,220	4.8
		350	—	—	—	—	350	1.5	580	1,050	2.0	350	2	510	1,220	3.8
		400	—	—	—	—	400	1.5	580	870	1.6	400	2	510	1,020	3.2
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	JC8118	~150	3	1,200	1,920	5.8	~150	3	960	2,300	8.6	~150	3	910	2,910	13.7
		200	—	—	—	—	200	3	830	1,750	6.6	200	3	760	2,280	10.8
		250	—	—	—	—	250	2.5	640	1,250	3.9	250	3	660	1,720	8.1
		300	—	—	—	—	300	2	580	1,050	2.6	300	2.5	510	1,220	4.8
		350	—	—	—	—	350	1.5	580	1,050	2.0	350	2	510	1,220	3.8
		400	—	—	—	—	400	1.5	580	870	1.6	400	2	510	1,020	3.2
Stainless steel SUS304 Below 250HB	JC7560	~150	2	960	860	3.4	~150	2	760	1,370	6.9	~150	2	610	1,100	6.9
		200	—	—	—	—	200	2	660	1,200	6.0	200	2	510	920	5.8
		250	—	—	—	—	250	1.5	500	900	3.4	250	2	440	800	5.0
		300	—	—	—	—	300	1.5	460	860	3.2	300	1.5	360	650	3.1
		350	—	—	—	—	350	1	460	860	2.2	350	1.5	360	650	3.1
		400	—	—	—	—	400	0.5	460	660	0.8	400	1	360	550	1.7

ℓ: Overhung length, a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

■ NOTE

1) The figure to be adjusted according to the machine rigidity or work rigidity.
2) In case of chatter occurring, recommend to reduce 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.

Wild Radius WDRTYPE

RECOMMENDED CUTTING CONDITIONS

Face mill & end mill type

Work materials	Grades	Tool dia. (mm)														
		80					100					125				
		No. of teeth 5N					No. of teeth 6N					No. of teeth 6N				
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S50C, S55C (C50,C55) Below 250HB	JC7560 (JC8118)	~150	3	720	2,520	20.2	~150	3	580	2,440	24.4	~150	3	460	1,930	24.1
		200	3	600	2,100	16.8	200	3	480	2,020	20.2	200	3	460	1,930	24.1
		250	3	520	1,560	12.5	250	3	480	1,730	17.3	250	3	380	1,480	18.5
		300	3	400	1,200	9.6	300	3	420	1,510	15.1	300	3	380	1,370	17.1
		350	2.5	400	1,000	6.7	350	3	320	960	9.6	350	3	380	1,250	15.6
		400	2	360	900	4.8	400	2.5	320	960	8.0	400	3	330	990	12.4
Die steel SKD61,SKD11 (1.2344,1.2379) Below 255HB	JC7560 (JC8118)	~150	3	720	2,520	20.2	~150	3	580	2,440	24.4	~150	3	460	1,930	24.1
		200	3	600	2,100	16.8	200	3	480	2,020	20.2	200	3	460	1,930	24.1
		250	3	520	1,560	12.5	250	3	480	1,730	17.3	250	3	380	1,480	18.5
		300	3	400	1,200	9.6	300	3	420	1,510	15.1	300	3	380	1,370	17.1
		350	2.5	400	1,000	6.7	350	3	320	960	9.6	350	3	380	1,250	15.6
		400	2	360	900	4.8	400	2.5	320	960	8.0	400	3	330	990	12.4
Mold steel HPM7,PX5,P20 (1.2311,P20) 30-36HRC	JC7560 (JC8118)	~150	3	720	2,520	22.7	~150	3	580	2,440	27.5	~150	3	460	1,930	27.1
		200	3	600	2,100	18.9	200	3	480	2,020	22.7	200	3	460	1,930	27.1
		250	3	520	1,560	14.0	250	3	480	1,730	19.5	250	3	380	1,480	20.8
		300	3	400	1,200	10.8	300	3	420	1,510	17.0	300	3	380	1,370	19.3
		350	2.5	400	1,000	7.5	350	3	320	960	10.8	350	3	380	1,250	17.6
		400	2	360	900	5.4	400	2.5	320	960	9.0	400	3	330	990	13.9
Mold steel NAK80, HPM1, P21 (1.2311,P21) 38-43HRC	JC8118	~150	2	480	1,080	11.5	~150	2	380	1,020	13.6	~150	2	310	840	14.0
		200	2	400	900	9.6	200	2	320	860	11.5	200	2	260	700	11.7
		250	2	350	790	8.4	250	2	280	750	10.0	250	2	220	600	10.0
		300	2	290	650	6.9	300	2	230	620	8.3	300	2	160	430	7.2
		350	1.5	290	650	5.2	350	1.5	230	620	6.2	350	1.5	160	430	5.4
		400	1	290	540	2.9	400	1.5	230	510	5.1	400	1.5	160	420	5.3
Hardened die steel SKD61 DAC DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	1.5	320	400	4.1	~150	1.5	260	390	5.0	~150	1.5	210	310	5.0
		200	1.5	270	340	3.5	200	1.5	220	330	4.2	200	1.5	170	260	4.2
		250	1.5	230	290	3.0	250	1.5	190	280	3.6	250	1.5	150	220	3.5
		300	1.5	160	200	2.1	300	1.5	160	240	3.1	300	1.5	130	200	3.2
		350	1	160	200	1.4	350	1	160	240	2.1	350	1	130	200	2.1
		400	0.5	160	200	0.7	400	1	160	200	1.7	400	1	130	180	1.9
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	JC8118 (JC7560)	~150	3	720	2,880	17.3	~150	3	580	2,780	20.9	~150	3	460	2,210	20.7
		200	3	600	2,250	13.5	200	3	480	2,160	16.2	200	3	460	2,210	20.7
		250	3	520	1,820	10.9	250	3	480	1,870	14.0	250	3	380	1,600	15.0
		300	3	400	1,300	7.8	300	3	420	1,640	12.3	300	3	380	1,500	14.1
		350	2.5	400	1,200	6.0	350	3	320	1,060	8.0	350	3	380	1,370	12.8
		400	2	360	990	4.0	400	2.5	320	1,060	6.6	400	3	330	1,090	10.2
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	JC8118	~150	3	720	2,880	17.3	~150	3	580	2,780	20.9	~150	3	460	2,210	20.7
		200	3	600	2,250	13.5	200	3	480	2,160	16.2	200	3	460	2,210	20.7
		250	3	520	1,820	10.9	250	3	480	1,870	14.0	250	3	380	1,600	15.0
		300	3	400	1,300	7.8	300	3	420	1,640	12.3	300	3	380	1,500	14.1
		350	2.5	400	1,200	6.0	350	3	320	1,060	8.0	350	3	380	1,370	12.8
		400	2	360	990	4.0	400	2.5	320	1,060	6.6	400	3	330	1,090	10.2
Stainless steel SUS304 Below 250HB	JC7560	~150	2	480	1,080	8.6	~150	2	380	1,020	10.2	~150	2	310	840	10.5
		200	2	400	900	7.2	200	2	320	860	8.6	200	2	260	700	8.8
		250	2	350	790	6.3	250	2	280	750	7.5	250	2	220	600	7.5
		300	2	290	650	5.2	300	2	230	620	6.2	300	2	160	430	5.4
		350	1.5	290	650	3.9	350	2	230	620	6.2	350	2	160	430	5.4
		400	1	290	540	2.2	400	1.5	230	510	3.8	400	2	160	420	5.3

ℓ: Overhung length, a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

NOTE

1) The figure to be adjusted according to the machine rigidity or work rigidity.
2) In case of chatter occurring, recommend to reduce 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.

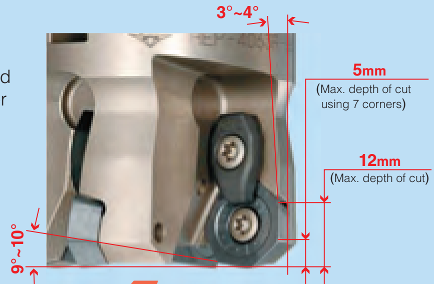
Hepta Mill HEPTYPE

Features of HEPTA MILL

1 High metal removal

Cutting forces are reduced due to outer edge and inner edge has side and face clearance, so high feed machining can be achieved in case of higher depth of cut.

- Material to be cut S50C (C50): fz=1mm/t in case of ap=3mm,
  fz=0.6mm/t in case of ap=5mm.
- Material to be cut FC300 (GG300): fz=1mm/t in case of ap=5mm.
- Material to be cut SKD61 (1.2344), 45HRC: fz=0.6mm/t in case of ap=2.5mm.



2 G-Body

Combination of rigid G-Body and high stability to the insert in the insert pocket gives stable machining without chatter in case of roughing.

3 Stronger heptagon insert

Improved insert strength 40% compared with conventional insert by increasing size and thickness of insert.

4 7 times indexability

Heptagoninsert gives maximum 7 times indexability when ap=5mm or less.

5 Double clamp system

Adopted double clamp system tightens the insert strongly.

Please refer page C009 for "Insert set up installation point of double clamping mechanism type

HEPTAGON INSERT

6 Insert grades JC5040 JC8015 JC8050 JC7560

"JC5040" is suitable for general steel.
"JC8015" is suitable for cast iron, stainless steel and hardened steel.
Tough grade "JC8050" against chipping for unfavorable conditions.
"JC7560" improved heat-fracture and impact strength for rough milling.

7 Insert corner identification

Insert has corner identification No. on the top face.

NEW HEPTA MILL

HEP type **HEPTA MILL with Heptagon insert**

Hepta Mill HEPTYPE

CUTTING PERFORMANCE

Chip volume comparison

HEPTA MILL: HEP-4063R-08

Cutting condition

Mat'l: S50C (C50), 201HB	ap=3mm
Tool dia.: φ63mm	ae=40mm
n=800min^{-1}	Q=384cm^3/min
	Power load: 66%

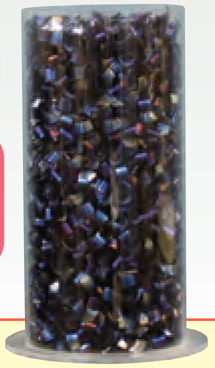
High feed cutter

Cutting condition

Mat'l: S50C (C50), 201HB	ap=1.5mm
Tool dia.: φ63mm	ae=40mm
n=800min^{-1}	Q=384cm^3/min
	Power load: 66%

Chip volume comparison (same weight 3kg/min)

LESS STORAGE SPACE REQUIRED

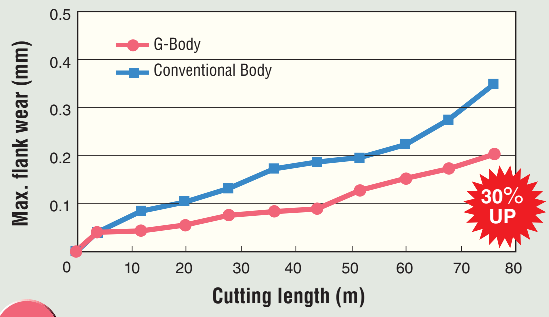


Reduced chip volume by 20%

Tool life comparison G-body VS Conventional body

Cutting condition

Mat'l: S53C	fz=1mm/t
Tool dia: φ63mm (HEP-4063R-08)	ap=3mm
n=800min^{-1}	ae=40mm
Vc=158m/min	Dry, Down cut
Vf=800mm/min	Insert grade: JC5040



G-body gives body strength and improved tool life by 1.3 times compared with conventional body.

Hepta Mill

HEPTYPE

G-Body **Through Coolant Hole** (except dia. φ200)

JCTMA2009-003 ECOPRODUCT ☆☆☆

Face Milling

Pocket Milling

Copy Milling

Helical Interpolation

Plunge Milling

Fig. 1

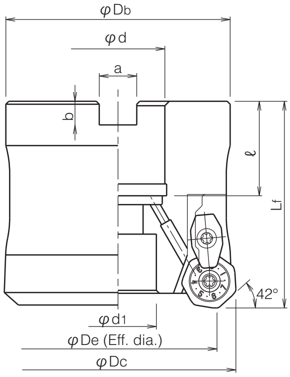


Fig. 2 (Without coolant hole)

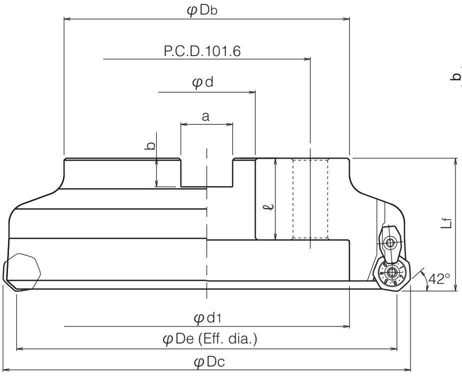
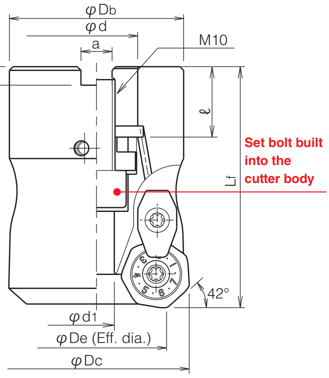


Fig. 3



BODY / FACE MILL TYPE

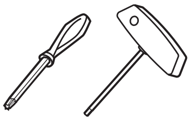
Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)									Head cap screw (JIS Standard)	weight (kg)	Fig.
				φDc	φDe (Eff. dia.)	Lf	φDb	φd	φd1	a	b	ℓ			
Metric Bore	**HEP-3050R-08-22**	●	3	50	36.7	65	47	22	9.6	10.4	6.3	19	※M10×1.5×25	0.9	3
	HEP-4063R-08-22	●	4	63	49.5	50	60	22	17	10.4	6.3	20	M10	1.1	1
	HEP-4063R-08-27	●	4	63	49.5	50	60	27	20	12.4	7	22	※M12×1.75×30	1.1	1
	HEP-5080R-08-27	●	5	80	66.6	55	76	27	20	12.4	7	22	※M12×1.75×40	1.9	1
	HEP-6100R-08-32	●	6	100	86.6	70	96	32	26	14.4	8	32	※M16×2.0×45	3.6	1
	HEP-7125R-08-40	●	7	125	111.6	70	100	40	32	16.4	9	35	※M20×2.5×45	5.5	1
	HEP-8160R-08-40	●	8	160	146.6	70	100	40	32	16.4	9	35	※M20×2.5×45	8.4	1
	HEP-9200R-08-60	●	9	200	186.6	65	140	60	140	25.4	14.3	40	M16	10.2	2

Note) 1. All cutters are supplied without inserts.
2. Please refer page C112-C119 for recommended cutting conditions.
3. ※ Mark shows: these cutter bodies are equipped with the set bolt because of the specified bolt size. Except for these cutter bodies, please use the set bolt equipped with arbor.
4. In case of using double clamping mechanism type, please refer page C009.

Hepta Mill

HEPTYPE

PARTS

Clamp screw	Clamp set	Wrench
 Recommended Torque 6.0 N•m		
DSW-4512H	DCM-17	Facemill type : A-20 Endmill type : A-20SD

HEXAGON WRENCH SIZE FOR SET BOLT

Thread	 Hexagon wrench size (mm)
M10	8
M12	10
M16	14
M20	17
M24	19

Note) All cutters are supplied without hexagon wrench.

Hepta Mill

HEP TYPE

INSERTS

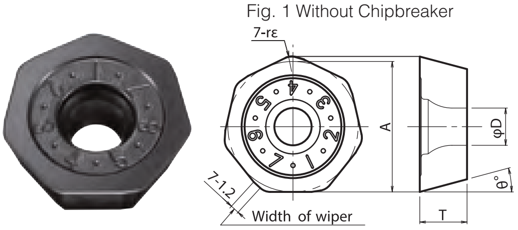
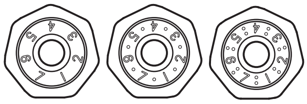


Fig. 1 Without Chipbreaker


JC5118
JC8015 JC5040 JC8050
JC7560

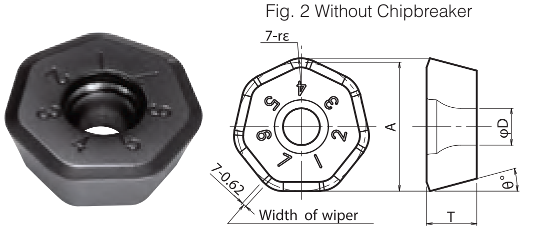


Fig. 2 Without Chipbreaker

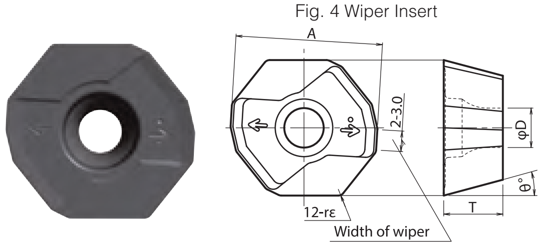


Fig. 4 Wiper Insert

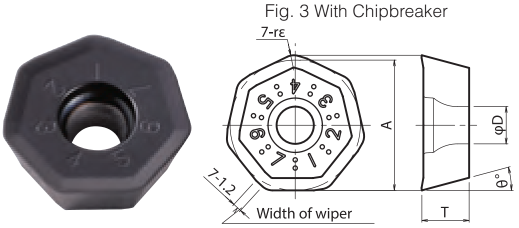
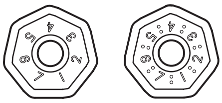


Fig. 3 With Chipbreaker


JC5118
JC8015 JC8050
JC7560

Cat. No.	Tole-rance	Dimensions (mm)					PVD coated						Fig.
		A	T	φD	rε	θ°	JC8015	JC5040	JC5118	JC8118	JC8050	JC7560	
XDMW080620ZTR	M	17.5	6.35	5	2	15	●	○	○		●	●	1
XDMW080635ZTR-S	M	17.5	6.35	5	3.5	15	●						2
XDMT080620ZER	M	17.5	6.35	5	2	15	●		○		●	●	3
XDMT080708ZER (Wiper Insert)	M	18.6	7.5	5	0.8	15	●						4
XDMT080620ZER-ML	M	17.3	6.5	5	2	15				●		●	3

10 inserts per case

How to use of corner change

Recommend to rotate the insert counter-clockwise for corner change.

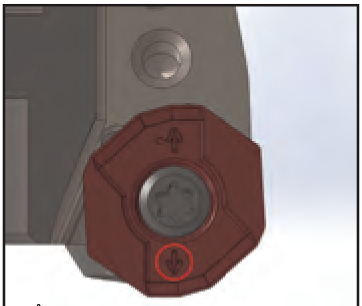
● : Standard stock items ☐ : Stock in Japan ○ : Soon to be deleted

■ Attention for using wiper insert

- ● In case of feed per rev. f >1.2mm/rev and required surface roughness Rz ≒ 12.5 μm, we recommend to use wiper insert.

f (mm/rev)	No. of wiper inserts to install
1.2 < f (mm/rev) ≦ 3	1
3 < f (mm/rev) ≦ 6	2
6 < f (mm/rev) ≦ 9	3
9 < f (mm/rev) ≦ 12	4

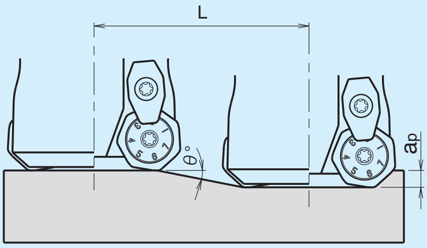
- ● Please put wiper inserts to become unequal pitch.
- ● Even if wiper insert is used, the same cutting condition (page C088-C095) is applied.



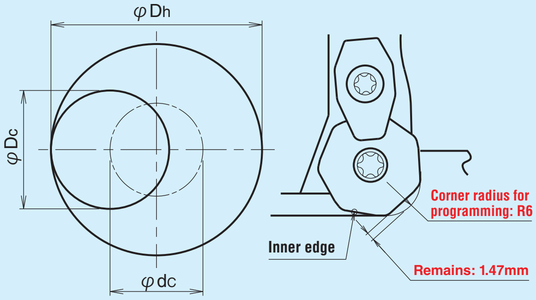
“☟” mark is shown to the front

■ Instructions for profiling milling with "HEPTA MILL"

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

$$\underset{\text{Tool pass dia.}}{\varphi dc} = \underset{\text{Bore dia.}}{\varphi Dh} - \underset{\text{Tool dia.}}{\varphi Dc}$$

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

● Down cutting is recommended, so tool pass rotation should be counter-clockwise.

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Ramping (at maximum depth of cut ap=5mm)				Helical interpolation	
			Ramping angle to the inner edge θ°	Total cutting length with inner edge L (mm)	Max. ramping angle θ°	Total cutting length L (mm)	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)
HEP-3050	50	36.7	1°50′	156	9°	31	74	96
HEP-*063	63	49.5	1°25′	202	7°	40	100	122
HEP-*080	80	66.6	1°	286	5°	57	134	156
HEP-*100	100	86.6	0°45′	382	3°30′	81	174	196
HEP-*125	125	111.6	0°35′	491	2°30′	114	224	246
HEP-*160	160	146.6	0°25′	687	2°	143	294	316
HEP-*200	200	186.6	0°20′	860	1°30′	190	374	396

Hepta Mill HEPTYPE

■ RECOMMENDED CUTTING CONDITIONS General Use

Work Materials	Inserts	Insert Grades	Overhung length ℓ (mm)	Tool dia. (mm)							
				50				63			
				No. of teeth 3N				No. of teeth 4N			
				a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMT080620ZER(-ML) (XDMW080620ZTR)	**JC7560** **(JC5040)**	100	4	900	2,200	15.7	4	700	2,300	20.6
			150	3.5	800	1,700	10.6	3.5	650	1,800	14.1
			200	3	700	1,300	7	3	600	1,500	10.1
			250	2.5	700	1,050	4.7	2.5	600	1,200	6.7
			300	2	700	1,050	3.7	2	600	1,200	5.4
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC5118)** **(JC5040)**	100	3	900	1,900	10.2	3	700	2,000	13.6
			150	2.5	800	1,400	6.3	2.5	650	1,600	9.1
			200	2.5	700	1,050	4.7	2.5	600	1,200	6.8
			250	2	700	850	3.1	2	600	1,000	4.5
			300	2	700	850	3.1	2	600	1,000	4.5
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER)	**JC5118** **(JC8015)**	100	3	650	1,400	8.1	3	500	1,400	10.2
			150	2.5	600	1,100	5.3	2.5	450	1,100	6.7
			200	2.5	500	750	3.6	2.5	400	700	4.2
			250	2	500	600	2.3	2	400	600	2.9
			300	2	500	600	2.3	2	400	600	2.9
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER(-ML) (XDMW080620ZTR)	**JC7560** **(JC5040)**	100	3	900	1,900	10.2	3	700	2,000	13.6
			150	2.5	800	1,400	6.3	2.5	650	1,600	9.1
			200	2.5	700	1,050	4.7	2.5	600	1,200	6.8
			250	2	700	850	3.1	2	600	1,000	4.5
			300	2	700	850	3.1	2	600	1,000	4.5
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	XDMW080620ZTR (XDMW080620ZTR)	**JC5118** **(JC8015)**	100	2.5	450	550	3.8	2.5	450	700	6.1
			150	2	400	450	2.5	2	400	600	4.2
			200	2	350	320	1.8	2	300	350	2.5
			250	1.5	350	320	1.3	1.5	300	350	1.8
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	XDMW080620ZTR (XDMW080635ZTR-S)	**JC8015** **(JC8015)**	100	5	900	2,700	17.2	5	700	2,800	22.5
			150	4	800	2,400	12.2	4	600	2,400	15.4
			200	3.5	700	1,800	8	3.5	550	2,000	11.2
			250	3	700	1,600	6.1	3	550	1,600	7.7
			300	2.5	700	1,600	5.1	2.5	550	1,600	6.4
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	XDMW080620ZTR (XDMW080620ZTR) (XDMW080635ZTR-S)	**JC5118** **(JC8015)** **(JC8015)**	100	4	750	1,800	13.5	4	600	2,000	18.9
			150	3	680	1,350	7.6	3	550	1,450	10.3
			200	2.5	600	1,000	4.7	2.5	500	1,150	6.8
			250	2	600	900	3.4	2	500	900	4.3
			300	1.5	600	900	2.5	1.5	500	900	3.2
Stainless steel SUS304 Below 250HB	XDMT080620ZER(-ML) (XDMT080620ZER)	**JC7560** **(JC8050)**	100	4	800	1,200	9.2	4	650	1,200	11.6
			150	3.5	700	1,000	6.7	3.5	600	1,000	8.5
			200	3	600	700	4	3	500	800	5.8
			250	2.5	600	550	2.6	2.5	500	600	3.6
			300	2	600	550	2.1	2	500	600	2.9

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
(Above parameter is for BT50 arbor)
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed and feed speed.
3) Use air blow to flush the chips out.
4) We recommend to use XDMW080635ZTR-S JC8015 (negative geometry inserts) for material having sand inclusions and uneven removal stocks.

Hepta Mill

HEPTYPE

RECOMMENDED CUTTING CONDITIONS **General Use**

Work Materials	Inserts	Insert Grades	Overhung length ℓ (mm)	Tool dia. (mm)							
				80				100			
				No. of teeth 5N				No. of teeth 6N			
				a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMT080620ZER(-ML) (XDMW080620ZTR)	**JC7560** **(JC5040)**	100	4	550	2,200	25.1	4	450	2,200	31.3
			150	4	500	1,800	20.5	4	400	1,700	24.2
			200	3.5	450	1,400	14	3.5	350	1,300	16.2
			250	3	450	1,100	9.4	3	350	1,100	11.8
			300	2.5	450	1,100	7.8	2.5	350	1,100	9.8
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC5118)** **(JC5040)**	100	3	550	2,000	17.3	3	450	1,900	20.5
			150	3	500	1,500	12.9	3	400	1,500	16.2
			200	2.5	450	1,100	7.9	2.5	350	1,100	9.9
			250	2.5	450	900	6.5	2.5	350	850	7.6
			300	2	450	900	5.2	2	350	850	6.1
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER)	**JC5118** **(JC8015)**	100	3	400	1,300	12	3	350	1,500	17.3
			150	3	350	1,050	9.7	3	300	1,200	13.8
			200	2.5	300	800	6.2	2.5	250	800	7.7
			250	2.5	300	600	4.6	2.5	250	600	5.8
			300	2	300	600	3.7	2	250	600	4.6
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER(-ML) (XDMW080620ZTR)	**JC7560** **(JC5040)**	100	3	550	2,000	17.3	3	450	1,900	20.5
			150	3	500	1,500	12.9	3	400	1,500	16.2
			200	2.5	450	1,100	7.9	2.5	350	1,100	9.9
			250	2.5	450	900	6.5	2.5	350	850	7.6
			300	2	450	900	5.2	2	350	850	6.1
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	XDMW080620ZTR (XDMW080620ZTR)	**JC5118** **(JC8015)**	100	2.5	350	700	7.8	2.5	250	600	8.3
			150	2.5	300	600	6.7	2.5	200	500	6.9
			200	2	250	400	3.6	2	160	400	4.4
			250	2	250	350	3.1	2	160	350	3.9
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	XDMW080620ZTR (XDMW080635ZTR-S)	**JC8015** **(JC8015)**	100	5	550	2,750	28	5	450	2,700	34.4
			150	5	500	2,400	24.5	5	400	2,400	30.6
			200	4	450	1,800	14.7	4	350	2,000	20.4
			250	3.5	450	1,600	11.4	3.5	350	1,600	14.3
			300	3	450	1,600	9.8	3	350	1,600	12.2
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	XDMW080620ZTR (XDMW080620ZTR) (XDMW080635ZTR-S)	**JC5118** **(JC8015)** **(JC8015)**	100	4	450	1,750	21	4	380	1,800	27.1
			150	4	400	1,350	16.2	4	350	1,350	20.3
			200	3	380	1,000	9	3	300	1,150	13
			250	2.5	380	900	6.8	2.5	300	900	8.5
			300	2	380	900	5.4	2	300	900	6.8
Stainless steel SUS304 Below 250HB	XDMT080620ZER(-ML) (XDMT080620ZER)	**JC7560** **(JC8050)**	100	4	500	1,200	14.7	4	400	1,100	16.9
			150	4	450	900	11.1	4	350	1,000	15.4
			200	3.5	400	800	8.6	3.5	300	700	9.4
			250	3	400	600	5.5	3	300	600	6.9
			300	2.5	400	600	4.6	2.5	300	550	5.3

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
(Above parameter is for BT50 arbor)
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed and feed speed.
3) Use air blow to flush the chips out.
4) We recommend to use XDMW080635ZTR-S JC8015 (negative geometry inserts) for material having sand inclusions and uneven removal stocks.

Hepta Mill

HEP TYPE

RECOMMENDED CUTTING CONDITIONS **General Use**

Work Materials	Inserts	Insert Grades	Overhung length ℓ (mm)	Tool dia. (mm)							
				125				160			
				No. of teeth 7N				No. of teeth 8N			
				a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMT080620ZER(-ML) (XDMW080620ZTR)	**JC7560** **(JC5040)**	100	4	350	2,000	35.6	4	300	1,900	43.3
			150	4	320	1,600	28.5	4	260	1,500	34.2
			200	4	300	1,300	23.1	4	220	1,100	25.1
			250	3.5	300	1,100	17.1	3.5	220	900	18
			300	3	300	1,100	14.7	3	220	900	15.4
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC5118)** **(JC5040)**	100	3	350	1,700	22.9	3	300	1,700	29.3
			150	3	320	1,350	18.2	3	260	1,250	21.6
			200	3	300	1,050	14.2	3	220	900	15.5
			250	2.5	300	1,000	11.2	2.5	220	700	10.1
			300	2.5	300	1,000	11.2	2.5	220	700	10.1
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER)	**JC5118** **(JC8015)**	100	3	300	1,500	21.6	3	250	1,400	25.8
			150	3	250	1,100	15.8	3	200	1,000	18.4
			200	3	200	750	10.8	3	150	600	11.1
			250	2.5	200	600	7.2	2.5	150	500	7.7
			300	2.5	200	600	7.2	2.5	150	500	7.7
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER(-ML) (XDMW080620ZTR)	**JC7560** **(JC5040)**	100	3	350	1,700	22.9	3	300	1,700	29.3
			150	3	320	1,350	18.2	3	260	1,250	21.6
			200	3	300	1,050	14.2	3	220	900	15.5
			250	2.5	300	1,000	11.2	2.5	220	700	10.1
			300	2.5	300	1,000	11.2	2.5	220	700	10.1
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	XDMW080620ZTR (XDMW080620ZTR)	**JC5118** **(JC8015)**	100	2.5	200	550	9.5	2.5	170	550	12.2
			150	2.5	150	400	6.9	2.5	150	500	11.1
			200	2.5	125	260	4.5	2.5	120	300	6.7
			250	2	125	260	3.6	2	120	280	5
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	XDMW080620ZTR (XDMW080635ZTR-S)	**JC8015** **(JC8015)**	100	5	350	2,450	39	5	280	2,250	45.9
			150	5	320	2,200	35	5	260	2,100	42.8
			200	5	280	1,800	28.7	5	220	1,700	34.7
			250	4	280	1,400	17.8	4	220	1,400	22.8
			300	3.5	280	1,400	15.6	3.5	220	1,400	20
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	XDMW080620ZTR (XDMW080620ZTR) (XDMW080635ZTR-S)	**JC5118** **(JC8015)** **(JC8015)**	100	4	300	1,700	31.9	4	250	1,500	36.1
			150	4	270	1,250	23.5	4	220	1,200	28.9
			200	3	250	1,000	14.1	3	180	950	17.1
			250	3	250	800	11.3	3	180	800	14.4
			300	2.5	250	800	9.4	2.5	180	800	12
Stainless steel SUS304 Below 250HB	XDMT080620ZER(-ML) (XDMT080620ZER)	**JC7560** **(JC8050)**	100	4	300	1,000	19.2	4	240	900	22.1
			150	4	250	800	15.4	4	200	750	18.4
			200	4	220	650	12.5	4	180	600	14.7
			250	3.5	220	550	9.2	3.5	180	500	10.8
			300	3	220	500	7.2	3	180	450	8.3

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
(Above parameter is for BT50 arbor)
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed and feed speed.
3) Use air blow to flush the chips out.
4) We recommend to use XDMW080635ZTR-S JC8015 (negative geometry inserts) for material having sand inclusions and uneven removal stocks.

Hepta Mill HEPTYPE

RECOMMENDED CUTTING CONDITIONS General Use

Work Materials	Inserts	Insert Grades	Overhung length ℓ (mm)	Tool dia. (mm)							
				200							
				No.of teeth 9N							
				a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)				
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMT080620ZER(-ML) (XDMW080620ZTR)	**JC7560** **(JC5040)**	100	4	220	1,600	45.6				
			150	4	200	1,300	37				
			200	4	180	1,000	28.5				
			250	3.5	180	800	20				
			300	3	180	800	17.1				
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC5118)** **(JC5040)**	100	3	220	1,400	30.2				
			150	3	200	1,100	23.7				
			200	3	180	800	17.3				
			250	2.5	180	650	11.7				
			300	2.5	180	650	11.7				
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER)	**JC5118** **(JC8015)**	100	3	200	1,100	25.3				
			150	3	170	1,000	23				
			200	3	130	600	13.8				
			250	2.5	130	500	9.6				
			300	2.5	130	500	9.6				
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER(-ML) (XDMW080620ZTR)	**JC7560** **(JC5040)**	100	3	220	1,400	30.2				
			150	3	200	1,100	23.7				
			200	3	180	800	17.3				
			250	2.5	180	650	11.7				
			300	2.5	180	650	11.7				
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	XDMW080620ZTR (XDMW080620ZTR)	**JC5118** **(JC8015)**	100	2.5	140	500	13.9				
			150	2.5	120	450	12.5				
			200	2.5	100	280	7.8				
			250	2	100	250	5.6				
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	XDMW080620ZTR (XDMW080635ZTR-S)	**JC8015** **(JC8015)**	100	5	220	2,000	51				
			150	5	200	1,800	45.9				
			200	5	180	1,400	35.7				
			250	4	180	1,300	26.5				
			300	3.5	180	1,300	23.2				
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	XDMW080620ZTR (XDMW080620ZTR) (XDMW080635ZTR-S)	**JC5118** **(JC8015)** **(JC8015)**	100	4	180	1,350	40.6				
			150	4	170	1,000	30.1				
			200	3	150	800	18				
			250	3	150	700	15.8				
			300	2.5	150	700	13.2				
Stainless steel SUS304 Below 250HB	XDMT080620ZER(-ML) (XDMT080620ZER)	**JC7560** **(JC8050)**	100	4	200	800	24.6				
			150	4	160	650	20				
			200	4	140	550	16.9				
			250	3.5	140	450	12.1				
			300	3	140	400	9.2				

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
(Above parameter is for BT50 arbor)
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed and feed speed.
3) Use air blow to flush the chips out.
4) We recommend to use XDMW080635ZTR-S JC8015 (negative geometry inserts) for material having sand inclusions and uneven removal stocks.

Hepta Mill

HEP TYPE

■ RECOMMENDED CUTTING CONDITIONS

Interrupted Cutting

Work Materials	Inserts	Insert Grades	Overhung length ℓ (mm)	Tool dia. (mm)							
				50				63			
				No.of teeth 3N				No. of teeth 4N			
				a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	4	750	1,800	12.8	4	600	1,950	17.5
			150	3.5	680	1,450	9	3.5	550	1,500	11.8
			200	3	600	1,100	5.9	3	500	1,300	8.8
			250	2.5	600	900	4	2.5	500	1,000	5.6
			300	2	600	900	3.2	2	500	1,000	4.5
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	3	750	1,600	8.6	3	600	1,700	11.6
			150	2.5	680	1,200	5.4	2.5	550	1,350	7.6
			200	2.5	600	900	4.1	2.5	500	1,000	5.7
			250	2	600	720	2.6	2	500	850	3.9
			300	2	600	720	2.6	2	500	850	3.9
Mold steel NAK80,HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER	**JC5118**	100	3	550	1,100	6.3	3	450	1,250	9.1
			150	2.5	500	900	4.3	2.5	400	1,000	6.1
			200	2.5	400	600	2.9	2.5	350	700	4.2
			250	2	400	500	1.9	2	350	600	2.9
			300	2	400	500	1.9	2	350	600	2.9
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	3	750	1,600	8.6	3	600	1,700	11.6
			150	2.5	680	1,200	5.4	2.5	550	1,350	7.6
			200	2.5	600	900	4.1	2.5	500	1,000	5.7
			250	2	600	720	2.6	2	500	850	3.9
			300	2	600	720	2.6	2	500	850	3.9
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	XDMW080620ZTR (XDMW080620ZTR)	**JC5118** **(JC8015)**	100	2.5	450	450	3.1	2.5	450	550	4.8
			150	2	400	350	1.9	2	400	500	3.5
			200	2	350	250	1.4	2	300	300	2.1
			250	1.5	350	250	1	1.5	300	300	1.6
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	XDMW080620ZTR (XDMT080620ZER) (XDMW080635ZTR-S)	**JC5118** **(JC8050)** **(JC8015)**	100	5	750	2,250	14.3	5	600	2,400	19.3
			150	4	680	2,000	10.2	4	550	2,200	14.2
			200	3.5	600	1,500	6.8	3.5	500	1,700	9.5
			250	3	600	1,350	5.2	3	500	1,350	6.5
			300	2.5	600	1,350	4.3	2.5	500	1,350	5.4
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	XDMW080620ZTR (XDMT080620ZER) (XDMW080635ZTR-S)	**JC5118** **(JC8050)** **(JC8015)**	100	4	650	1,400	10.5	4	550	1,500	14.2
			150	3	600	1,100	6.2	3	500	1,200	8.5
			200	2.5	500	750	3.5	2.5	400	800	4.8
			250	2	500	600	2.3	2	400	650	3.1
			300	1.5	500	600	1.7	1.5	400	650	2.3
Stainless steel SUS304 Below 250HB	XDMT080620ZER(-ML) (XDMT080620ZER)	**JC7560** **(JC8050)**	100	4	650	1,000	7.7	4	500	1,000	9.7
			150	3.5	550	800	5.4	3.5	450	800	6.8
			200	3	500	550	3.2	3	400	650	4.7
			250	2.5	500	450	2.2	2.5	400	500	3
			300	2	500	450	1.7	2	400	500	2.4

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
(Above parameter is for BT50 arbor)
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed and feed speed.
3) Use air blow to flush the chips out.
4) We recommend to use XDMW080635ZTR-S JC8015 (negative geometry inserts) for material having sand inclusions and uneven removal stocks.

Hepta Mill

HEP TYPE

■ RECOMMENDED CUTTING CONDITIONS

Interrupted Cutting

Work Materials	Inserts	Insert Grades	Overhung length ℓ (mm)	Tool dia. (mm)							
				80				100			
				No. of teeth 5N				No. of teeth 6N			
				a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	4	450	1,800	20.5	4	380	1,800	25.6
			150	4	400	1,500	17.1	4	350	1,400	19.9
			200	3.5	380	1,200	12	3.5	300	1,100	13.7
			250	3	380	900	7.7	3	300	900	9.6
			300	2.5	380	900	6.4	2.5	300	900	8
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	3	450	1,700	14.7	3	380	1,600	17.3
			150	3	400	1,250	10.8	3	350	1,250	13.5
			200	2.5	380	900	6.5	2.5	300	900	8.9
			250	2.5	380	750	5.4	2.5	300	700	6.3
			300	2	380	750	4.3	2	300	700	5
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER	**JC5118**	100	3	350	1,150	10.6	3	300	1,200	13.8
			150	3	300	900	8.3	3	250	900	10.4
			200	2.5	250	700	5.4	2.5	200	550	5.3
			250	2.5	250	500	3.8	2.5	200	450	4.3
			300	2	250	500	3.1	2	200	450	3.5
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	3	450	1,700	14.7	3	380	1,600	17.3
			150	3	400	1,250	10.8	3	350	1,250	13.5
			200	2.5	380	900	6.5	2.5	300	900	8.9
			250	2.5	380	750	5.4	2.5	300	700	6.3
			300	2	380	750	4.3	2	300	700	5
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	XDMW080620ZTR (XDMW080620ZTR)	**JC5118** **(JC8015)**	100	2.5	350	550	6.1	2.5	250	500	6.9
			150	2.5	300	500	5.6	2.5	200	400	5.6
			200	2	250	320	2.8	2	160	320	3.6
			250	2	250	280	2.5	2	160	280	3.1
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	XDMW080620ZTR (XDMT080620ZER) (XDMW080635ZTR-S)	**JC5118** **(JC8050)** **(JC8015)**	100	5	450	2,250	22.9	5	380	2,250	28.7
			150	5	400	1,900	19.3	5	350	2,000	26
			200	4	380	1,500	12.2	4	300	1,700	17.3
			250	3.5	380	1,350	9.7	3.5	300	1,400	12.2
			300	3	380	1,350	8.3	3	300	1,350	10.4
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	XDMW080620ZTR (XDMT080620ZER) (XDMW080635ZTR-S)	**JC5118** **(JC8050)** **(JC8015)**	100	4	400	1,350	16.2	4	330	1,200	18
			150	4	350	1,100	13.2	4	300	900	13.5
			200	3	300	800	7.2	3	250	750	8.5
			250	2.5	300	650	4.9	2.5	250	600	5.6
			300	2	300	650	3.9	2	250	600	4.5
Stainless steel SUS304 Below 250HB	XDMT080620ZER(-ML) (XDMT080620ZER)	**JC7560** **(JC8050)**	100	4	400	1,000	12.3	4	300	900	13.8
			150	4	350	700	8.6	4	300	800	12.3
			200	3.5	300	650	7	3.5	250	600	8.1
			250	3	300	600	5.5	3	250	500	5.8
			300	2.5	300	600	4.6	2.5	250	450	4.3

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
   (Above parameter is for BT50 arbor)
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed and feed speed.
3) Use air blow to flush the chips out.
4) We recommend to use XDMW080635ZTR-S JC8015 (negative geometry inserts) for material having sand inclusions and uneven removal stocks.

Hepta Mill HEPTYPE

RECOMMENDED CUTTING CONDITIONS **Interrupted Cutting**

Work Materials	Inserts	Insert Grades	Overhung length ℓ (mm)	Tool dia. (mm)							
				125				160			
				No. of teeth 7N				No. of teeth 8N			
				a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)	a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	4	300	1,700	30.3	4	250	1,600	36.5
			150	4	270	1,400	24.9	4	220	1,200	27.4
			200	4	250	1,100	19.6	4	180	900	20.5
			250	3.5	250	900	14	3.5	180	750	15
			300	3	250	900	12	3	180	750	12.8
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	3	300	1,400	18.9	3	250	1,400	24.2
			150	3	270	1,100	14.8	3	220	1,000	17.3
			200	3	250	900	12.1	3	180	750	12.9
			250	2.5	250	850	9.5	2.5	180	600	8.6
			300	2.5	250	850	9.5	2.5	180	600	8.6
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER	**JC5118**	100	3	250	1,150	16.6	3	200	1,100	20.2
			150	3	200	800	11.5	3	150	800	14.7
			200	3	150	550	7.9	3	120	550	10.1
			250	2.5	150	500	6	2.5	120	450	6.9
			300	2.5	150	500	6	2.5	120	450	6.9
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	3	300	1,400	18.9	3	250	1,400	24.2
			150	3	270	1,100	14.8	3	220	1,000	17.3
			200	3	250	900	12.1	3	180	750	12.9
			250	2.5	250	850	9.5	2.5	180	600	8.6
			300	2.5	250	850	9.5	2.5	180	600	8.6
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	XDMW080620ZTR (XDMW080620ZTR)	**JC5118** **(JC8015)**	100	2.5	200	450	7.8	2.5	170	450	10
			150	2.5	150	320	5.6	2.5	150	400	8.9
			200	2.5	125	200	3.5	2.5	120	250	5.6
			250	2	125	200	2.8	2	120	220	3.9
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	XDMW080620ZTR (XDMT080620ZER) (XDMW080635ZTR-S)	**JC5118** **(JC8050)** **(JC8015)**	100	5	300	2,100	33.5	5	250	2,000	40.8
			150	5	270	1,850	29.8	5	220	1,750	35.7
			200	5	250	1,500	24.4	5	180	1,450	29.5
			250	4	250	1,200	15.1	4	180	1,200	19.4
			300	3.5	250	1,200	13.3	3.5	180	1,200	17
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	XDMW080620ZTR (XDMT080620ZER) (XDMW080635ZTR-S)	**JC5118** **(JC8050)** **(JC8015)**	100	4	250	1,100	20.7	4	200	1,000	24.1
			150	4	230	850	16	4	170	800	19.2
			200	3	200	700	9.9	3	150	600	10.8
			250	3	200	550	7.8	3	150	500	9
			300	2.5	200	550	6.5	2.5	150	500	7.5
Stainless steel SUS304 Below 250HB	XDMT080620ZER(-ML) (XDMT080620ZER)	**JC7560** **(JC8050)**	100	4	250	800	15.4	4	200	700	17.2
			150	4	200	650	12.5	4	160	600	14.7
			200	4	180	500	9.6	4	150	500	12.3
			250	3.5	180	450	7.6	3.5	150	400	8.6
			300	3	180	400	5.8	3	150	350	6.5

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
(Above parameter is for BT50 arbor)
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed and feed speed.
3) Use air blow to flush the chips out.
4) We recommend to use XDMW080635ZTR-S JC8015 (negative geometry inserts) for material having sand inclusions and uneven removal stocks.

Hepta Mill

HEPTYPE

RECOMMENDED CUTTING CONDITIONS **Interrupted Cutting**

Work Materials	Inserts	Insert Grades	Overhung length ℓ (mm)	Tool dia. (mm)							
				200							
				No. of teeth 9N							
				a_p (mm)	n (min^{-1})	V_f (mm/min)	P_c (kW)				
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	4	180	1,300	37				
			150	4	170	1,100	31.3				
			200	4	150	850	24.2				
			250	3.5	150	700	17.5				
			300	3	150	700	15				
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	3	180	1,200	25.9				
			150	3	170	900	19.4				
			200	3	150	700	15.1				
			250	3.5	150	550	9.9				
			300	2.5	150	550	9.9				
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER	**JC5118**	100	3	170	1,000	23				
			150	3	150	800	18.4				
			200	3	100	500	11.5				
			250	2.5	100	400	7.7				
			300	2.5	100	400	7.7				
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMW080620ZTR(-ML) (XDMT080620ZER) (XDMW080620ZTR)	**JC7560** **(JC8050)** **(JC8050)**	100	3	180	1,200	25.9				
			150	3	170	900	19.4				
			200	3	150	700	15.1				
			250	2.5	150	550	9.9				
			300	2.5	150	550	9.9				
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	XDMW080620ZTR (XDMW080620ZTR)	**JC5118** **(JC8015)**	100	2.5	140	400	11.1				
			150	2.5	120	350	9.7				
			200	2.5	100	220	6.1				
			250	2	100	200	4.4				
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	XDMW080620ZTR (XDMT080620ZER) (XDMW080635ZTR-S)	**JC5118** **(JC8050)** **(JC8015)**	100	5	180	1,600	40.8				
			150	5	170	1,500	39				
			200	5	150	1,200	30.3				
			250	4	150	1,100	22.5				
			300	3.5	150	1,100	19.7				
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	XDMW080620ZTR (XDMT080620ZER) (XDMW080635ZTR-S)	**JC5118** **(JC8050)** **(JC8015)**	100	4	160	900	27.1				
			150	4	140	700	21				
			200	3	120	500	11.3				
			250	3	120	400	9				
			300	2.5	120	400	7.5				
Stainless steel SUS304 Below 250HB	XDMT080620ZER(-ML) (XDMT080620ZER)	**JC7560** **(JC8050)**	100	4	160	650	20				
			150	4	130	500	15.4				
			200	4	110	450	13.8				
			250	3.5	110	350	9.4				
			300	3	110	300	6.9				

a_p: Depth of cut, n: Spindle speed, V_f: Feed speed, P_c: Net power consumption

NOTE

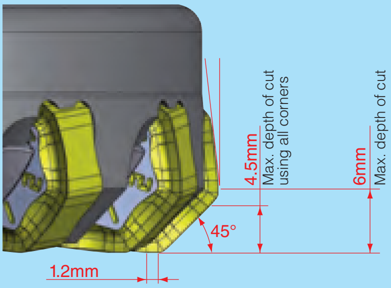
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
(Above parameter is for BT50 arbor)
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed and feed speed.
3) Use air blow to flush the chips out.
4) We recommend to use XDMW080635ZTR-S JC8015 (negative geometry inserts) for material having sand inclusions and uneven removal stocks.

Nega Hepta NHPTYPE

14 Cutting Edges Insert
AENtype for Cast iron
AER-PM & AEN-KLtype for Steel

FEATURES

Economical cutter with multi corner insert



- Lower cutting forces by 3D positive geometry chip breaker even though double side negative insert.
- Pocket milling is possible due to outer cutting edge has side clearance.

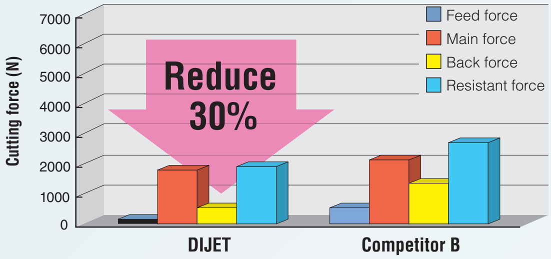
Wide range of cutter body

- Regular type for lower power consumption.
- Ultra fine pitch type for high efficient machining.
- From dia. 63mm to 250mm

Nega Hepta NHPTYPE

CUTTING PERFORMANCE

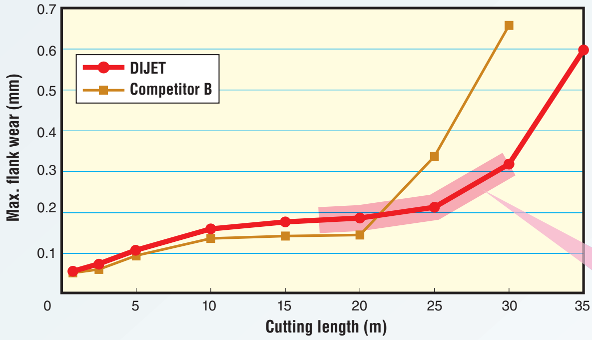
Cutting Force Comparison



φ125, 18 inserts

Material: FC300
Cutting conditions:
Vc=200m/min
fz=0.5mm/t
a_p=3mm
a_e=80mm
Overhung length: ℓ=138mm
Downcut, Dry

Tool Life Comparison



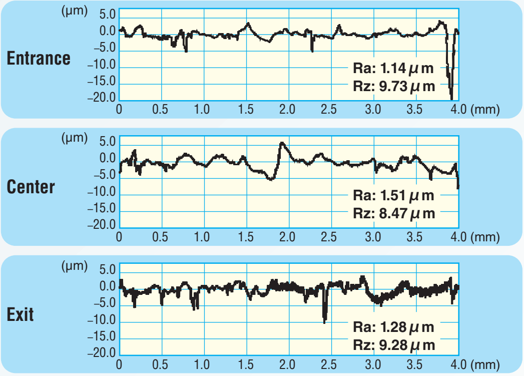
Material: FC300 (Interrupted cutting)
Cutting conditions: Vc=300m/min, n=764min^{-1},
fz=0.3mm/t, a_p=3mm,a_e=100mm
Overhung length: ℓ=138mm, Dry

DIJET: 30m

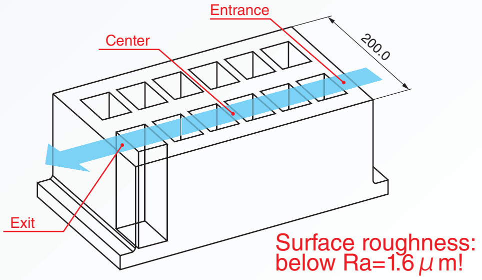
Competitor B: 30m

Inserts got wornout gradually

Surface Roughness



Material: FC300 (Interrupted cutting)
Cutting conditions: Vc=300m/min, n=764min^{-1},
fz=0.3mm/t, a_p=3mm,
a_e=100mm
Overhung length: ℓ=138mm, Dry



Surface roughness:
below Ra=1.6μm!

Nega Hepta NHP TYPE

Face Milling Pocket Milling

Fig. 1

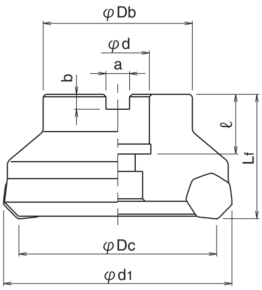
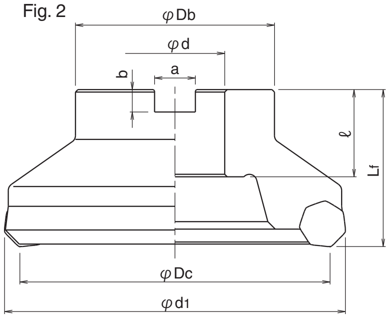


Fig. 2



BODY / ULTRA FINE PITCH TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)								Weight (kg)	Fig.
				φDc	Lf	φDb	φd	φd1	a	b	ℓ		
Metric Bore	**NHP-14100R-08-32**	□	14	**100**	50	70	32	112.4	14.4	8	32	2.1	2
	NHP-18125R-08-40	□	18	**125**	63	80	40	137.4	16.4	9	35	3.7	2
	NHP-22160R-08-40	□	22	**160**	63	100	40	172.4	16.4	9	29	5.2	4
	NHP-28200R-08-60	□	28	**200**	63	140	60	212.4	25.4	14.3	40	7.6	3
	NHP-36250R-08-60	□	36	**250**	63	160	60	262.4	25.4	14.3	40	12.9	3

Note) 1. All cutters are supplied without inserts.
2. Refer page C126 for recommended cutting conditions.

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

Nega Hepta NHP TYPE

Fig. 3

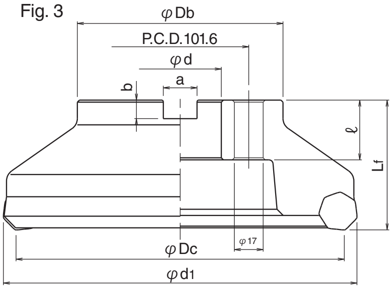
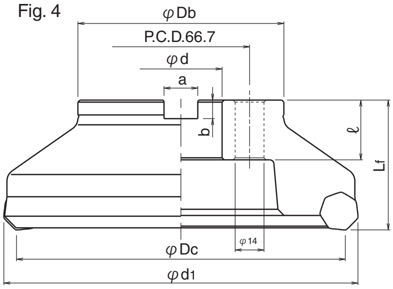


Fig. 4

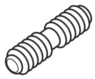
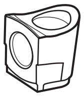
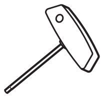


■ BODY/REGULAR TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)								Weight (kg)	Fig.
				φDc	Lf	φDb	φd	φd1	a	b	ℓ		
Metric Bore	**NHP-5063R-08-22**	●	5	**63**	50	60	22	75.4	10.4	6.3	20	1.2	1
	NHP-6080R-08-27	●	6	**80**	50	60	27	92.4	12.4	7	22	1.6	1
	NHP-8100R-08-32	●	8	**100**	50	70	32	112.4	14.4	8	32	2.0	2
	NHP-8125R-08-40	●	8	**125**	63	80	40	137.4	16.4	9	35	3.2	2
	NHP-10160R-08-40	●	10	**160**	63	100	40	172.4	16.4	9	29	5.2	4

Note) 1. All cutters are supplied without inserts.
2. Refer page C126 for recommended cutting conditions

■ PARTS

Wedge Screw	Wedge	Wrench
 Recommended Torque 6.0 N·m		
LS-110	70710	A-15T

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

Nega Hepta NHPTYPE

INSERT

Fig. 1

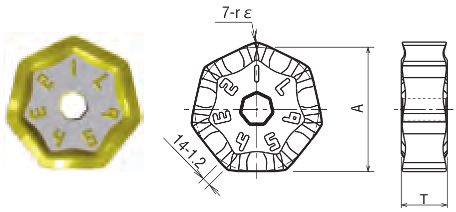


Fig. 2 (Low cutting force)

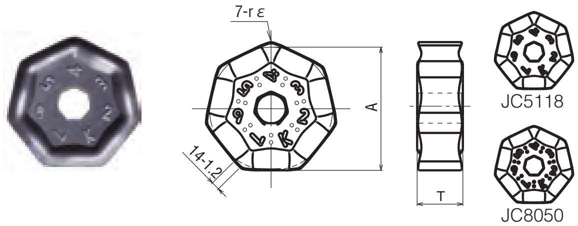


Fig. 3 (Wiper insert)

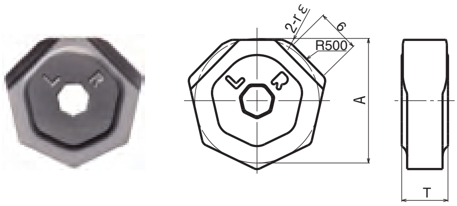
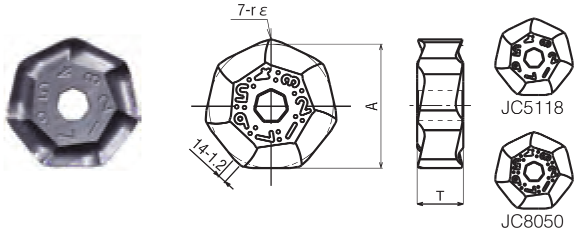


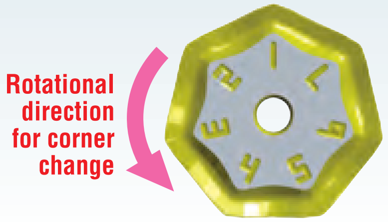
Fig. 4



BODY

Cat. No.	Tole-rance	Dimensions (mm)			PVD coated			CVD coated	Fig.
		A	T	rε	JC5118	JC8003	JC8050	JC608X	
XNMU080610AEN	M	17.5	6.5	1				●	1
XNMU080610AEN-KL					●		●		2
XNMU080610AER-PM					●		●		4
XNHU0806AEN-W	H					●			3

HOW TO USE OF CORNER CHANGE



Recommend to rotate the insert counter-clockwise for corner change

ATTENTION TO USING WIPER INSERT

- In case of feed per rev. f >1.2mm/rev and required surface roughness Rz≒12.5μm, we recommend to use wiper insert.
- Feed per tooth fz < 6mm/rev is recommended.
- Please put insert as "R" mark is shown to the front.

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

Nega Hepta NHP TYPE

⚠ ★ Instructions for mounting inserts

1 Clean

Clean the insert pocket including insert seat carefully

2 Mounting insert

Press insert to inside seat ① and slide down ward ② (Refer Fig. 1)

3 Tightening wedge screw

Tightening wedge screw ③ and confirm there is no gap between insert and insert seat. (Refer Fig. 2)
※ Recommended tightening torque: 6N･m

4 Confirmation

Confirm the insert edge is parallel to insert pocket edge. (Refer Fig. 3)

Fig.1

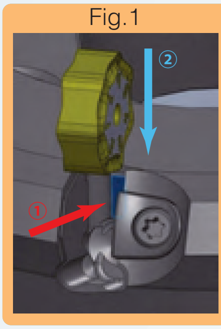
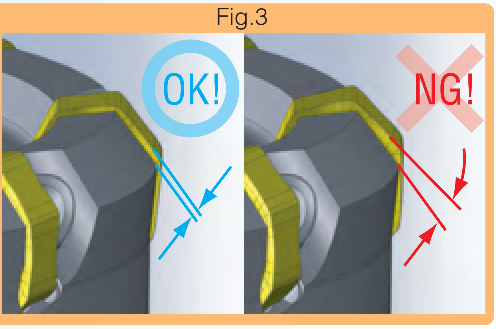


Fig.2

Fig.3



■ POWER CONSUMPTION

Tool dia. φDc (mm)	Ultra fine pitch type		Regular type	
	No. of Insert	Power Consumption	No. of Insert	Power Consumption
	z (tooth)	**Pc** (kW)	**z** (tooth)	**Pc** (kW)
63			5	6.8
80			6	8.1
100	14	18.9	8	10.8
125	18	24.3	8	10.8
160	22	29.7	10	13.5
200	28	37.8		
250	36	48.6		

Power consumption Pc was calculated as Q/Pc'=34 (cm^3/kW) from test data at below cutting condition.

Work Material: FC250
ap=3 (mm)　fz=0.3 (mm/t)
ae=0.8Dc (mm)　Vc=200 (m/min)

Power consumption calculating formula:
Pc (kW)= (ae×ap×Vf)/ {1000 × (Q/Pc')}

Note) The parameters calculated are based on cutting test of cast iron. Actual Pc (kW) is changed according to work shape and cutting conditions.

Nega Hepta NHPTYPE

RECOMMENDED CUTTING CONDITIONS

Cat. No.	Insert	Depth of cut ap (mm)	Cutting speed Vc (m/min)	Feed per tooth fz (mm)	Insert Grades
Grey cast iron FC300 (GG30) Below 300HB	XNMU080610AEN XNMU080610AEN-KL	Below 3.0	200 (150-250)	0.3 (0.1-1.0)	Vc≧200: JC608X (XNMU080610AEN) ※Vc≦200: JC5118 (XNMU080610AEN-KL)
		3-6		0.3 (0.1-0.5)	
Nodular cast iron FCD400 (GGG40) Below 300HB	XNMU080610AEN XNMU080610AEN-KL	Below 3.0	150 (120-180)	0.2 (0.1-0.8)	Vc≧150: JC608X (XNMU080610AEN) ※Vc≦150: JC5118 (XNMU080610AEN-KL)
		3-6		0.2 (0.1-0.4)	
Low carbon steel SS400, S10C (17100, C10) Below 180HB	XNMU080610AEN-KL	Below 2.5	180 (140-220)	0.3 (0.1-0.5)	JC5118 (JC8050) (For interrupted cutting)
	XNMU080610AER-PM	2.0-3.5			
Carbon steel S50C, S55C (C50, C55) Below 250HB	XNMU080610AEN-KL	Below 2.5	160 (120-200)	0.3 (0.1-0.5)	JC5118 (JC8050) (For interrupted cutting)
	XNMU080610AER-PM	2.0-3.5			
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XNMU080610AEN-KL	Below 2.5	140 (100-180)	0.3 (0.1-0.5)	JC5118 (JC8050) (For interrupted cutting)
	XNMU080610AER-PM	2.0-3.5			
Mold steel NAK80, HPM1, P21 (1.2311, P21) 30-43HRC	XNMU080610AEN-KL	Below 2.5	80 (60-100)	0.15 (0.1-0.3)	JC5118 (JC8050) (For interrupted cutting)
Stainless steel SUS304 Below 250HB	XNMU080610AEN-KL	Below 2.5	130 (100-160)	0.2 (0.1-0.4)	JC8050
	XNMU080610AER-PM	2.0-3.0			

※ For low power machine

NOTE

The cutting parameters to be adjusted according to the machine rigidity or work rigidity.

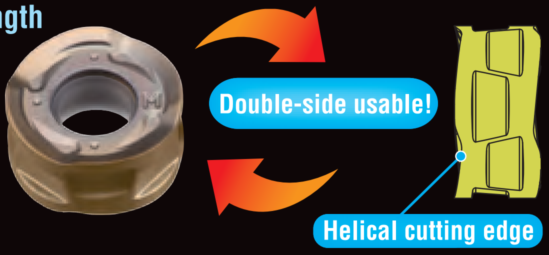
TDM EXTREME

EXTDMTYPE

Feature of product

"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.

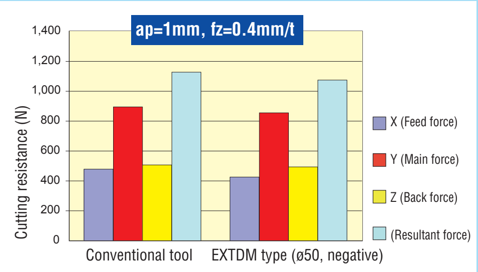
- Insert are arranged in an irregular pitch (except for 3 tooth type). Prevents chattering & vibration.

Cutting performance

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

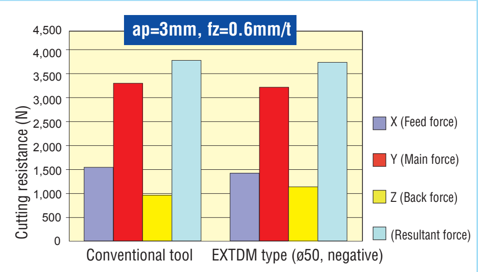
Cutting force comparison

Material: S50C C50
Cutting conditions: Vc=120/min, fz=1.0mm/t, ap=0,6mm, ae=15mm
Down cut, Air blow, Tool No.: EXTDM-5050R-12-22 (ø50),
Insert No.: RNMU1205MOE-MM (JC7560P)



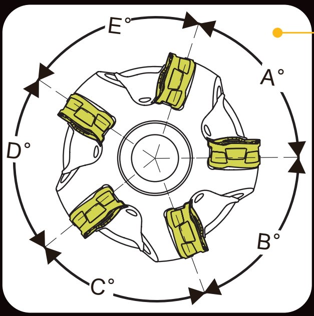
Cutting force comparison

Material: S50C C50
Cutting conditions: Vc=120/min, fz=1.0mm/t, ap=0,6mm, ae=15mm
Dow cut, Air blow, Tool No.: EXTDM-5050R-12-22 (ø50),
Insert No.: RNMU1205MOE-MM (JC7560P)

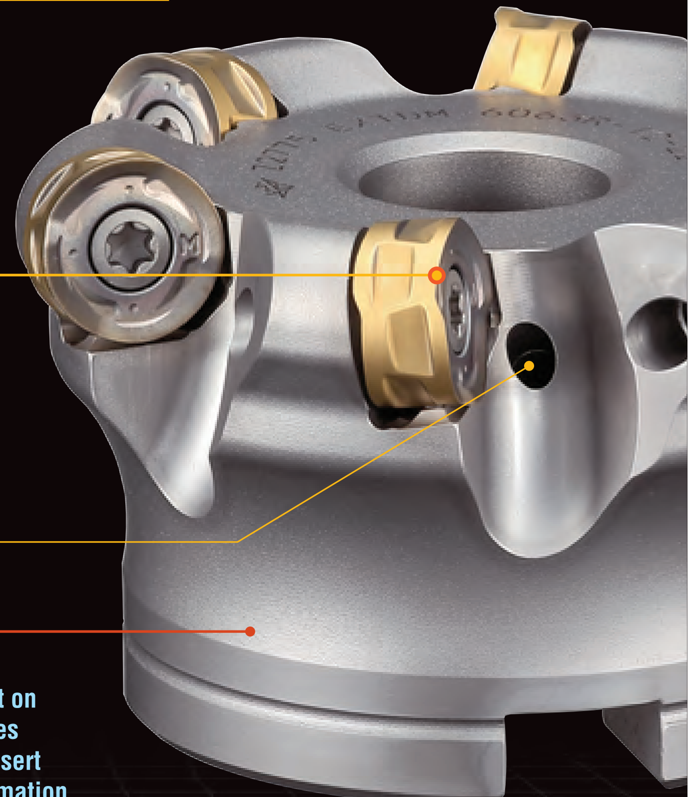


TDM EXTREME EXTDMTYPE

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

● Tool life comparison

Material: SUS420J2
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

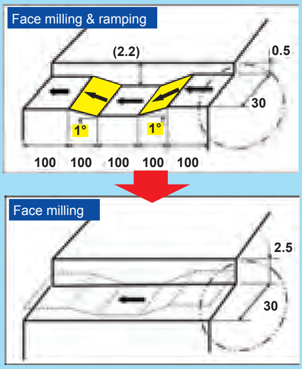
Down cut

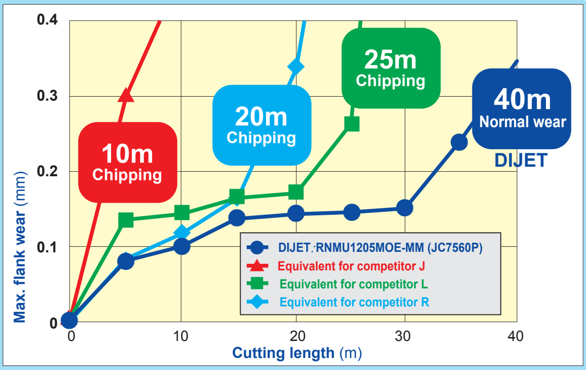
Air blow

Test by 1 insert

Tool No.:
EXTDM-5050R-12-22 (ø50)

Insert No.:
RNMU1205MOE-MM
(JC7560P)



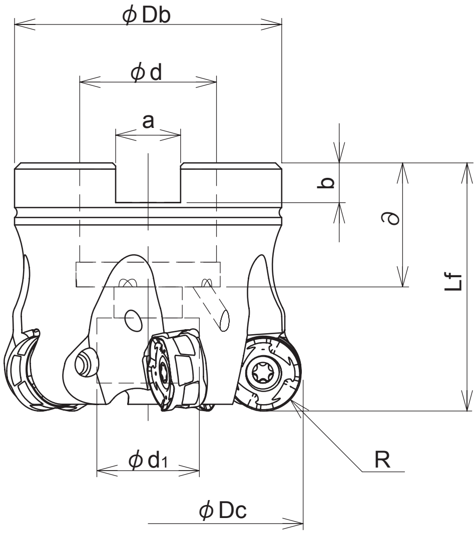


TDM EXTREME EXTDM TYPE

G-Body Through Coolant Hole

Face Milling | Pocket Milling | Helical Interpolation | Copy Milling

FACE MILL TYPE



Type	Cat. No.	Stock	No. of tooth	Dimensions (mm)									Weight (kg)
				φDc	R	Lf	φDb	φd	φd1	a	b	ℓ	
Metric Bore	**EXTDM-5050R-12-22**	●	5	**50**	6	40	43	22	16.5	10.4	6.3	20	0.29
	EXTDM-5052R-12-22	●	5	**52**	6	40	43	22	16.5	10.4	6.3	20	0.30
	EXTDM-6063R-12-22	●	6	**63**	6	40	48	22	16.5	10.4	6.3	20	0.43
	EXTDM-6063R-12-27	●	6	**63**	6	50	58	27	20	12.4	7	22	0.56
	EXTDM-6066R-12-27	●	6	**66**	6	50	60	27	20	12.4	7	22	0.64

Note) All cutters are supplied without inserts.

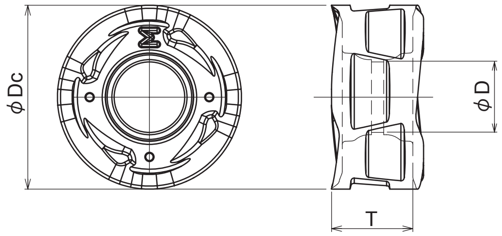
Modular Head Type **Please refer Page B132**

Wrench	Clamp Screw	Recommended Torque (N·m)
A-15T	**TSW-410H**	3.5

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

TDM EXTREME EXTDMTYPE

INSERT

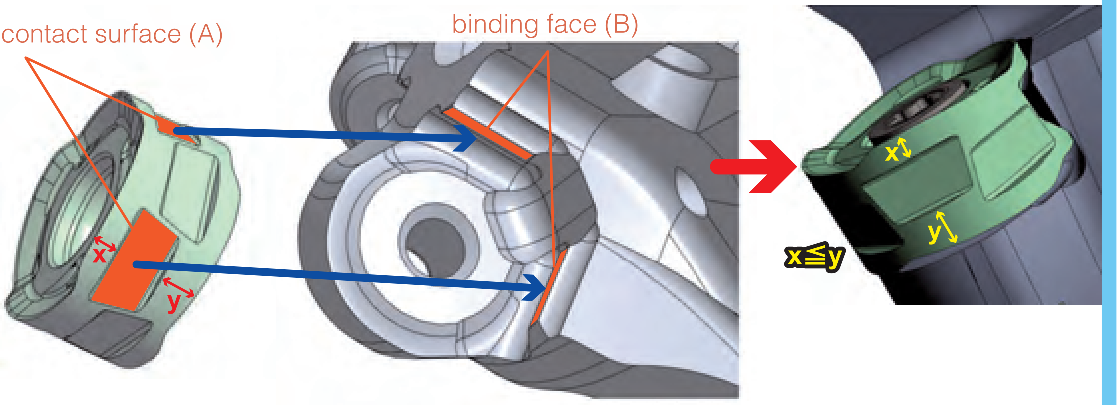


BODY

Cat. No.	Tolerance	Total of corners (double-side)	Dimensions (mm)			PVD coated
			φDc	T	φD	NEW JC7560P
RNMU1205MOE-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).

TDM EXTREME

EXTDM TYPE

■ RECOMMENDED CUTTING CONDITIONS

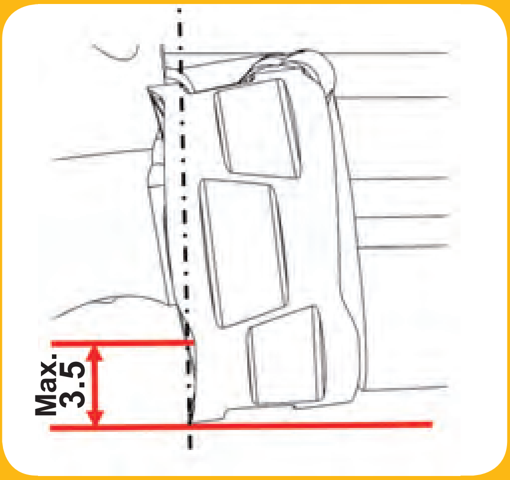
Work Materials	Grades	Cutting speed V_c (m/min)	Breaker	Depth of cut		Feed per tooth	Tool dia. φDc (mm)			
							50/52×5N		63/66×6N	
				ap range (mm)	ap (mm)	fz (mm/t)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)
Stainless steel (Martensitic) 13Cr (SUS403, 410, 420, 430)	JC7560P	170-220-270	MM	0.5 – 3.0 Recommended up to 2.5mm	0.5	0.55	1,347 (V_c=220) (φ52)	3,704	1,060 (V_c=220) (φ66)	3,498
					1.0	0.40		2,694		2,544
					1.5	0.35		2,357		2,226
					2.0	0.30		2,021		1,908
					2.5	0.27		1,818		1,717
					(3.0)	0.25		1,683		1,590
Stainless steel (Austenitic) (SUS304, 316, 317)	JC7560P	120-160-200	MM	0.5 – 3.0 Recommended up to 2.5mm	0.5	0.55	979 (V_c=160) (φ52)	2,692	771 (V_c=160) (φ66)	2,544
					1.0	0.40		1,958		1,850
					1.5	0.35		1,713		1,619
					2.0	0.30		1,469		1,388
					2.5	0.27		1,322		1,249
					(3.0)	0.25		1,224		1,157

ℓ: Overhung length, ap: Depth of cut, V_c: Cutting speed, n: Spindle speed, V_f: Feed speed, fz: Feed per tooth

■ 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.



Overhung length ℓ/Dc	V_c (m/min)	V_f (mm/min)
~3Dc Or under 3Dc	100%	100%
3Dc~5Dc Over 3Dc, up to 5Dc	70%	70%

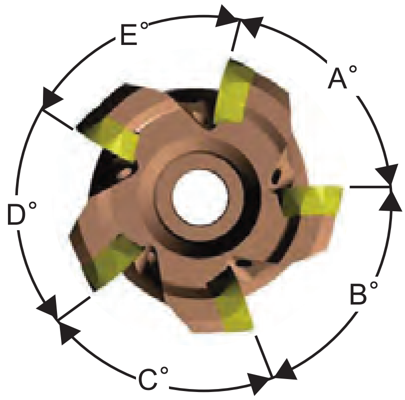
■ Max. ramping angle

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

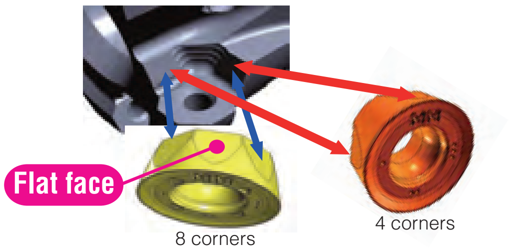
Blade Chipper TDMTYPE

Aerospace Tooling

High speed and high performance at machining stainless steel turbin blade



Unequal pitch design prevents chatter and vibration.



Flat face insert locking seat prevents insert movement

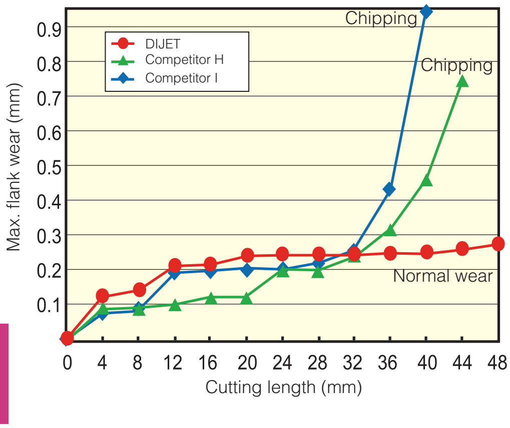
CUTTING PERFORMANCE

Tool life comparison

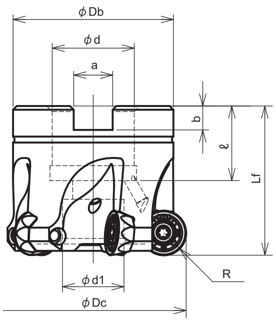
Cutting condition

Insert: RPMT1204MOE-MM8 JC7560
Mat'l: Stainless steel (SUS420J2)
Tool dia.: φ52mm
Vc=260m/min (n=1,952min^{-1}), fz=0.4mm/t
ap=2mm, ae=0~32mm, Dry
*Machined by 1 teeth

TDM type: 48m, normal wear
Competitor: 40m, chipping



Blade Chipper **TDM**TYPE



BODY

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)									Weight (kg)
				φDc	R	L_f	φDb	φd	φd_1	a	b	ℓ	
Metric Bore	**TDM-5050R-12-22**	●	5	**50**	6	40	43	22	16.5	10.4	6.3	20	0.28
	TDM-5052R-12-22	●	5	**52**	6	40	43	22	16.5	10.4	6.3	20	0.35

Note) All cutters are supplied without inserts.

INSERT

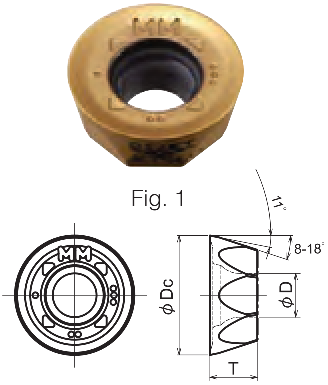


Fig. 1

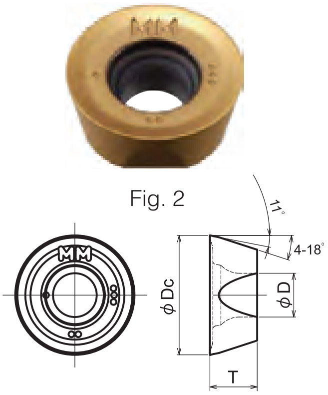


Fig. 2

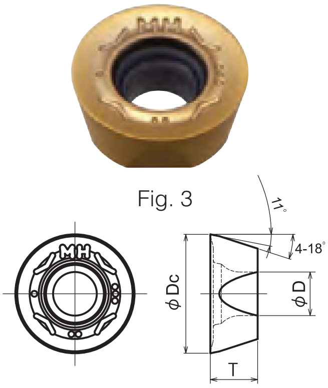
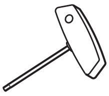


Fig. 3

Type	No. of Corner	Cat. No.	Tolerance	PVD coated	Dimensions (mm)			Fig.
				JC7560 P	φDc	T	φD	
Regular	8	**RPMT1204MOE-MM8**	M	●	12	4.762	4.4	1
Regular	4	**RPMT1204MOE-MM4**	M	●	12	4.762	4.4	2
Strong	4	**RPMT1204MOE-MH4**	M	●	12	4.762	4.4	3

10 inserts per case

PARTS

Clamp screw	Wrench
	
DSW-410H	A-15T

Clamp Screw	Recommended Torque (N·m)
DSW-410H	3.6

Blade Chipper TDMTYPE

Aerospace Tooling

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

JCTMA 2008-005 ECO PRODUCT ☆☆☆

Face Milling

Copy Milling

Pocket Milling

Feature of product

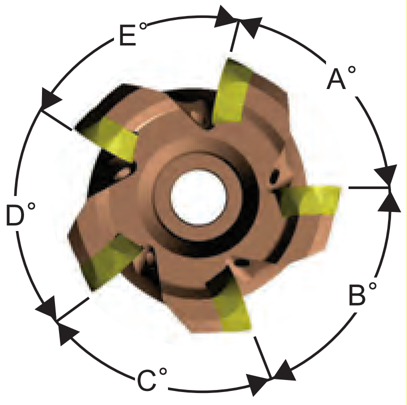
1. Has extensive lineup of small diameter type for machining small to medium-sized turbine blade.

2. Insert are arranged in an irregular pitch (except for 3 tooth type). Prevents chattering & vibration.

3. Available now medium or heavy type inserts.

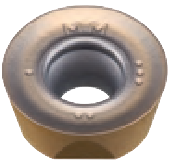
4. Adoptied new PVD coated grade “JC7560P” improved heat-fracture resistance & impact strength.

■ Specification of TDM / MTD type



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

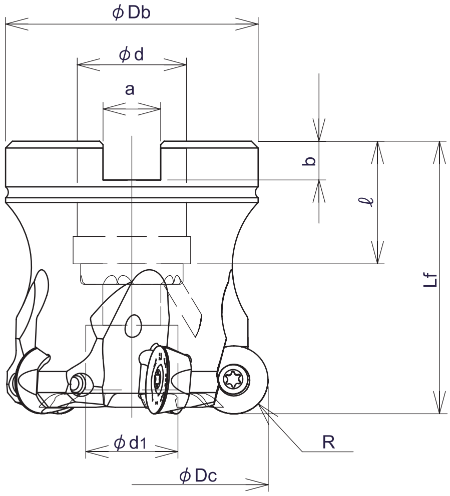
■ Insert shape of TDM / MTD small diameter type

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

Blade Chipper TDMTYPE

FACE MILL TYPE

Through Coolant Hole



Wrench	Clamp Screw	Recommended Torque (N·m)
A-10	**DSW-307H**	1.8

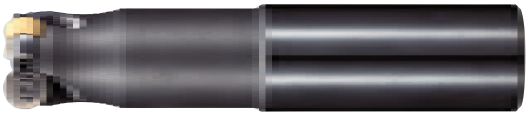
Type	Cat. No.	Stock	No. of tooth	Dimensions (mm)									Weight (kg)
				φDc	R	Lf	φDb	φd	φd1	a	b	ℓ	
Metric Bore	**TDM-5040R-10-16**	●	5	**40**	5	40	37	16	13.5	8.4	5.6	18	0.19
	TDM-5042R-10-16	●	5	**42**	5	40	38	16	13.5	8.4	5.6	18	0.20

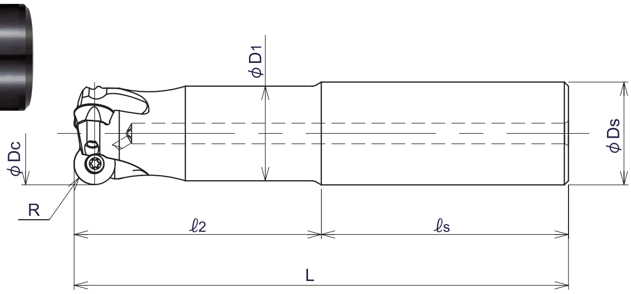
Note) All cutters are supplied without inserts.

Modular Head Type Please refer Page B127

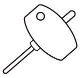
END MILL TYPE

Through Coolant Hole





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

Cat. No.	Stock	No. of inserts	Dimensions (mm)							Applicable inserts	Parts	
			φDc	R	ℓ2	ℓs	L	φD1	φDs		Clamp screw	Wrench
TDM-3025-60-S25	●	3	**25**	5	60	60	120	23	25	RPMT10T3MOE-MM4	 DSW-307H	 A-10
TDM-4032-70-S32	●	4	**32**	5	70	60	130	29	32			

Note) All cutters are supplied without inserts.

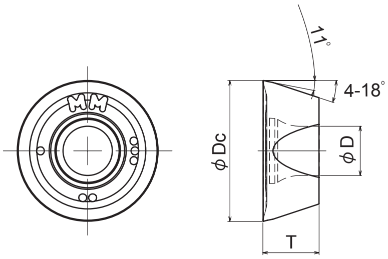
● : Standard stock items ☐ : Stock in Japan ○ : Soon to be deleted

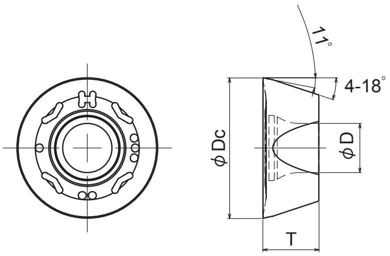
Blade Chipper TDMTYPE

INSERT

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

Blade Chipper **TDMTYPE**

RECOMMENDED CUTTING CONDITIONS

TDM type (End mill type)

Work Materials	Grades	Cutting speed V_c (m/min)	Breaker	Depth of cut		Feed per tooth	Tool dia. φDc (mm)			
							25×3N		32×4N	
				a_p range (mm)	a_p (mm)	f_z (mm/t)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)
Stainless steel (Martensitic) 13Cr (SUS403, 410, 420, 430)	JC7560P	180-230-280	MM4 MH4	0.5 – 2.5	0.5	0.33	2,928 (V_c=230)	2,899	2,288 (V_c=230)	3,020
					1.0	0.22		1,932		2,013
					1.5	0.19		1,669		1,739
					2.0	0.18		1,581		1,647
Stainless steel (Austenitic) 17Cr (SUS304, 316, 317)	JC7560P	120-170-220	MM4 MH4	0.5 – 2.5	0.5	0.33	2,165 (V_c=170)	2,143	1,691 (V_c=170)	2,232
					1.0	0.22		1,429		1,488
					1.5	0.19		1,234		1,285
					2.0	0.18		1,169		1,218

ℓ: Overhung length, a_p: Depth of cut, V_c: Cutting speed, n: Spindle speed, V_f: Feed speed, f_z: Feed per tooth

TDM type (Face mill type)

Work Materials	Grades	Cutting speed V_c (m/min)	Breaker	Depth of cut		Feed per tooth	Tool dia. φDc (mm)			
							50		52	
				a_p range (mm)	a_p (mm)	f_z (mm/t)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)
Stainless steel (Martensitic) 13Cr (SUS403, 410, 420, 430)	JC7560	190-240-290	MM8	0.5 – 1.5 (Max 3mm in case of 4 corners use)	0.5	0.55	1,528 (V_c=240)	4,202	1,469 (V_c=240)	4,040
					1.0	0.40		3,056		2,938
			MM4 (MH4)	0.5 – 3	2.0	0.30		2,292		2,204
					3.0	0.25		1,910		1,836
Stainless steel (Austenitic) 17Cr (SUS304, 316, 317)	JC7560	130-180-230	MM8	0.5 – 1.5 (Max 3mm in case of 4 corners use)	0.5	0.55	1,146 (V_c=180)	3,152	1,102 (V_c=180)	3,031
					1.0	0.40		2,292		2,204
			MM4 (MH4)	0.5 – 3	2.0	0.30		1,719		1,653
					3.0	0.25		1,433		1,37

ℓ: Overhung length, a_p: Depth of cut, V_c: Cutting speed, n: Spindle speed, V_f: Feed speed, f_z: Feed per tooth

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.

Overhung length ℓ/Dc	V_c (m/min)	V_f (mm/min)
~3Dc Or under 3Dc	100%	100%
3Dc~5Dc Over 3Dc, up to 5Dc	70%	70%

Blade Chipper TDMTYPE

RECOMMENDED CUTTING CONDITIONS

● TDM type (Face mill type)

Work Materials	Grades	Cutting speed V_c (m/min)	Breaker	Depth of cut		Feed per tooth	Tool dia. φDc (mm)			
							40×5N		42×5N	
				ap range (mm)	ap (mm)	fz (mm/t)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)
Stainless steel (Martensitic) 13Cr (SUS403, 410, 420, 430)	JC7560P	190-**240**-290	MM4 MH4	0.5 – 2.5	0.5	0.35	1,910 (Vc=240)	3,343	1,819 (Vc=240)	3,083
					1.0	0.25		2,388		2,274
					1.5	0.21		2,006		1,910
					2.0	0.20		1,910		1,819
					2.5	0.18		1,719		1,637
Stainless steel (Austenitic) 17Cr (SUS304, 316, 317)	JC7560P	130-**180**-230	MM4 MH4	0.5 – 2.5	0.5	0.35	1,432 (Vc=180)	2,506	1,364 (Vc=180)	2,387
					1.0	0.25		1,790		1,705
					1.5	0.21		1,504		1,432
					2.0	0.20		1,432		1,364
					2.5	0.18		1,289		1,228

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

MM4: Medium type / 4 corners
MH4: Heavy type / 4 corners

■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case of more overhung length, cutting speed and feed speed to be reduced according to the right table.
3) Use air blow to flush the chips out.

Overhung length ℓ/Dc	V_c (m/min)	V_f (mm/min)
~3Dc 3Dc or less	100%	100%
3Dc~5Dc Over 3Dc, up to 5Dc	70%	70%

Super Diemaster HDMTYPE

High efficient machining tool with edge sharpness and strength.

Through coolant hole

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 clamp system

Adopted double clamp system for more rigidity.

Adopted positive axial rake

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

⇒Reduced cutting forces by 21% than conventional Diemaster.

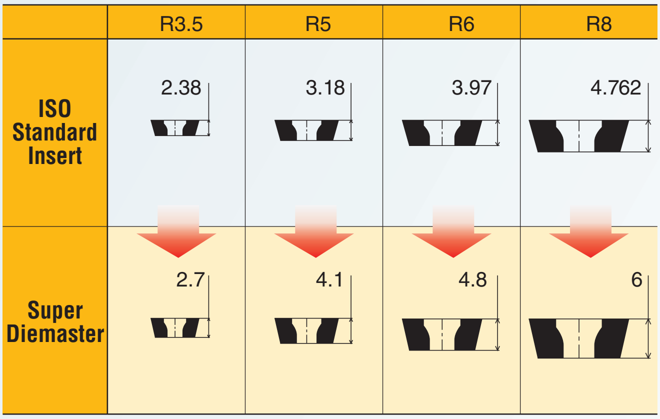
Variation

Modular Head is available with combination of carbide shank.
(Please refer page B023-B024 for modular type)

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 and highly tough. This results increased tool life by 30% or more compared with general cutter body. It is difficult to get damage even under severe cutting conditions. Also rust-proof and anti-welding effect are much improved.

Insert strength comparison

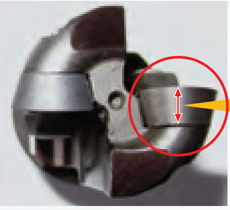


	R3.5	R5	R6	R8
ISO Standard Insert	2.38	3.18	3.97	4.762
Super Diemaster	2.7	4.1	4.8	6

68% Stronger than ISO Standard Insert

■ Insert comparison

Super Diemaster

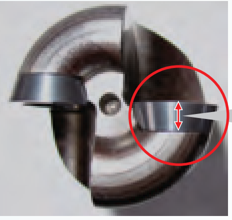


Insert thickness: 4.1

Body:
SDH-2250-R10-M12

Insert:
RDMW1004MOT

ISO Standard Insert



Insert thickness: 3.18

Body:
MDH-2250-M12

Insert:
RDHX1003MOT

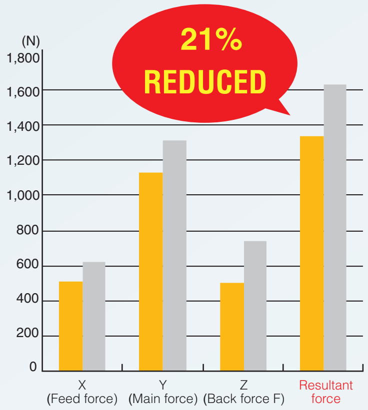
Super Diemaster HDMTYPE

CUTTING PERFORMANCE

Cutting force comparison

① General machining for hardened die steel

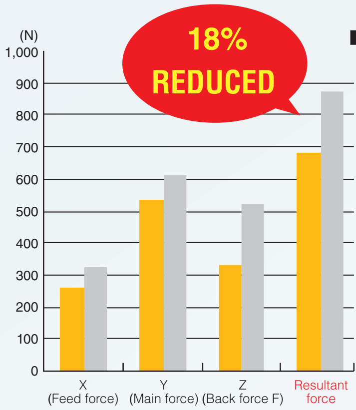
Tool dia.: 20mm, Mat'l: SKD61 (1.2344) 45HRC
Vc=91m/min, fz =0.2mm/t, ap=0.7mm,
ae=10mm by down cut
Modular Head + MSN Carbide Shank



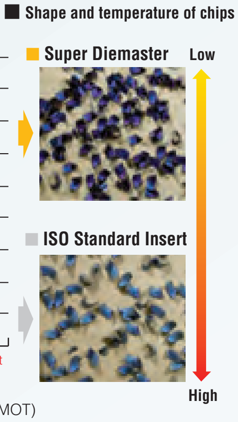
🟧 SDH-2200-R07-M10 (Insert RDMW07T2MOT)
▨ MDH-4200-M10 (ISO Standard Insert RDHX0702MOT)

② General machining for die steel

Tool dia.: 20mm, Mat'l: SKD11 (1.2379) HS30
Vc=179m/min, fz =0.34mm/t,ap=1.2mm,
ae=10mm by down cut
Modular Head + MSN Carbide Shank

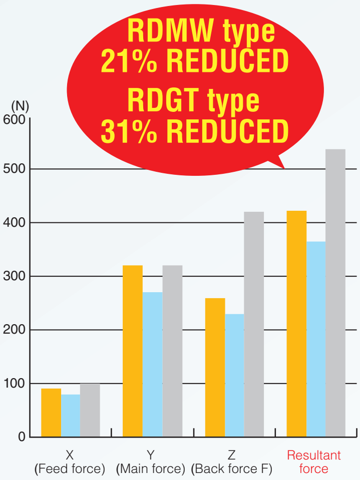


🟧 SDH-2200-R07-M10 (Insert RDMW07T2MOT)
▨ MDH-4200-M10 (ISO Standard Insert RDHX0702MOT)



③ High feed machining for hardened die steel

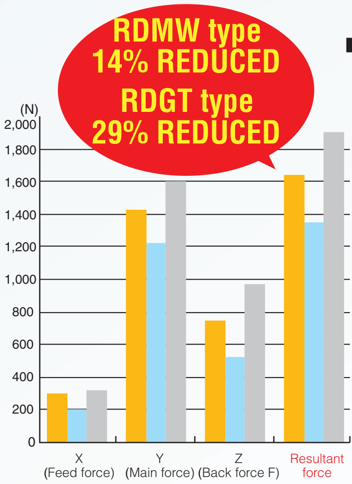
Tool dia.: 40mm, Mat'l: SKD61 (1.2344) 45HRC
Vc=201m/min, fz=0.4mm/t, ap=0.2mm,
ae=10mm by down cut
Modular Head + MSN Carbide Shank



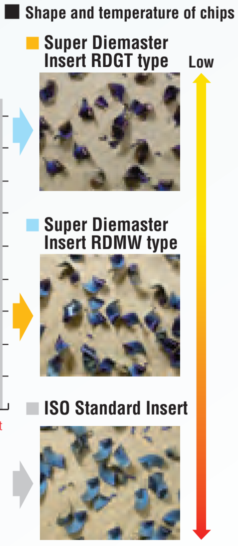
🟧 SDH-2400-R12-M16
(Without Chipbreaker RDMW1204MOT)
🟦 SDH-2400-R12-M16
(With Chipbreaker RDGT1204MOE)
▨ MDH-4400-M10
(ISO Standard Without Chipbreaker RDHX1203MOT)

④ General machining for die steel

Tool dia.: 40mm, Mat'l: SKD11 (1.2379) HS30
Vc=179m/min, fz =0.34mm/t, ap=1.2mm,
ae=10mm by down cut
Modular Head + MSN Carbide Shank



🟧 SDH-2400-R12-M16
(Without Chipbreaker RDMW1204MOT)
🟦 SDH-2400-R12-M16
(With Chipbreaker RDGT1204MOE)
▨ MDH-4400-M10
(ISO Standard Without Chipbreaker RDHX1203MOT)



Super Diemaster

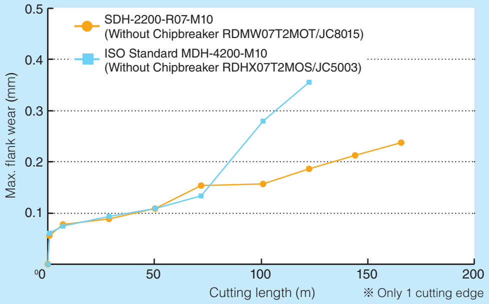
HDMTYPE

CUTTING PERFORMANCE

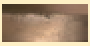
Tool life comparison

① High feed machining for hardened die steel

Tool dia: 20mm, Mat'l: SKD61 (1.2344), 43HRC, Overhung length: 70mm, Vc=250m/min, fz=0.2mm/t, a_p=0.2mm, a_e=10mm (Air blow, Down cutting)
Modular Head + MSN Carbide Shank: MSN-M10-40-S20C

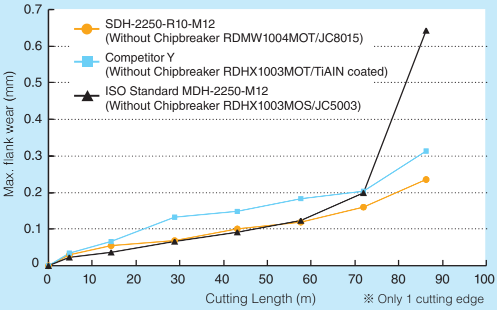


Condition of damaged inserts

	After 72m	After 122.4m	After 165.6m
Super Diemaster RDMW07T2MOT (JC8015) VB MAX (mm)	 0.154		 0.237
ISO Standard RDHX07T2MOS (JC5003) VB MAX (mm)	 0.134	 0.356	

② High feed machining for hardened die steel

Tool dia: 25mm, Mat'l: SKD11 (1.2379), 43HRC, Overhung length: 70mm, Vc=250m/min, fz=0.3mm/t, a_p=0.2mm, a_e=15.5mm (Air blow, Down cutting)
Modular Head + MSN Carbide Shank: MSN-M12-55-S25C

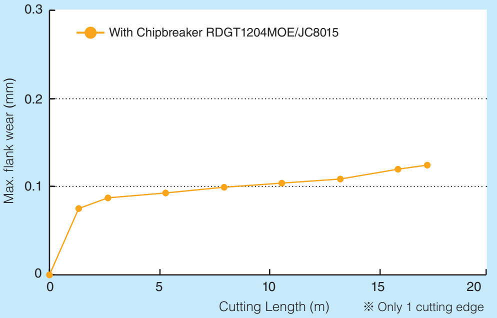


Condition of damaged inserts

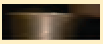
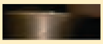
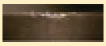
	After 72m	After 86.2m
Super Diemaster RDMW1004MOT (JC8015) VB MAX (mm)	 0.159	 0.235
Competitor Y RDHX1003MOT (TiAIN coated) VB MAX (mm)	 0.203	 0.313
ISO Standard RDHX1003MOS (JC5003) VB MAX (mm)	 0.199	 0.643

③ Ti-alloy age hardened

Tool dia: 32mm, Mat'l: Ti6Al4V, 42HRC, Overhung length: 118mm, Vc=60m/min, fz=0.3mm/t, a_p=0.5mm, a_e=12mm (Wet cutting, Down cutting)
Modular Head: SDH-2320-R12-M16 + MSN Carbide Shank: MSN-M16-157S-S32C



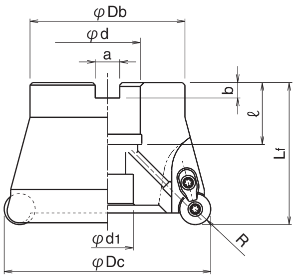
Condition of damaged inserts

	After 1.32m	After 10.56m	After 17.16m
Super Diemaster RDGT1204MOE (JC8015) VB MAX (mm)	 0.075	 0.104	 0.124

Super Diemaster HDMTYPE

G-Body **Through Coolant Hole**

Face Milling Pocket Milling Copy Milling Helical Interpolation



BODY / FACEMILL・STANDARD TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)									Head cap screw (JIS Standard)	weight (kg)	Inserts
				φDc	R	Lf	φDb	φd	φd1	a	b	ℓ			
Metric Bore	**HDM-3050-12R-22**	●	3	**50**	6	50	47	22	16.5	10.4	6.3	20	M10	0.5	RD○○1204M0○
	HDM-3050-16R-22	●	3	**50**	8	55	47	22	16.5	10.4	6.3	20	M10	0.5	RD○○1606M0○
	HDM-4063-12R-22	●	4	**63**	6	50	60	22	16.5	10.4	6.3	20	M10	0.7	RD○○1204M0○
	HDM-4063-16R-22	●	4	**63**	8	50	60	22	16.5	10.4	6.3	20	M10	0.7	RD○○1606M0○

Modular Head Type Please refer Page B111

Note)
1. All cutters are supplied without inserts.
2. Please refer page C147-C153 for recommended cutting conditions.
3. Mark shows: these cutter bodies are equipped with the set bolt because of the specified bolt size. Except for these cutter bodies, please use the set bolt equipped with arbor.
4. In case of using double clamping mechanism type, please refer page C009.

HEXAGON WRENCH FOR SET BOLT

Thread	Hexagon Wrench Size (mm)
M10	8
M12	10
M16	14
M20	17
M24	19

Note) All cutters are supplied without Hexagon Wrench

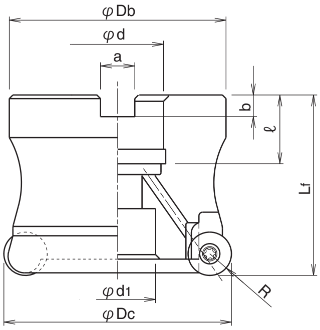
● : Standard stock items ☐ : Stock in Japan ○ : Soon to be deleted

Super Diemaster

HDMTYPE

G-Body **Through Coolant Hole**

Face Milling · Pocket Milling · Copy Milling · Helical Interpolation



BODY/FACEMILL・FINE PITCH TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)									Head cap screw (JIS Standard)	weight (kg)	Inserts
				φDc	R	L_f	φDb	φd	φd_1	a	b	ℓ			
Metric Bore	**HDM-4050-16R-22**	●	4	50	8	55	47	22	16.5	10.4	6.3	20	M10	0.4	RD○○1606MO○
	HDM-5050-12R-22	●	5	50	6	50	47	22	16.5	10.4	6.3	20	M10	0.4	RD○○1204MO○
	HDM-4052-16R-22	●	4	52	8	55	40	22	16.5	10.4	6.3	20	M10	0.5	RD○○1606MO○
	HDM-5052-12R-22	●	5	52	6	50	40	22	16.5	10.4	6.3	20	M10	0.5	RD○○1204MO○
	HDM-5063-16R-27	●	5	63	8	50	60	27	20	12.4	7	22	M12	0.7	RD○○1606MO○
	HDM-6063-12R-27	●	6	63	6	50	60	27	20	12.4	7	22	M12	0.8	RD○○1204MO○
	HDM-5066-16R-27	●	5	66	8	50	60	27	20	12.4	7	22	M12	0.7	RD○○1606MO○
	HDM-6066-12R-27	●	6	66	6	50	60	27	20	12.4	7	22	M12	0.7	RD○○1204MO○
	HDM-6080-16R-27	●	6	80	8	55	76	27	20	12.4	7	22	M12	1.3	RD○○1606MO○
	HDM-7080-12R-27	●	7	80	6	55	76	27	20	12.4	7	22	M12	1.4	RD○○1204MO○

Note) 1. All cutters are supplied without inserts.
2. Please refer page C147-C153, for recommended cutting conditions.

Modular Head Type **Please refer Page B111**

HEXAGON WRENCH FOR SET BOLT

Thread	 Hexagon Wrench Size (mm)
M10	8
M12	10
M16	14
M20	17
M24	19

Note) All cutters are supplied without Hexagon Wrench

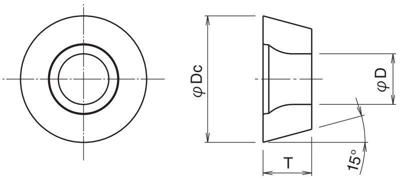
● : Standard stock items ☐ : Stock in Japan ○ : Soon to be deleted

Super Diemaster HDMTYPE

INSERTS

Standard Type

Without Chipbreaker
Chamfer -MOT
General Cutting



10 Inserts per case

Cat. No.	Tolerance	PVD coated			Dimensions (mm)		
		DH103	**JC8015**	**JC5040**	φDc	T	φD
RDMW1204MOT	M	●	●	●	12	4.8	4.4
RDMW1606MOT	M	●	●	●	16	6	5

Low Cutting Force

With Chipbreaker
Chamfer -MOT
R-honed -MOE
Stainless Steel

With Chipbreaker
R-honed -MOE
Titanium·Inconel

Fig. 1

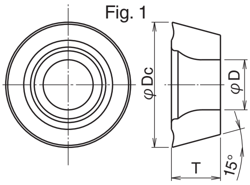
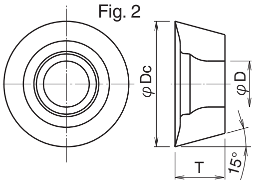


Fig. 2

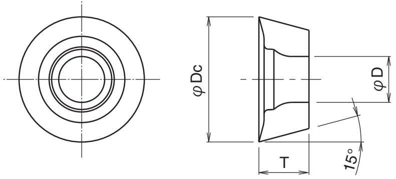


10 Inserts per case

Cat. No.	Tolerance	PVD coated				Dimensions (mm)			Fig.
		JC5118	**JC8015**	**JC8050**	**JC8118**	φDc	T	φD	
RDGT1204MOE	G		●	●		12	4.8	4.4	1
RDGT1204MOT	G		●	●					
RDGT1606MOE	G		●	●		16	6	5	1
RDGT1606MOT	G		●	●					
RDMT1204MOE	M	○	○	●	◎	12	4.8	4.4	1
RDMT1204MOE-ML	M			●					2
RDMT1204MOT	M	○	○	●	◎				1
RDMT1606MOE	M	○	○	●	◎	16	6	5	1
RDMT1606MOT	M	○	○	●	◎				

Low Cutting Force

With Chipbreaker
Sharp edge
Aluminium

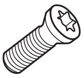
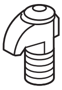
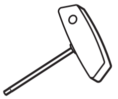


10 Inserts per case

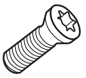
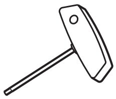
Cat. No.	Tolerance	Uncoated	Dimensions (mm)		
		FZ05	φDc	T	φD
RDGT1204MOF-AL	G	●	12	4.8	4.4
RDGT1606MOF-AL	G	●	16	6	5

Note) In case of chip clogging remove the clamp set. (DCM-18, DCM-17) (Only in the case of Aluminium Machining)

PARTS/FACE MILL·STANDARD TYPE

Inserts	Clamp Screw	Clamp Set	Wrench
			
RD◯◯1204MO◯	DSW-410H	DCM-18	A-15T
RD◯◯1606MO◯	DSW-4512H	DCM-17	A-20 (~φ125) A-20L (φ160)

PARTS/FACE MILL·FINE PITCH TYPE

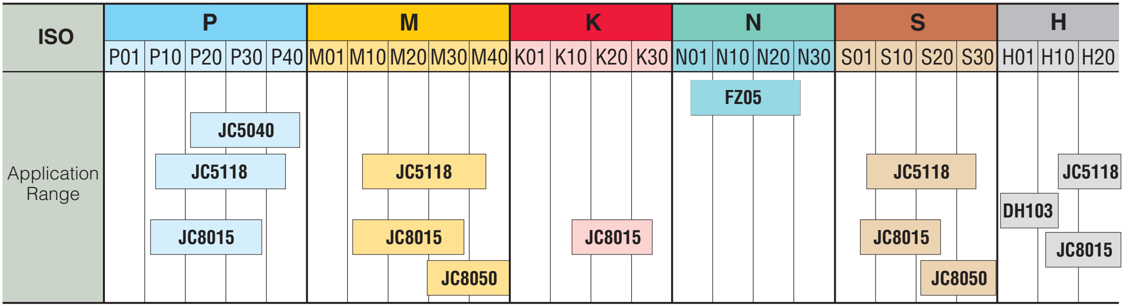
Inserts	Clamp Screw	Wrench
		
RD◯◯1204MO◯	DSW-410H	A-15T
RD◯◯1606MO◯	DSW-4512H	A-20

Clamp Screw	Recommended Torque (N•m)
DSW-410H	3.6
DSW-4512H	6.0

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

Super Diemaster HDMTYPE

Grade selection guide



Guidelines for selection of milling Inserts

Work Materials	Cast iron Cast steel	Carbon steel Die steel			Mold steel		High hardened steel	Titanium alloy Inconel		Stainless steel		Aluminium alloy
Grades / Cat. No.	JC8015 JC5118	JC5040	JC5118	JC8050	JC8015 JC5118	JC8050	DH103 (Over50HRC) JC8015 JC5118	JC8015 JC5118	JC8050	JC8015 JC5118	JC8050	FZ05
RDMW1204MOT	◎	◎			◎		◎	○		○		
RD○T1204MOT	☆		☆		○					◎		
RD○T1204MOE				●		●		◎	●		●	
RDMT1204MOE-ML									◎		◎	
RDMW1606MOT	◎	◎			◎		◎	○		○		
RD○T1606MOT	☆		☆		○					◎		
RD○T1606MOE				●		●		◎	●		●	
RDGT○○○○MOF-AL												◎

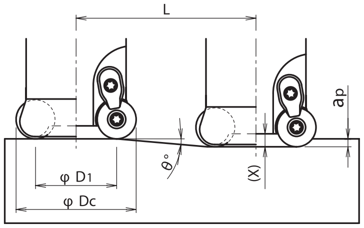
- RDMW type: without chipbreaker
- RD○T type: with chipbreaker

◎ : First choice, Good condition ○ : Moderate condition ● : Unfavorable condition ☆ : Light cutting

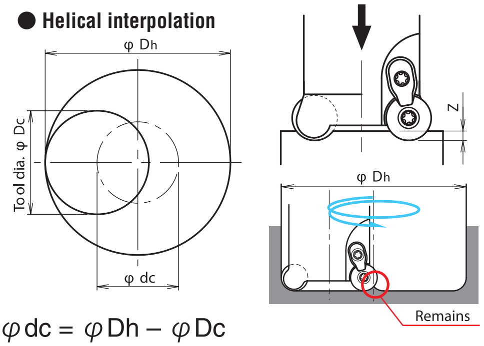
Super Diemaster HDM TYPE

Instructions for profile milling

● Ramping



● Helical interpolation



● Calculation of tool pass dia. $\underset{\text{Tool pass dia.}}{\varphi dc} = \underset{\text{Bore dia.}}{\varphi Dh} - \underset{\text{Tool dia.}}{\varphi Dc}$

● Depth of cut per one circle should not exceed max. depth of cut ap.
● Down cutting is recommended, so tool pass rotation should be counter-clockwise.
● 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 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.

Tool dia. φDc (mm)	Insert dia. (mm)	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)
50	12 R6	38	80	98	5°15′	6.0	65.2	3.5	4.5
50	16 R8	34	75	98	7°25′	8.0	61.4	4.0	5.0
52	12 R6	40	84	102	4°55′	6.0	69.7	3.5	4.5
52	16 R8	36	79	102	6°55′	8.0	65.9	4.0	5.0
63	12 R6	51	106	124	3°45′	6.0	91.5	3.5	4.5
63	16 R8	47	101	124	5°00′	8.0	91.4	4.0	5.0
66	12 R6	54	112	130	3°30′	6.0	98.1	3.5	4.5
66	16 R8	50	107	130	4°40′	8.0	98.0	4.0	5.0
80	12 R6	68	140	158	2°45′	6.0	124.9	3.5	4.5
80	16 R8	64	135	158	3°30′	8.0	130.7	4.0	5.0

Super Diemaster HDMTYPE

■ RECOMMENDED CUTTING CONDITIONS

● FACE MILL • STANDARD TYPE

Work Materials	Insert Grades	Tool dia. (mm) (Insert type)											
		50 (R6)				50 (R8)				63 (R6)			
		No. of teeth 3N (Double Clamp)				No. of teeth 3N (Double Clamp)				No. of teeth 4N (Double Clamp)			
		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	JC8050 JC5040 JC5118	150	3	1,250	1,090	150	4	1,260	1,100	150	3	980	1,140
		200	2.5	1,250	1,160	200	3	1,260	1,210	200	2.7	980	1,300
		250	2	880	870	250	2	880	980	250	2.2	690	910
		300	1.2	880	1,130	300	1.5	880	1,160	300	1.6	690	1,100
		350	0.7	750	950	350	1	760	1,000	350	1	590	1,010
		400	–	–	–	400	–	–	–	400	0.5	540	1,190
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC5118 JC8015 For over 40HRC	150	2.5	1,200	1,190	150	3.5	1,210	1,010	150	2.5	940	1,160
		200	2	1,200	1,220	200	3	1,210	1,100	200	2.2	940	1,240
		250	1.1	840	1,130	250	2.5	850	940	250	1.6	660	970
		300	0.9	840	1,260	300	2	850	970	300	1.1	660	1,180
		350	0.5	720	1,180	350	1	730	1,110	350	0.7	560	1,120
		400	–	–	–	400	–	–	–	400	0.5	520	1,140
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC5118	150	3	1,180	1,030	150	4	1,200	1,040	150	3	930	1,080
		200	2.5	1,180	1,130	200	3	1,200	1,180	200	2.7	930	1,120
		250	2	830	840	250	2	840	960	250	2.2	650	850
		300	1.2	830	1,000	300	1.5	840	1,100	300	1.6	650	1,040
		350	0.7	700	950	350	1	720	950	350	1	560	870
		400	–	–	–	400	–	–	–	400	0.5	510	1,100
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC5118	150	3	990	860	150	4	1,000	870	150	3	780	900
		200	2.5	990	890	200	3	1,000	990	200	2.7	780	930
		250	2	690	700	250	2	700	780	250	2.2	550	730
		300	1.2	690	860	300	1.5	700	920	300	1.6	550	830
		350	0.7	590	820	350	1	600	790	350	1	470	690
		400	–	–	–	400	–	–	–	400	0.5	430	940
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8015 Without Chipbreaker (DH103) (For over 50HRC)	100	1.5	810	560	100	2	860	590	100	1.5	650	580
		150	1.2	810	610	150	1.8	860	620	150	1.2	650	650
		200	1	570	410	200	1.6	600	470	200	1	450	490
		250	0.8	570	510	250	1.2	600	520	250	0.8	450	520
		300	0.4	490	440	300	0.8	520	465	300	0.6	390	590
		350	–	–	–	350	–	–	–	350	0.3	360	620
Grey & Nodular cast iron FC, FCD (GG,GGG) Below 300HB	JC8015 JC5118	150	3	1,120	1,170	150	4	1,130	1,190	150	3	880	1,370
		200	2.5	1,120	1,110	200	3	1,130	1,290	200	2.7	880	1,440
		250	2	780	960	250	2	790	1,060	250	2.2	620	1,120
		300	1.2	780	1,170	300	1.5	790	1,300	300	1.6	620	1,240
		350	0.7	670	920	350	1	680	900	350	1	530	1,160
		400	–	–	–	400	–	–	–	400	0.5	480	1,220
Titanium alloy 35-43HRC	JC8050 JC8015 JC5118	150	1	420	270	150	1.5	440	330	150	1	330	260
		200	0.8	420	315	200	1.2	440	265	200	0.9	330	290
		250	0.6	290	260	250	1	310	205	250	0.7	230	240
		300	0.4	290	305	300	0.8	310	230	300	0.5	230	295
		350	0.2	250	375	350	0.4	260	255	350	0.3	200	340
		400	–	–	–	400	–	–	–	400	0.2	180	360
Inconel 35-43HRC	JC8015 JC5118 JC8050	150	1	210	135	150	1.5	220	145	150	1	165	130
		200	0.8	210	155	200	1.2	220	165	200	0.9	165	160
		250	0.6	150	135	250	1	150	115	250	0.7	120	130
		300	0.4	150	160	300	0.8	150	130	300	0.5	120	150
		350	0.2	130	195	350	0.4	130	155	350	0.3	100	165
		400	–	–	–	400	–	–	–	400	0.2	90	180
Aluminium alloy A5052, A7075 50-110HB	FZ05	150	4.5	4,450	5,200	150	6	4,450	5,200	150	4.5	3,500	5,500
		200	4	4,450	5,400	200	5	4,450	5,400	200	4	3,500	5,700
		250	3.5	3,800	4,900	250	4	3,800	4,900	250	3.5	3,050	5,200
		300	2.5	3,200	5,000	300	3	3,200	5,000	300	2.5	2,500	5,200
		350	1.5	3,100	4,200	350	2	3,100	4,200	350	1.5	2,400	4,300
		400	1	2,550	3,000	400	1	2,550	3,000	400	1	2,000	3,200

ℓ: Overhung length, ap: Axial 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.

Super Diemaster HDMTYPE

■ RECOMMENDED CUTTING CONDITIONS

● FACE MILL・STANDARD TYPE

Work Materials	Insert Grades	Tool dia. (mm) (Insert type)											
		63 (R8)											
		No. of teeth 4N (Double Clamp)											
		ℓ (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)								
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC5118	150	4	990	1,110								
		200	3	990	1,290								
		250	2	690	1,200								
		300	1.5	690	1,210								
		350	1	590	1,040								
		400	0.5	540	1,360								
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC5118 JC8015 For over 40HRC	150	3.5	950	1,140								
		200	3	950	1,250								
		250	2.5	670	980								
		300	2	670	1,020								
		350	1	570	1,000								
		400	0.5	520	1,330								
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC5118	150	4	940	1,090								
		200	3	940	1,240								
		250	2	660	970								
		300	1.5	660	1,160								
		350	1	560	980								
		400	0.5	520	1,330								
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC5118	150	4	790	920								
		200	3	790	1,040								
		250	2	550	850								
		300	1.5	550	960								
		350	1	470	800								
		400	0.5	430	1,100								
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8015 Without Chipbreaker (DH103) (For over 50HRC)	100	2	660	600								
		150	1.8	660	610								
		200	1.6	460	460								
		250	1.2	460	500								
		300	0.8	400	530								
		350	0.4	370	470								
Grey & Nodular cast iron FC, FCD (GG,GGG) Below 300HB	JC8015 JC5118	150	4	890	1,240								
		200	3	890	1,350								
		250	2	620	1,140								
		300	1.5	620	1,310								
		350	1	530	1,180								
		400	0.5	490	1,250								
Titanium alloy 35-43HRC	JC8050 JC8015 JC5118	150	1.5	340	300								
		200	1.3	340	325								
		250	1.1	240	240								
		300	0.9	240	250								
		350	0.6	200	290								
		400	0.3	190	300								
Inconel 35-43HRC	JC8015 JC5118 JC8050	150	1.5	170	170								
		200	1.3	170	155								
		250	1.1	120	120								
		300	0.9	120	130								
		350	0.6	100	140								
		400	0.3	95	180								
Aluminium alloy A5052, A7075 50-110HB	FZ05	150	6	3,500	5,500								
		200	5	3,500	5,700								
		250	4	3,050	5,200								
		300	3	2,500	5,200								
		350	2	2,400	4,300								
		400	1	2,000	3,200								

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

■ NOTE

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 Titanium alloy or Inconel, recommend wet cutting

Super Diemaster HDMTYPE

■ RECOMMENDED CUTTING CONDITIONS

● FACE MILL • FINE PITCH TYPE

Work Materials	Insert Grades	Tool dia. (mm) (Insert type)											
		50/52 (R6)				50/52 (R8)				63/66 (R6)			
		No. of teeth 5N				No. of teeth 4N				No. of teeth 6N			
		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) Below 250HB	JC8050 JC5040 JC5118	150	2	1,290	2,250	150	3	1,300	1,700	150	2	1,010	2,000
		200	1.7	1,290	1,920	200	2.5	1,300	1,820	200	1.8	1,010	1,800
		250	1.5	900	1,620	250	2	910	1,350	250	1.6	710	1,530
		300	1	900	2,020	300	1.2	910	1,800	300	1.2	710	1,910
		350	0.5	780	2,150	350	0.7	780	1,870	350	0.8	610	1,830
		400	–	–	–	400	–	–	–	400	0.4	560	1,850
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC5118 JC8015 For over 40HRC	150	1.7	1,230	2,200	150	2.5	1,250	1,750	150	1.7	960	2,060
		200	1.5	1,230	2,150	200	2	1,250	1,850	200	1.6	960	2,130
		250	1.2	860	1,720	250	1.1	880	1,760	250	1.4	670	1,610
		300	0.8	860	1,720	300	0.9	880	1,760	300	1	670	1,810
		350	0.4	730	1,800	350	0.5	750	1,800	350	0.6	570	2,200
		400	–	–	–	400	–	–	–	400	0.4	550	2,150
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC5118	150	1.7	1,230	2,200	150	2.5	1,260	1,750	150	1.7	960	2,060
		200	1.5	1,230	2,150	200	2	1,260	1,850	200	1.6	960	2,130
		250	1.2	860	1,720	250	1.1	880	1,760	250	1.4	670	1,610
		300	0.8	860	1,720	300	0.9	880	1,760	300	1	670	1,850
		350	0.4	730	1,800	350	0.5	750	1,850	350	0.6	570	2,200
		400	–	–	–	400	–	–	–	400	0.4	550	2,150
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC5118	150	2	1,020	1,780	150	3	1,030	1,350	150	2	800	1,670
		200	1.7	1,020	1,520	200	2.5	1,030	1,440	200	1.8	800	1,770
		250	1.5	710	1,240	250	2	720	1,060	250	1.6	560	1,180
		300	1	710	1,420	300	1.2	720	1,420	300	1.2	560	1,340
		350	0.5	610	1,530	350	0.7	620	1,490	350	0.8	480	1,380
		400	–	–	–	400	–	–	–	400	0.4	440	1,580
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8015 Without Chipbreaker (DH103) (For over 50HRC)	100	1.2	850	1,060	100	1.5	880	880	100	1.2	650	970
		150	1	850	1,100	150	1.2	880	950	150	1.1	650	1,010
		200	0.8	560	980	200	1	620	740	200	0.9	460	970
		250	0.5	560	1,260	250	0.8	620	870	250	0.6	460	1,250
		300	0.3	510	1,270	300	0.4	530	850	300	0.4	390	1,170
		350	–	–	–	350	–	–	–	350	0.2	360	1,300
Grey & Nodular cast iron FC, FCD (GG,GGG) Below 300HB	JC8015 JC5118	150	2	1,150	2,350	150	3	1,170	1,820	150	2	900	2,260
		200	1.7	1,150	2,580	200	2.5	1,170	2,000	200	1.8	900	2,420
		250	1.5	800	1,840	250	2	820	1,470	250	1.6	630	1,700
		300	1	800	2,300	300	1.2	820	1,800	300	1.2	630	1,920
		350	0.5	690	2,410	350	0.7	700	1,680	350	0.8	540	1,610
		400	–	–	–	400	–	–	–	400	0.4	500	1,730
Titanium alloy 35-43HRC	JC8050 JC8015 JC5118	150	1	420	420	150	1.5	440	440	150	1	330	400
		200	0.8	420	630	200	1.2	440	410	200	0.9	330	460
		250	0.6	290	460	250	1	310	310	250	0.7	230	370
		300	0.4	290	580	300	0.8	310	370	300	0.5	230	460
		350	0.2	250	630	350	0.4	260	420	350	0.3	200	540
		400	–	–	–	400	–	–	–	400	0.2	180	560
Inconel 35-43HRC	JC8015 JC5118 JC8050	150	1	210	210	150	1.5	220	220	150	1	165	200
		200	0.8	210	320	200	1.2	220	210	200	0.9	165	230
		250	0.6	150	230	250	1	150	160	250	0.7	120	190
		300	0.4	150	290	300	0.8	150	190	300	0.5	120	230
		350	0.2	130	320	350	0.4	130	210	350	0.3	100	270
		400	–	–	–	400	–	–	–	400	0.2	90	280
Aluminium alloy A5052, A7075 50-110HB	FZ05	150	4	4,300	8,400	150	5.5	4,300	6,700	150	4	3,350	7,800
		200	3.5	4,300	8,800	200	4.5	4,300	7,000	200	3.5	3,350	8,200
		250	3	3,650	7,800	250	3.5	3,650	6,300	250	3	2,900	7,400
		300	2	3,050	8,900	300	2.5	3,050	6,300	300	2	2,400	7,500
		350	1	2,950	6,600	350	1.5	2,950	5,300	350	1	2,300	7,200
		400	0.7	2,450	4,300	400	1	2,450	3,400	400	0.7	2,150	5,200

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

■ NOTE

Please refer page C118-C119

Super Diemaster HDMTYPE

■ RECOMMENDED CUTTING CONDITIONS

● FACE MILL • FINE PITCH TYPE

Work Materials	Insert Grades	Tool dia. (mm) (Insert type)											
		63/66 (R8)				80 (R6)				80 (R8)			
		No. of teeth 5N				No. of teeth 7N				No. of teeth 6N			
		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) Below 250HB	JC8050 JC5040 JC5118	150	3	1,020	1,660	150	2	790	1,830	150	3	790	1,540
		200	2.7	1,020	1,530	200	1.8	790	1,640	200	2.7	790	1,320
		250	2.2	720	1,330	250	1.6	550	1,380	250	2.2	550	1,220
		300	1.6	720	1,450	300	1.2	550	1,730	300	1.6	550	1,330
		350	1	620	1,550	350	0.8	470	1,650	350	1	470	1,410
		400	0.5	560	1,800	400	0.4	430	1,660	400	0.5	430	1,660
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC5118 JC8015 For over 40HRC	150	2.5	970	1,690	150	1.7	740	1,850	150	2.5	750	1,570
		200	2.2	970	1,790	200	1.6	740	1,920	200	2.2	750	1,660
		250	1.6	680	1,460	250	1.4	520	1,460	250	1.6	530	1,370
		300	1.1	680	1,800	300	1	520	1,640	300	1.1	530	1,680
		350	0.7	580	1,590	350	0.6	440	1,980	350	0.7	450	1,480
		400	0.5	560	1,680	400	0.4	410	1,870	400	0.5	410	1,480
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC5118	150	2.5	970	1,690	150	1.7	740	1,850	150	2.5	750	1,570
		200	2.2	970	1,790	200	1.6	740	1,920	200	2.2	750	1,660
		250	1.6	680	1,460	250	1.4	520	1,460	250	1.6	530	1,370
		300	1.1	680	1,800	300	1	520	1,680	300	1.1	530	1,680
		350	0.7	580	1,590	350	0.6	440	1,980	350	0.7	450	1,480
		400	0.5	560	1,680	400	0.4	410	1,870	400	0.5	410	1,480
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC5118	150	3	810	1,320	150	2	620	1,510	150	3	620	1,210
		200	2.7	810	1,330	200	1.8	620	1,600	200	2.7	620	1,220
		250	2.2	570	1,050	250	1.6	430	1,060	250	2.2	430	950
		300	1.6	570	1,220	300	1.2	430	1,200	300	1.6	430	1,100
		350	1	490	1,230	350	0.8	370	1,240	350	1	370	1,110
		400	0.5	450	1,420	400	0.4	340	1,420	400	0.5	340	1,290
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC5118 JC8015 Without Chipbreaker (DH103) (For over 50HRC)	100	1.5	670	840	100	1.2	500	870	100	1.5	500	750
		150	1.2	670	900	150	1.1	500	910	150	1.2	500	810
		200	1	460	760	200	0.9	350	860	200	1	350	690
		250	0.8	460	920	250	0.6	350	1,110	250	0.8	350	840
		300	0.6	400	900	300	0.4	300	1,050	300	0.6	300	810
		350	0.3	360	900	350	0.2	270	1,140	350	0.3	270	810
Grey & Nodular cast iron FC, FCD (GG,GGG) Below 300HB	JC8015 JC5118	150	3	910	1,540	150	2	700	2,050	150	3	710	1,440
		200	2.7	910	1,860	200	1.8	700	2,200	200	2.7	710	1,740
		250	2.2	640	1,440	250	1.6	490	1,540	250	2.2	500	1,350
		300	1.6	640	1,700	300	1.2	490	1,740	300	1.6	500	1,590
		350	1	550	1,510	350	0.8	420	1,460	350	1	430	1,420
		400	0.5	510	1,630	400	0.4	380	1,530	400	0.5	390	1,500
Titanium alloy 35-43HRC	JC8050 JC8015 JC5118	150	1.5	340	430	150	1	250	350	150	1.5	250	380
		200	1.3	340	470	200	0.9	250	410	200	1.3	250	420
		250	1.1	240	390	250	0.7	170	320	250	1.1	180	350
		300	0.9	240	400	300	0.5	170	400	300	0.9	180	360
		350	0.6	200	350	350	0.3	150	470	350	0.6	150	320
		400	0.3	180	490	400	0.2	140	510	400	0.3	140	460
Inconel 35-43HRC	JC8015 JC5118 JC8050	150	1.5	170	220	150	1	120	170	150	1.5	125	190
		200	1.3	170	240	200	0.9	120	200	200	1.3	125	210
		250	1.1	120	200	250	0.7	80	150	250	1.1	90	180
		300	0.9	120	200	300	0.5	80	180	300	0.9	90	180
		350	0.6	100	180	350	0.3	70	220	350	0.6	75	160
		400	0.3	90	250	400	0.2	65	240	400	0.3	70	230
Aluminium alloy A5052, A7075 50-110HB	FZ05	150	5.5	3,350	6,500	150	4	2,800	7,600	150	5.5	2,800	6,500
		200	4.5	3,350	6,800	200	3.5	2,800	8,000	200	4.5	2,800	6,900
		250	3.5	2,900	6,200	250	3	2,400	7,200	250	3.5	2,400	6,200
		300	2.5	2,400	6,200	300	2	2,000	7,300	300	2.5	2,000	6,200
		350	1.5	2,300	5,200	350	1	1,900	6,000	350	1.5	1,900	5,100
		400	1	2,150	4,300	400	0.7	1,600	4,500	400	1	1,600	3,800

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

■ NOTE

Please refer page C118-C119

Super Diemaster

HDMTYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● FACE MILL • FINE PITCH TYPE

Work Materials	Insert Grades	Tool dia. (mm) (Insert type)											
		50/52 (R6)				50/52 (R8)				63/66 (R6)			
		No. of teeth 5N				No. of teeth 4N				No. of teeth 6N			
		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	JC8015 Without chipbreaker	150	1.4	1,590	3,180	150	1.9	1,640	2,400	150	1.4	1,240	2,980
		200	1.2	1,590	3,180	200	1.7	1,640	2,400	200	1.2	1,240	2,980
		250	1	1,110	2,220	250	1.3	1,150	1,680	250	1	870	2,090
		300	0.6	1,030	2,830	300	1	1,070	1,710	300	0.6	800	2,200
		350	0.3	950	2,610	350	0.4	980	2,350	350	0.3	740	2,040
		400	–	–	–	400	–	–	–	400	–	–	–
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC		150	1.4	1,520	3,040	150	1.9	1,570	2,300	150	1.4	1,190	2,850
		200	1.2	1,520	3,040	200	1.7	1,570	2,300	200	1.2	1,190	2,850
		250	1	1,060	2,120	250	1.3	1,100	1,600	250	1	830	1,990
		300	0.6	990	2,720	300	1	1,020	1,630	300	0.6	770	2,220
		350	0.3	910	2,500	350	0.4	940	2,250	350	0.3	710	1,950
		400	–	–	–	400	–	–	–	400	–	–	–
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB		150	1.4	1,520	3,040	150	1.9	1,570	2,300	150	1.4	1,190	2,850
		200	1.2	1,520	3,040	200	1.7	1,570	2,300	200	1.2	1,190	2,850
		250	1	1,060	2,120	250	1.3	1,100	1,600	250	1	830	1,990
		300	0.6	990	2,720	300	1	1,020	1,630	300	0.6	770	2,120
		350	0.3	910	2,500	350	0.4	940	2,250	350	0.3	710	1,950
		400	–	–	–	400	–	–	–	400	–	–	–
Stainless steel SUS304 Below 250HB	JC8015 Without chipbreaker	150	1.4	1,320	2,640	150	1.9	1,360	2,000	150	1.4	1,030	2,470
		200	1.2	1,320	2,640	200	1.7	1,360	2,000	200	1.2	1,030	2,470
		250	1	920	1,840	250	1.3	950	1,390	250	1	720	1,730
		300	0.6	860	2,360	300	1	880	1,400	300	0.6	670	1,840
		350	0.3	790	2,170	350	0.4	820	1,970	350	0.3	620	1,700
		400	–	–	–	400	–	–	–	400	–	–	–
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	DH103	100	1	1,070	1,870	100	1.2	1,100	1,540	100	1	830	1,710
		150	0.8	1,070	1,870	150	1	1,100	1,540	150	0.8	830	1,710
		200	0.6	750	3,740	200	0.8	770	1,120	200	0.6	580	1,390
		250	0.3	700	2,100	250	0.5	710	1,700	250	0.3	540	1,620
		300	0.2	640	2,170	300	0.3	660	1,650	300	0.2	500	1,980
		350	–	–	–	350	–	–	–	350	–	–	–
Grey & Nodular cast iron FC, FCD (GG,GGG) Below 300HB	DH103	150	1.4	1,450	3,980	150	1.9	1,600	3,000	150	1.4	1,130	3,660
		200	1.2	1,450	3,980	200	1.7	1,500	3,000	200	1.2	1,130	3,660
		250	1	1,010	2,020	250	1.3	1,050	1,500	250	1	790	1,900
		300	0.6	940	3,520	300	1	970	2,700	300	0.6	730	2,400
		350	0.3	870	3,260	350	0.4	900	2,880	350	0.3	680	2,150
		400	–	–	–	400	–	–	–	400	–	–	–
Aluminium alloy A5052, A7075 50-110HB	FZ05	150	1.6	5,500	15,000	150	2.1	5,500	12,000	150	1.6	4,300	14,000
		200	1.4	5,500	15,000	200	1.9	5,500	12,000	200	1.4	4,300	14,000
		250	1.2	4,900	17,000	250	1.5	4,900	13,600	250	1.2	3,850	16,000
		300	0.8	4,300	15,000	300	1.2	4,300	12,000	300	0.8	3,350	14,000
		350	0.6	4,000	14,000	350	0.6	4,000	11,200	350	0.6	3,150	13,000
		400	0.4	3,650	13,000	400	0.4	3,650	10,400	400	0.4	2,900	13,000

ℓ: Overhung length, ap: Axial 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 spee
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.

Super Diemaster

HDM TYPE

RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

FACE MILL • FINE PITCH TYPE

Work Materials	Insert Grades	Tool dia. (mm) (Insert type)											
		63/66 (R8)				80 (R6)				80 (R8)			
		No. of teeth 5N				No. of teeth 7N				No. of teeth 6N			
		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) Below 250HB	JC8015 Without chipbreaker	150	1.9	1,270	2,350	150	1.4	970	2,720	150	1.9	980	2,180
		200	1.7	1,270	2,350	200	1.2	970	2,720	200	1.7	980	2,180
		250	1.3	890	1,650	250	1	680	1,900	250	1.3	690	1,530
		300	1	830	1,600	300	0.6	630	2,030	300	1	640	1,490
		350	0.4	760	2,280	350	0.3	580	1,870	350	0.4	590	2,120
		400	–	–	–	400	–	–	–	400	–	–	–
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC		150	1.9	1,220	2,250	150	1.4	920	2,580	150	1.9	940	2,090
		200	1.7	1,220	2,250	200	1.2	920	2,580	200	1.7	940	2,090
		250	1.3	850	1,570	250	1	640	1,790	250	1.3	660	1,470
		300	1	790	1,580	300	0.6	600	1,930	300	1	610	1,460
		350	0.4	730	2,200	350	0.3	550	1,770	350	0.4	560	2,030
		400	–	–	–	400	–	–	–	400	–	–	–
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB		150	1.9	1,220	2,250	150	1.4	920	2,580	150	1.9	940	2,090
		200	1.7	1,220	2,250	200	1.2	920	2,580	200	1.7	940	2,090
		250	1.3	850	1,570	250	1	640	1,790	250	1.3	660	1,470
		300	1	790	1,580	300	0.6	600	1,930	300	1	610	1,460
		350	0.4	730	2,200	350	0.3	550	1,770	350	0.4	560	2,030
		400	–	–	–	400	–	–	–	400	–	–	–
Stainless steel SUS304 Below 250HB	JC8015 Without chipbreaker	150	1.9	1,050	1,940	150	1.4	800	2,240	150	1.9	810	1,800
		200	1.7	1,050	1,940	200	1.2	800	2,240	200	1.7	810	1,800
		250	1.3	730	1,440	250	1	560	1,570	250	1.3	570	1,370
		300	1	680	1,360	300	0.6	520	1,680	300	1	530	1,270
		350	0.4	630	1,890	350	0.3	480	1,550	350	0.4	490	1,760
		400	–	–	–	400	–	–	–	400	–	–	–
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	DH103	100	1.2	840	1,470	100	1	640	1,540	100	1.2	660	1,390
		150	1	840	1,470	150	0.8	640	1,540	150	1	660	1,390
		200	0.8	590	1,090	200	0.6	450	1,260	200	0.8	460	1,020
		250	0.5	550	1,320	250	0.3	420	1,470	250	0.5	430	1,240
		300	0.3	510	1,270	300	0.2	380	1,750	300	0.3	400	1,200
		350	–	–	–	350	–	–	–	350	–	–	–
Grey & Nodular cast iron FC, FCD (GG,GGG) Below 300HB	DH103	150	1.9	1,160	2,900	150	1.4	880	3,320	150	1.9	900	2,700
		200	1.7	1,160	2,900	200	1.2	880	3,320	200	1.7	900	2,700
		250	1.3	810	1,930	250	1	620	1,740	250	1.3	630	1,800
		300	1	750	2,600	300	0.6	570	2,180	300	1	590	2,480
		350	0.4	700	2,800	350	0.3	530	1,950	350	0.4	540	2,590
		400	–	–	–	400	–	–	–	400	–	–	–
Aluminium alloy A5052, A7075 50-110HB	FZ05	150	2.1	4,300	11,800	150	1.6	3,600	13,800	150	2.1	3,600	11,900
		200	1.9	4,300	11,800	200	1.4	3,600	13,800	200	1.9	3,600	11,900
		250	1.5	3,850	13,500	250	1.2	3,200	15,600	250	1.5	3,200	13,400
		300	1.2	3,350	11,700	300	0.8	2,800	13,700	300	1.2	2,800	11,750
		350	0.6	3,150	11,000	350	0.6	2,600	12,700	350	0.6	2,600	11,000
		400	0.4	2,900	11,000	400	0.4	2,400	12,600	400	0.4	2,400	10,800

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

NOTE

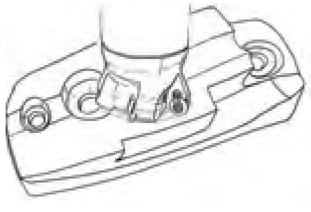
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed spee
4) Use air blow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

Super Diemaster

HDM TYPE

CASE STUDIES

1. Forged carbon steel.

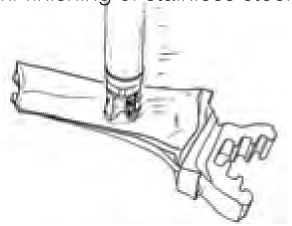


Result

Tool life is 7 times longer than competitor's tool.
SUPER DIEMASTER: 30 pieces
Competitor's tool: 4 pieces
It also reduces machining time by 25%

Work	Part name	Parts
	Material	SF700
	Hardness	290~325HB
Tool	Tool No.	HDM-3050-16R
	Insert No.	RDMW1606MOT (JC8015)
Cutting conditions	Cutting Speed	800 (min^{-1}), 125 (m/min)
	Feed Speed	200 (mm/min), 0.25 (mm/rev)
	Depth of cut	0.2 (mm)
	Width of cut	20~30 (mm)
	Coolant	Oil
	Machine	Vertical MC

2. Semi-finishing of stainless steel.

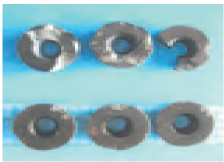


Result

Even after machining 100 blades, inserts have less wear and less vibrations than the competitor's.

Work	Part name	Turbine Blades
	Material	Stainless steel (SUS420)
	Hardness	280HB
Tool	Tool No.	SDH-2200-R07-M10
	Insert No.	RDMW07T2MOT (JC8015)
Cutting conditions	Cutting Speed	3,200 (min^{-1}), 200 (m/min)
	Feed Speed	1,920 (mm/min), 0.3 (mm/rev)
	Depth of cut	0.3 (mm)
	Width of cut	0.5 (mm)
	Coolant	Wet
	Machine	Vertical MC

3. Cutting of welded part.



ISO Standard
Insert thickness
4.76mm

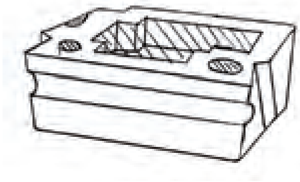
Super Diemaster
Insert thickness
6.0mm

Result

ISO standard insert was getting chip-off on welded area but HDM insert could cut without chatter and chip-off.
Tool life was improved 1.5 times.

Work	Part name	Cam
	Material	SKD11+Welding 62
	Hardness	HRC
Tool	Tool No.	HDM-3050-16R
	Insert No.	RDMW1606MOT (JC8015)
Cutting conditions	Cutting Speed	1,000 (min^{-1}), 157 (m/min)
	Feed Speed	500 (mm/min), 0.5 (mm/rev)
	Depth of cut	1 (mm)
	Width of cut	27 (mm)
	Coolant	Dry
	Machine	Vertical MC 22 KW

4. Cutting of die casting mold.



Result

It is observed that HDM Cutter cycle time is reduced by 20% and tool life is improved by 1.3 times compared with competitors. Feed speed is improved from 1,100mm/min to 1,400mm/min.

Work	Part name	Die Casting Mold
	Material	SKT4
	Hardness	36~42HRC
Tool	Tool No.	HDM-4080-12R
	Insert No.	RDMW1204MOT (JC8015)
Cutting conditions	Cutting Speed	450 (min^{-1}), 115 (m/min)
	Feed Speed	1,400 (mm/min), 3 (mm/rev)
	Depth of cut	1.5~2.0 (mm)
	Width of cut	50 (mm)
	Coolant	Dry
	Machine	Vertical MC

Swing Ball

SWBTYPE

Applicable range is from soft material to welded and hard material. For high efficiency and longer tool life.

Copy Milling | Shoulder Milling | Slotting

1. Smooth and calm cutting and low cutting force at higher feed rate.

Cutting force is reduced by 25% compared with conventional type. This is achieved by using a positive style insert with chipbreaker groove and edge notches. Double insert desgin gives smooth cutting action and excellent cutting.

2. Plunge cutting is possible because of better crack resistance on nose cutting nose portion.

Providing sub chip pocket at spiral nose cutting edge ejects chips smoothly and improves crack-resistance (except for Semi-finishing insert -H type)

3. Reliable insert location and improved security for heavy operations.

By providing key on the back face of insert and cutter body, insert movement is prevented. Impact of cutting load is secured.

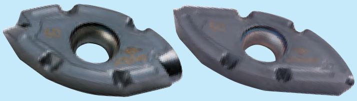
4. G-Body

Special surface harding treatment on thermal resistant high strength steel gives high hardness over 65HRC and secure insert pocket and holder against thermal deformation. Improved body durabilty 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.

Insert Series Expansion

Available now 3 type inserts suitable for various uses:

① Low Cutting Force ② Welded & Hardened Material ③ Semi-Finishing



① Inserts for low cutting forces (-N type)

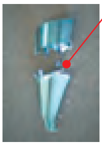
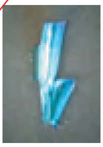
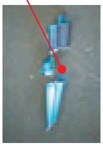
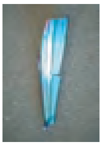
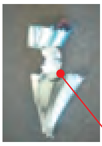
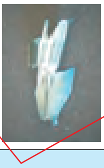
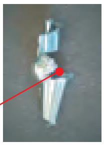
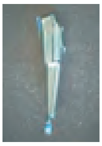
1. **15% reduced cutting force compared with regular type. More smooth and calm cutting is possible.**
2. **1.7 times longer tool life than conventional tool.**
3. **Chip breaking & ejection are improved by adopting notches on the cutting edge.**

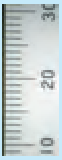
CUTTING PERFORMANCES

Body:	SWBS5060C508 (φ50)
Material:	SKD11(217HB)
Cutting: Conditions:	n=1,350min^{-1} f=0.6mm/rev a_e=10mm a_p=10mm

CHIPS COMPARISON

Completely breaking chips by notch

	Down cut		Up cut	
	Main blade	Sub blade	Main blade	Sub blade
SWB-N type (New type) Smooth cutting				
SWB type (Conventional type)				



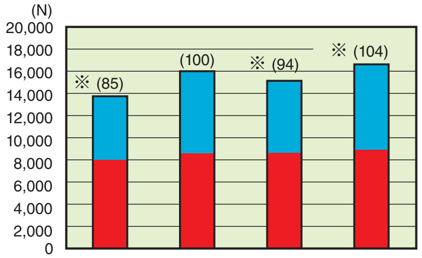
Not completely breaking chips by notch

Swing Ball

SWB TYPE

● CUTTING FORCE COMPARISON

Material: SKD11 (217HB) Tool dia.: φ50mm
n=1,082min⁻¹ Vc=170m/min Vf=650mm/min f=0.5mm/rev
ap=10mm ae=10mm Down cut



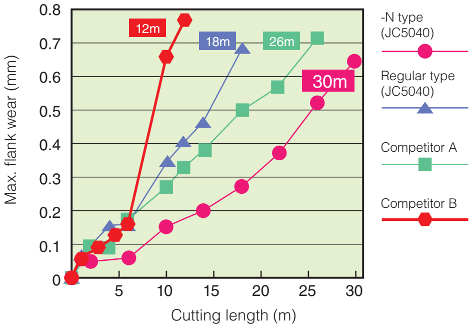
※ Regular type insert: 100

	-N type	Regular type	Competitor A	Competitor B
🟦 Main blade	5,890	7,525	6,454	7,783
🟥 Sub blade	7,901	8,524	8,671	8,925

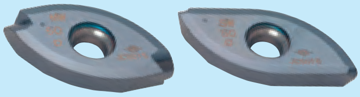
Compared with regular type insert, -N type insert (for low cutting forces) reduced cutting force by 15%.

● TOOL LIFE COMPARISON

Material: SKD11 (217HB)
n=1,350min⁻¹ Vc=212m/min Vf=810mm/min f=0.6mm/rev
ap=10mm ae=10mm Down & Up cut Air Blow

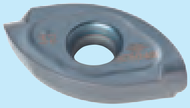


Compared with regular type insert, -N type insert (for low cutting force) improved tool life by 1.6 times



② Insert for welded & hardened steel (-W type)

1. Improved insert strength and achieved longer tool life.
2. Suitable for welded & hardened steel (over 50HRC)

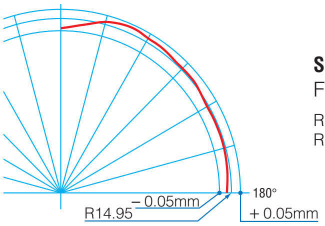


③ Insert for semi-finishing (main blade -H type)

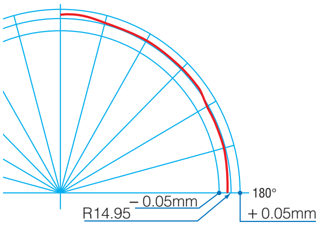
1. Main blades -H type for semi-finishing are available for φ20mm, φ25mm and φ30mm. In case of using -H type blade, please confirm the grade of both the inserts. It should be the same grade.
2. Able to use for semi-finishing by improving nose radius accuracy. Do not recommend to use for roughing.

● INSERT COMPARISON

SWB-HM type
Regular type
R min. 14.906
R max. 14.981

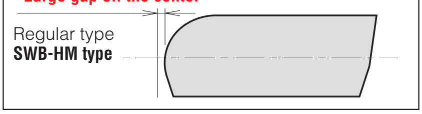


SWB-HM-H type
For Semi-finishing
R min. 14.938
R max. 14.983

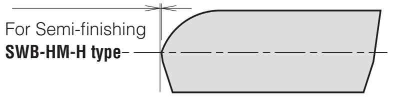


Radius form accuracy on body

Large gap off the center



Small gap off the center



Swing Ball

SWBTYPE

G-Body

Copy Milling Shoulder Milling Slotting

Fig.1

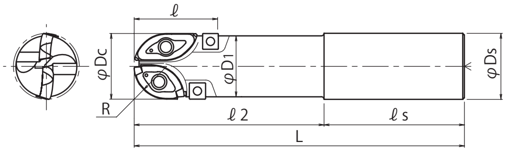


Fig.2

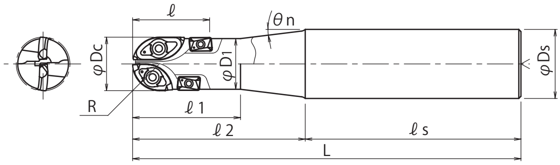
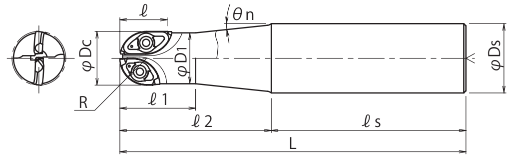


Fig.3



BODY

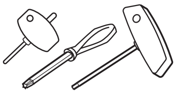
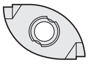
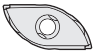
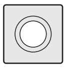
Type	Cat. No.	Stock	No. of inserts			Dimensions (mm)											Fig.
			Main Blade	Sub Blade	Peripheral Blade	R	φDc	ℓ	ℓ2	ℓs	L	ℓ1	φD1	θn	φDs	Md	
Straight Shank	SWB-20080S-S20	●	1	1	2	10	20	30	80	80	160	–	18.7	–	20	–	1
	SWB-20120S-S20	□	1	1	2			30	120	80	200	–	18.7	–	20	–	1
	SWB-20170S-S20	□	1	1	2			30	170	80	250	–	18.7	–	20	–	1
	SWBS2030S25	●	1	1	2			30	80	100	180	40	18.7	3°30′	25	–	2
	SWBM2030S25	●	1	1	2			30	100	100	200	40	18.7	2°	25	–	2
	SWBS2018S25	●	1	1	–			18	70	90	160	30	18.7	3°30′	25	–	3
	SWBS2535S32	●	1	1	2	12.5	25	35	80	100	180	50	23.5	7°	32	–	2
	SWBM2535S32	●	1	1	2			35	100	100	200	50	23.5	4°	32	–	2
	SWBS2522S32	●	1	1	–			22	70	90	160	35	23.5	6°	32	–	3
	SWBS3242S32-G	●	1	1	2	16	32	44	60	120	180	–	29.9	–	32	–	1
	SWBM3242S32-G	●	1	1	2			44	60	160	220	–	29.9	–	32	–	1

Note) 1) All cutters are supplied without inserts
2) Please refer page C167-C171 for recommended cutting conditions and refer page C170 for machined form.
3) Please refer page C164 for selection of inserts.

Modular Head Type Please refer Page B107

Swing Ball **SWB**TYPE

PARTS

Applicable Holders φDc	Clamp Screw		Wrench		Inserts		
	For main & sub blade	For peripheral blade	For main & sub blade	For peripheral blade	Main blade	Sub blade	Peripheral blade
							
φ20	DSW-307H	ESW-206	A-10	A-08SD	SWB220HM	SWB220HS	ZCMT100308R
					SWB220HM-H (For semi-finishing)	SWB220HS (Be sure to use the same grade of main blade)	
					SWB220MMW (For welded & hardened steel)	SWB220MSW (For welded & hardened steel)	
φ25	DSW-4085	ESW-206	A-15	A-08SD	SWB225HM	SWB225HS	ZCMT100308R
					SWB225HM-H (For semi-finishing)	SWB225HS (Be sure to use the same grade of main blade)	
					SWB225MMW (For welded & hardened steel)	SWB225MSW (For welded & hardened steel)	
φ32	TSW-511	ESW-206	A-20	A-08SD	SWB232HM-G	SWB232HS-G	ZCMT100308R
					SWB232MMW-G (For welded & hardened steel)	SWB232MSW-G (For welded & hardened steel)	

Note) 1. In case of using main blade -H type for semi-finishing, be sure to use the same grade for sub blade.
2. In case of using -N type for low cutting force, be sure to use the same notched inserts (-N type) for main blade and sub blade.

Clamp Screw	Recommended torque (N•m)
DSW-307H	1.8
DSW-4085	3.6
TSW-511	5.5
ESW-206	0.9

Swing Ball **SWB**TYPE

Straight Shank Type

Fig.2

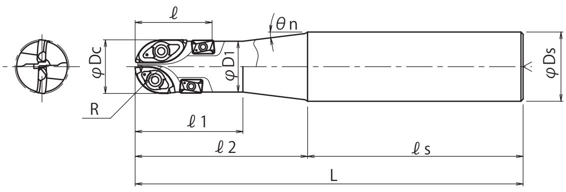
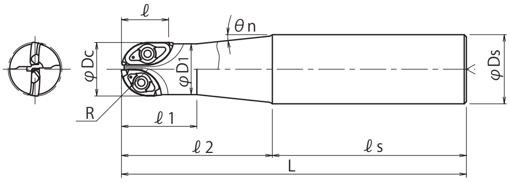


Fig.3



■ BODY

Type	Cat. No.	Stock	No. of inserts			Dimensions (mm)											Fig.
			Main Blade	Sub Blade	Peripheral Blade	R	φDc	ℓ	ℓ2	ℓs	L	ℓ1	φD1	θn	φDs	Md	
Straight Shank	**SWBL2030S25**	☐	1	1	2	**10**	**20**	30	100	150	250	40	18.7	2°	25	–	2
	SWBL2030S32	☐	1	1	2			30	100	150	250	40	18.7	5°30′	32	–	2
	SWBE2030S32	☐	1	1	2			30	110	190	300	40	18.7	4°30′	32	–	2
	SWBM2018S25	●	1	1	–			18	100	100	200	30	18.7	2°	25	–	3
	SWBL2018S25	☐	1	1	–			18	110	140	250	30	18.7	1°30′	25	–	3
	SWBL2018S32	☐	1	1	–			18	110	140	250	30	18.7	4°	32	–	3
	SWBE2018S32	●	1	1	–			18	120	180	300	30	18.7	3°30′	32	–	3
	SWBSS2535S25	●	1	1	2	**12.5**	**25**	35	70	80	150	–	23.5	–	25	–	2
	SWBML2535S25	☐	1	1	2			35	70	150	220	–	23.5	–	25	–	2
	SWBL2535S32	☐	1	1	2			35	110	140	250	50	23.5	3°30′	32	–	2
	SWBE2535S32	●	1	1	2			35	120	180	300	50	23.5	3°	32	–	2
	SWBM2522S32	☐	1	1	–			22	100	100	200	35	23.5	3°	32	–	3
	SWBL2522S32	●	1	1	–			22	110	140	250	35	23.5	2°40′	32	–	3
	SWBE2522S32	☐	1	1	–			22	120	180	300	35	23.5	2°20′	32	–	3
	SWBL3242S32-G	●	1	1	2	**16**	**32**	44	60	190	250	–	29.9	–	32	–	2
	SWBE3242S32-G	●	1	1	2			44	60	240	300	–	29.9	–	32	–	2

Note) 1) All cutters are supplied without inserts
2) Please refer page C167-C171 for recommended cutting conditions and refer page C170 for machined form.
3) Please refer page C164 for selection of inserts.

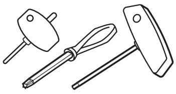
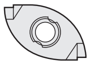
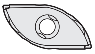
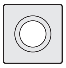
Modular Head Type Please refer Page B107

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

Swing Ball

SWBTYPE

PARTS

Applicable Holders φDc	Clamp Screw		Wrench		Inserts		
	For main & sub blade	For peripheral blade	For main & sub blade	For peripheral blade	Main blade	Sub blade	Peripheral blade
							
φ20	DSW-307H	ESW-206	A-10	A-08SD	SWB220HM	SWB220HS	ZCMT100308R
					SWB220HM-H (For semi-finishing)	SWB220HS (Be sure to use the same grade of main blade)	
					SWB220MMW (For welded & hardened steel)	SWB220MSW (For welded & hardened steel)	
φ25	DSW-4085	ESW-206	A-15	A-08SD	SWB225HM	SWB225HS	ZCMT100308R
					SWB225HM-H (For semi-finishing)	SWB225HS (Be sure to use the same grade of main blade)	
					SWB225MMW (For welded & hardened steel)	SWB225MSW (For welded & hardened steel)	
φ32	TSW-511	ESW-206	A-20	A-08SD	SWB232HM-G	SWB232HS-G	ZCMT100308R
					SWB232MMW-G (For welded & hardened steel)	SWB232MSW-G (For welded & hardened steel)	

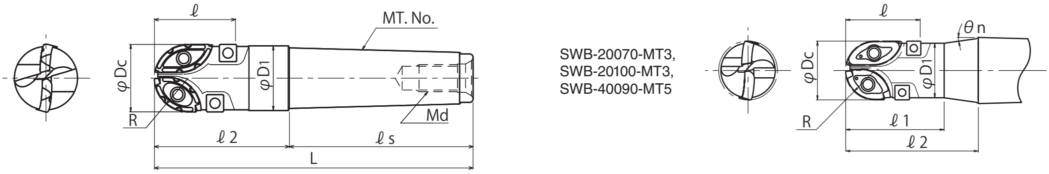
Note) 1. In case of using main blade -H type for semi-finishing, be sure to use the same grade for sub blade.
2. In case of using -N type for low cutting force, be sure to use the same notched inserts (-N type) for main blade and sub blade.

Clamp Screw	Recommended torque (N•m)
DSW-307H	1.8
DSW-4085	3.6
TSW-511	5.5
ESW-206	0.9

Swing Ball **SWB**TYPE

MT Shank Type / Weldon Shank Type / BT Shank Type

Fig.8



■ BODY

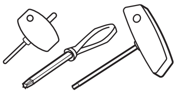
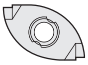
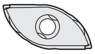
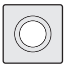
Type	Cat. No.	Stock	No. of inserts			Dimensions (mm)											Fig.
			Main Blade	Sub Blade	Peripheral Blade	R	φDc	ℓ	ℓ2	ℓs	L	ℓ1	φD1	θn	φDs	Md	
Straight Shank	**SWB-20070-MT3**	☐	1	1	2	**10**	**20**	30	70	86	156	40	18.7	4°	MT3	M12×1.75	8
	SWB-20100-MT3	☐	1	1	2			30	100	86	186	40	18.7	2°	MT3	M12×1.75	8
	SWB-25070-MT3	☐	1	1	2	**12.5**	**25**	35	70	86	156	–	23.5	–	MT3	M12×1.75	8
	SWB-25100-MT3	☐	1	1	2			35	100	86	186	–	23.5	–	MT3	M12×1.75	8
	SWB-32070-MT4-G	☐	1	1	2	**16**	**32**	44	70	109	179	–	30.4	–	MT4	M16×2	8
	SWB-32100-MT4-G	☐	1	1	2			44	100	109	209	–	30.4	–	MT4	M16×2	8
	SWB-40090-MT4	☐	1	1	2	**20**	**40**	50	90	109	199	–	36.9	–	MT4	M16×2	8
	SWB-40090-MT5	☐	1	1	2			50	90	136	226	66.8	36.9	8°	MT5	M20×2.5	8
	SWB-50100-MT5	☐	1	1	2	**25**	**50**	60	100	136	236	–	46.8	–	MT5	M20×2.5	8
	SWB-50120-MT5	☐	1	1	2			60	120	136	256	–	46.8	–	MT5	M20×2.5	8
	SWB-50150-MT5	☐	1	1	2			60	150	136	286	–	46.8	–	MT5	M20×2.5	8
	SWB-50170-MT5	☐	1	1	2			60	170	136	306	–	46.8	–	MT5	M20×2.5	8

Note) 1) All cutters are supplied without inserts
2) Please refer page C167-C171 for recommended cutting conditions and refer page C170 for machined form.
3) Please refer page C164 for selection of inserts.

Modular Head Type Please refer Page B107

Swing Ball SWBTYPE

PARTS

Applicable Holders φDc	Clamp Screw		Wrench		Inserts		
	For main & sub blade	For peri-pheral blade	For main & sub blade	For peri-pheral blade	Main blade	Sub blade	Peripheral blade
							
φ20	DSW-307H	ESW-206	A-10	A-08SD	SWB220HM	SWB220HS	ZCMT100308R
					SWB220HM-H (For semi-finishing)	SWB220HS (Be sure to use the same grade of main blade)	
					SWB220MMW (For welded & hardened steel)	SWB220MSW (For welded & hardened steel)	
φ25	DSW-4085	ESW-206	A-15	A-08SD	SWB225HM	SWB225HS	ZCMT100308R
					SWB225HM-H (For semi-finishing)	SWB225HS (Be sure to use the same grade of main blade)	
					SWB225MMW (For welded & hardened steel)	SWB225MSW (For welded & hardened steel)	
φ32	TSW-511	ESW-206	A-20	A-08SD	SWB232HM-G	SWB232HS-G	ZCMT100308R
					SWB232MMW-G (For welded & hardened steel)	SWB232MSW-G (For welded & hardened steel)	
φ40	TSW-614H	ESW-406	A-25	A-15	SWB240HMN	SWB240HSN	SPGA090304 SPMA090304
					SWB240MMW (For welded & hardened steel)	SWB240MSW (For welded & hardened steel)	
φ50	HSW-614H	CSW-510	A-30	A-20	SWB250HMN-N (For low cutting force)	SWB250HSN-N (For low cutting force)	IM-SP43GS
					SWB250MMW (For welded & hardened steel)	SWB250MSW (For welded & hardened steel)	

Note) 1. In case of using main blade -H type for semi-finishing, be sure to use the same grade for sub blade.
2. In case of using -N type for low cutting force, be sure to use the same notched inserts (-N type) for main blade and sub blade.

Clamp Screw	Recommended torque (N•m)
DSW-2563H	0.9
DSW-307H	1.8
DSW-4085	3.6
TSW-511	5.5
TSW-614H	7.5
HSW-614H	7.5
ESW-206	0.9
ESW-406	3.1
CSW-510	5.5

Swing Ball **SWB**TYPE

INSERTS

SWB-N type (For low cutting forces)

1. -N type insert for low cutting forces.
   Suitable for heavy roughing.
2. Reduced cutting forces compared with regular type by 15%.
   More smooth and calm cutting is possible.

Fig.1 (Main blade for low cutting forces)

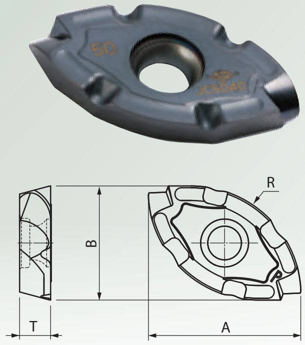
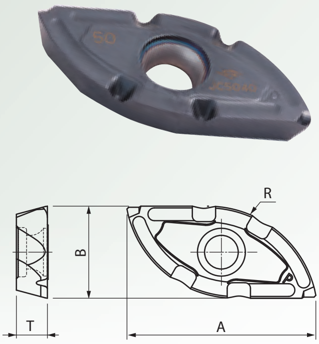


Fig.2 (Sub blade for low cutting forces)



SWB-H type (Main blade for semi-finishing)

1. -H type semi-finishing main blade for φ20, φ25, φ30
2. For use in semi-finishing only.
   (Not recommended for Roughing)

Fig.3 (Main blade for semi-finishing)

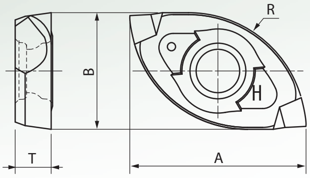


Fig.4 (Main blade)

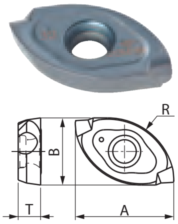


Fig.5 (Main blade)

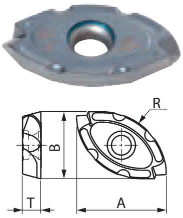


Fig.6 (Sub blade)

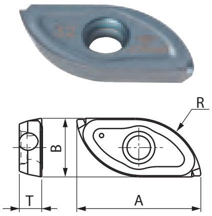


Fig.7 (Sub blade)

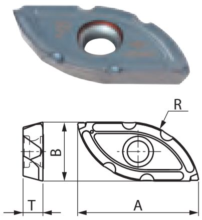


Fig.8 (Main blade for welded & hardened steel)

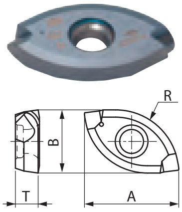


Fig.9 (Sub blade for welded & hardened steel)

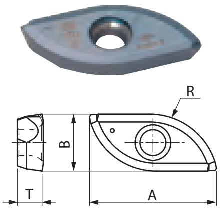


Fig.10 (Peripheral blade)

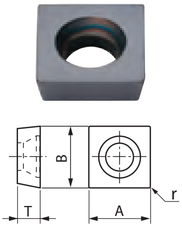


Fig.11 (Peripheral blade)

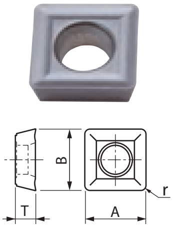
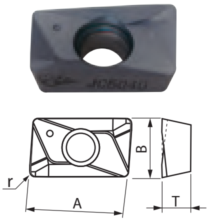


Fig.12 (Peripheral blade)



Swing Ball SWBTYPE

INSERTS

Cat. No.	Type	PVD coated					Dimensions (mm)					Fig.
		JC5015	JC5118	JC8015	JC8050	JC5040	R	A	B	T	r	
SWB220HM	Main blade			●		●	10	15.8	9.9	3.65	–	4
SWB220HM-H				●				16	9.9	3.65	–	3
SWB220MMW				●				15.8	9.9	3.65	–	8
SWB220HS	Sub blade			●		●		20	8.2	3.65	–	6
SWB220MSW				●				20	8.2	3.65	–	9
SWB225HM	Main blade			●		●	12.5	18.5	12.4	3.8	–	4
SWB225HM-H				□				18.9	12.4	3.8	–	3
SWB225MMW				●				18.5	12.4	3.8	–	8
SWB225HS	Sub blade			●		●		23.8	10.5	3.8	–	6
SWB225MSW				●				23.8	10.5	3.8	–	9
SWB232HM-G	Main blade			●		●	16	26	16	5.35	–	4
SWB232MMW-G				●				26	16	5.35	–	8
SWB232HS-G	Sub blade			●		●		31.7	13.9	5.35	–	6
SWB232MSW-G				●				31.7	13.9	5.35	–	9
SWB240HMN	Main blade			●		●	20	30.4	20.8	6.85	–	5
SWB240MMW				□				30.4	20.8	6.85	–	8
SWB240HSN	Sub blade			●		●		37.5	16.3	6.85	–	7
SWB240MSW				□				37.5	16.3	6.85	–	9
SWB250HMN-N	Main blade			●		●	25	34.4	25.7	7	–	1
SWB250MMW				●				34.4	25.7	7	–	8
SWB250HSN-N	Sub blade			●		●		42.6	20.8	7	–	2
SWB250MSW				●				42.6	20.8	7	–	9
SPGA090304	Peripheral blade					●	–	9.525	9.525	3.18	0.4	10
SPMA090304		●		□				9.525	9.525	3.18	0.4	10
IM-SP43GS			●			●		12.70	12.70	4.76	0.8	11
ZCMT100308R		●				●		10.4	6.35	3.4	0.8	12

10 inserts per case, but main blade (R20, R25) and sub blade (R16, R20, R25) are packed in 5pcs. per case.

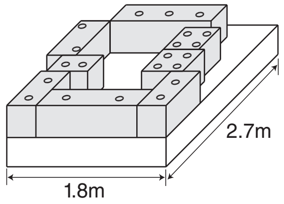
Note)
1. Please refer page C167-C171 for recommended cutting conditions and refer page C170 for machined form.
2. In case of using main blade -H type for semi-finishing, be sure to use the same grade for sub blade.
3. In case of using -N type for low cutting force, be sure to use the same notched inserts (-N type) for main blade and sub blade.

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

Swing Ball SWBTYPE

■ CASE STUDIES

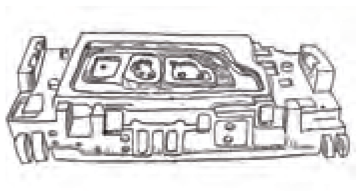
1. High feed machining.



Result Low cutting force, no chipping occured and completed one complete die as shown above by one insert.

Work	Part name	Stamping die
	Material	SX105V (Toolsteel) (Roughing)
	Hardness	—
Tool	Tool No.	SWB-50100-MT5
	Grade	SWB250HMN-N, SWB250HSN-N, JC5040
Cutting conditions	Vc, (n)	2,000 (min^{-1}), 314 (m/min)
	Vf, (fz)	1,200 (mm/min)
	ap (mm)	10 (mm)
	ae (mm)	8 (mm)
	Coolant	Dry cut
	Machine	Double column MC

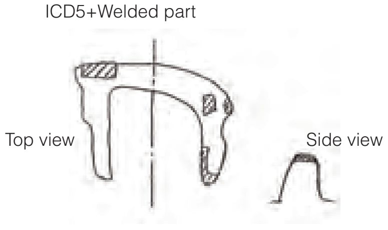
2. Improved tool life by JC8015 (Two times longer life)



Result Heavy roughing of material GM241. Current insert got wear VBMAX=0.7mm after 2 hours. But JC8015 insert got wear VBMAX=0.2mm after 2 hours and 2 times longer tool life.

Work	Part name	Stamping die
	Material	Alloy cast iron (GM241)
	Hardness	260–320HB
Tool	Tool No.	SWBS5060C508
	Grade	SWB250HMN-N, SWB250HSN-N, JC8015
Cutting conditions	Vc, (n)	1,215 (min^{-1}), 191 (m/min)
	Vf, (fz)	560 (mm/min)
	ap (mm)	20 (mm)
	ae (mm)	12 (mm)
	Coolant	Dry cut
	Machine	Double column MC

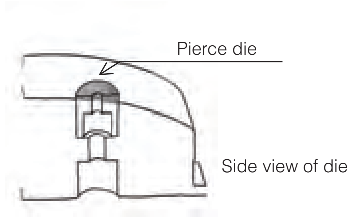
3. Machining welded part



Result After machining of welded and hardened stamping die for 40 mins, inserts were still in good conditions.

Work	Part name	Stamping die
	Material	Cast steel (ICD5) + welded part
	Hardness	58HRC
Tool	Tool No.	SWBS5060C508
	Grade	SWB250MMW, SWB250MSW, JC8015
Cutting conditions	Vc, (n)	1,215 (min^{-1}), 191 (m/min)
	Vf, (fz)	420 (mm/min)
	ap (mm)	1~3 (mm)
	ae (mm)	6 (mm)
	Coolant	Dry cut
	Machine	Double column MC

4. Machining pierce die (Higher feed and longer tool life)

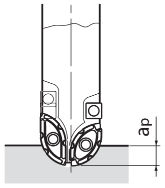
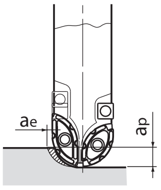
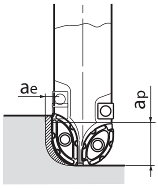


Result After machining 1 die, exsisting tool edge got damaged and was required to indexed. In case of Swing ball, feed rate was increased by 50% and could machine another 3 dies.

Work	Part name	Stamping die
	Material	SKD11
	Hardness	58-60HRC
Tool	Tool No.	SWBM3040S32
	Grade	SWB230MMW, SWB230MSW, JC8015
Cutting conditions	Vc, (n)	1,000 (min^{-1}), 94 (m/min)
	Vf, (fz)	300 (mm/min)
	ap (mm)	Max 3 (mm)
	ae (mm)	3~5(mm)
	Coolant	Dry cut
	Machine	Double column MC

Swing Ball SWBTYPE

RECOMMENDED CUTTING CONDITIONS FOR SWING BALL φ50mm

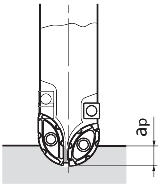
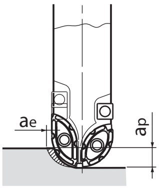
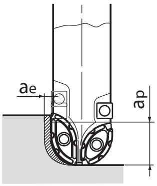
Type of Machining						
Work Materials	Insert Grades	Cutting conditions	Slotting	Shoulder milling		Shoulder milling (Deep)
Medium carbon steel S50C, S55C (C50 ,C55) 150-250HB	JC5040	n (min^{-1})	1,500	1,500	1,500	1,200
		V_f (mm/min)	720	1,000	680	420
		a_p (mm)	15	10	25	40
		a_e (mm)	–	10	15	10
Cast steel GM190, ICD5 (1.7225) 150-285HRC	JC5040 JC8015 For over 40HRC	n (min^{-1})	1,350	1,350	1,350	1,100
		V_f (mm/min)	650	900	600	380
		a_p (mm)	15	10	25	40
		a_e (mm)	–	10	15	10
Die steel SKD11, SX105V (1.2379) 150-255HRC	JC5040	n (min^{-1})	1,250	1,250	1,250	1,000
		V_f (mm/min)	550	750	500	300
		a_p (mm)	15	10	25	40
		a_e (mm)	–	10	15	5
Hardened steel SKD61, DAC (1.2344) 40-50HRC	JC8015 (Recommend to use -M○W type insert)	n (min^{-1})	1,200	1,200	1,200	–
		V_f (mm/min)	420	540	400	–
		a_p (mm)	~6	~5	~8	–
		a_e (mm)	–	6	10	–
Welded & Hardened steel SKD11 (1.2379) 55-63HRC	JC8015 (Recommend to use -M○W type insert)	n (min^{-1})	1,200	1,200	–	–
		V_f (mm/min)	360	400	–	–
		a_p (mm)	~3	~3	–	–
		a_e (mm)	–	6	–	–
Grey cast iron FC250 (GG25) 160-260HB	JC8015	n (min^{-1})	1,500	1,500	1,500	1,200
		V_f (mm/min)	970	1,400	900	480
		a_p (mm)	15	10	25	40
		a_e (mm)	–	10	15	10
Nodular cast iron FCD700, GM241 (GGG70) 170-300HB	JC8015	n (min^{-1})	1,300	1,300	1,300	1,050
		V_f (mm/min)	700	1,000	650	370
		a_p (mm)	15	10	25	40
		a_e (mm)	–	10	15	10

n: Spindle speed, V_f: Feed speed, a_p: Depth of cut, a_e: Pick feed

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. Use air blow

Swing Ball SWBTYPE

■ RECOMMENDED CUTTING CONDITIONS FOR SWING BALL φ40mm

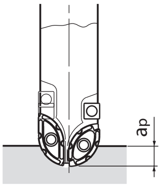
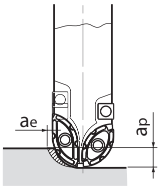
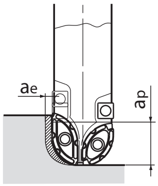
Type of Machining						
Work Materials	Insert Grades	Cutting conditions	Slotting	Shoulder milling		Shoulder milling (Deep)
Medium carbon steel S50C, S55C (C50 ,C55) 150-250HB	JC5040	n (min^{-1})	1,850	1,850	1,850	1,500
		V_f (mm/min)	800	1,070	740	480
		a_p (mm)	12	10	20	35
		a_e (mm)	–	8	12	8
Cast steel GM190, ICD5 (1.7225) 150-285HRC	JC5040 JC8015 For over 40HRC	n (min^{-1})	1,670	1,670	1,670	1,340
		V_f (mm/min)	720	960	670	420
		a_p (mm)	12	10	20	35
		a_e (mm)	–	8	12	8
Die steel SKD11, SX105V (1.2379) 150-255HRC	JC5040	n (min^{-1})	1,560	1,560	1,560	1,250
		V_f (mm/min)	620	810	560	350
		a_p (mm)	12	10	20	35
		a_e (mm)	–	8	12	4
Hardened steel SKD61, DAC (1.2344) 40-50HRC	JC8015 (Recommend to use -M◯W type insert)	n (min^{-1})	1,200	1,200	1,200	–
		V_f (mm/min)	420	540	420	–
		a_p (mm)	~5	~4	~6.5	–
		a_e (mm)	–	5	8	–
Welded & Hardened steel SKD11 (1.2379) 55-63HRC	JC8015 (Recommend to use -M◯W type insert)	n (min^{-1})	1,000	1,000	–	–
		V_f (mm/min)	300	350	–	–
		a_p (mm)	~3	~3	–	–
		a_e (mm)	–	5	–	–
Grey cast iron FC250 (GG25) 160-260HB	JC8015	n (min^{-1})	1,850	1,850	1,850	1,500
		V_f (mm/min)	1,100	1,500	1,000	570
		a_p (mm)	12	10	20	35
		a_e (mm)	–	8	12	8
Nodular cast iron FCD700, GM241 (GGG70) 170-300HB	JC8015	n (min^{-1})	1,650	1,650	1,650	1,320
		V_f (mm/min)	830	1,100	760	450
		a_p (mm)	12	10	20	35
		a_e (mm)	–	8	12	8

n: Spindle speed, V_f: Feed speed, a_p: Depth of cut, a_e: Pick feed

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. Use air blow

Swing Ball SWBTYPE

RECOMMENDED CUTTING CONDITIONS FOR SWING BALL φ32mm

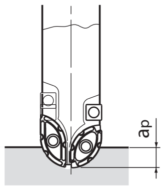
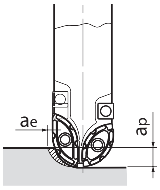
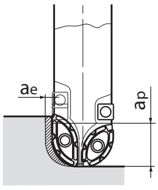
Type of Machining						
Work Materials	Insert Grades	Cutting conditions	Slotting	Shoulder milling		Shoulder milling (Deep)
Medium carbon steel S50C, S55C (C50 ,C55) 150-250HB	JC5040	n (min^{-1})	2,300	2,300	2,300	1,800
		V_f (mm/min)	800	1,020	770	450
		a_p (mm)	10	10	16	28
		a_e (mm)	–	6	9	6
Cast steel GM190, ICD5 (1.7225) 150-285HRC	JC5040 JC8015 For over 40HRC	n (min^{-1})	2,090	2,090	2,090	1,670
		V_f (mm/min)	720	920	700	420
		a_p (mm)	10	10	16	28
		a_e (mm)	–	6	9	6
Die steel SKD11, SX105V (1.2379) 150-255HRC	JC5040	n (min^{-1})	1,950	1,950	1,950	1,560
		V_f (mm/min)	630	810	600	390
		a_p (mm)	10	10	16	28
		a_e (mm)	–	6	9	3
Hardened steel SKD61, DAC (1.2344) 40-50HRC	JC8015 (Recommend to use -M○W type insert)	n (min^{-1})	1,600	1,600	1,600	–
		V_f (mm/min)	400	480	400	–
		a_p (mm)	~4	~4	~6.5	–
		a_e (mm)	–	5	8	–
Welded & Hardened steel SKD11 (1.2379) 55-63HRC	JC8015 (Recommend to use -M○W type insert)	n (min^{-1})	1,400	1,400	–	–
		V_f (mm/min)	280	350	–	–
		a_p (mm)	~3	~3	–	–
		a_e (mm)	–	5	–	–
Grey cast iron FC250 (GG25) 160-260HB	JC8015	n (min^{-1})	2,300	2,300	2,300	1,840
		V_f (mm/min)	1,140	1,380	1,020	640
		a_p (mm)	10	10	16	28
		a_e (mm)	–	6	9	6
Nodular cast iron FCD700, GM241 (GGG70) 170-300HB	JC8015	n (min^{-1})	2,060	2,060	2,060	1,650
		V_f (mm/min)	890	1,130	820	500
		a_p (mm)	10	10	16	28
		a_e (mm)	–	6	9	6

n: Spindle speed, V_f: Feed speed, a_p: Depth of cut, a_e: Pick feed

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. Use air blow

Swing Ball SWB TYPE

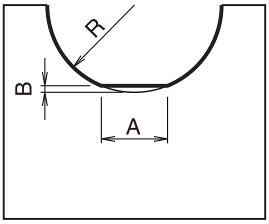
RECOMMENDED CUTTING CONDITIONS FOR SWING BALL φ25mm

Type of Machining						
Work Materials	Insert Grades	Cutting conditions	Slotting	Shoulder milling		Shoulder milling (Deep)
Medium carbon steel S50C, S55C (C50 ,C55) 150-250HB	JC5040	n (min^{-1})	2,550	2,550	2,550	2,290
		V_f (mm/min)	760	890	690	500
		a_p (mm)	6	6	12.5	20
		a_e (mm)	–	5	6.5	3
Cast steel GM190, ICD5 (1.7225) 150-285HRC	JC5040 JC8015 For over 40HRC	n (min^{-1})	2,400	2,400	2,400	2,160
		V_f (mm/min)	720	840	640	480
		a_p (mm)	6	6	12.5	20
		a_e (mm)	–	5	6.5	3
Die steel SKD11, SX105V (1.2379) 150-255HRC	JC5040	n (min^{-1})	2,160	2,160	2,160	1,910
		V_f (mm/min)	590	690	540	420
		a_p (mm)	6	6	12.5	20
		a_e (mm)	–	5	6.5	3
Hardened steel SKD61, DAC (1.2344) 40-50HRC	JC8015 (Recommend to use -M○W type insert)	n (min^{-1})	1,600	1,600	1,600	–
		V_f (mm/min)	350	400	350	–
		a_p (mm)	~3	~3	~5	–
		a_e (mm)	–	4	5	–
Welded & Hardened steel SKD11 (1.2379) 55-63HRC	JC8015 (Recommend to use -M○W type insert)	n (min^{-1})	1,400	1,400	–	–
		V_f (mm/min)	280	350	–	–
		a_p (mm)	~2	~2	–	–
		a_e (mm)	–	4	–	–
Grey cast iron FC250 (GG25) 160-260HB	JC8015	n (min^{-1})	2,550	2,550	2,550	2,290
		V_f (mm/min)	1,000	1,150	900	650
		a_p (mm)	6	6	12.5	20
		a_e (mm)	–	5	6.5	3
Nodular cast iron FCD700, GM241 (GGG70) 170-300HB	JC8015	n (min^{-1})	2,400	2,400	2,400	2,160
		V_f (mm/min)	860	1,000	770	600
		a_p (mm)	6	6	12.5	20
		a_e (mm)	–	5	6.5	3

n: Spindle speed, V_f: Feed speed, a_p: Depth of cut, a_e: Pick feed

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. Use air blow

MACHINED FORM BY SWING BALL



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

● **SWB type**

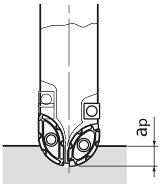
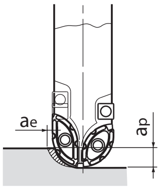
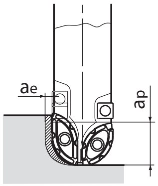
R	A	B
8	0.5	0.01
10	2.1	0.05
12.5	3.0	0.09
15	3.3	0.09
16	3.4	0.09
20	4.3	0.12
25	5.2	0.14

● **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

Swing Ball SWBTYPE

RECOMMENDED CUTTING CONDITIONS FOR SWING BALL φ20mm

Type of Machining						
Work Materials	Insert Grades	Cutting conditions	Slotting	Shoulder milling		Shoulder milling (Deep)
Medium carbon steel S50C, S55C (C50 ,C55) 150-250HB	JC5040	n (min^{-1})	3,180	3,180	3,180	2,860
		V_f (mm/min)	890	1,000	800	570
		a_p (mm)	5	5	10	16
		a_e (mm)	–	4	5	2
Cast steel GM190, ICD5 (1.7225) 150-285HRC	JC5040 JC8015 For over 40HRC	n (min^{-1})	3,020	3,020	3,020	2,700
		V_f (mm/min)	820	920	760	540
		a_p (mm)	5	5	10	16
		a_e (mm)	–	4	5	2
Die steel SKD11, SX105V (1.2379) 150-255HRC	JC5040	n (min^{-1})	2,700	2,700	2,700	2,390
		V_f (mm/min)	680	810	630	480
		a_p (mm)	5	5	10	16
		a_e (mm)	–	4	5	2
Hardened steel SKD61, DAC (1.2344) 40-50HRC	JC8015 (Recommend to use -M○W type insert)	n (min^{-1})	1,750	1,750	1,750	–
		V_f (mm/min)	350	400	320	–
		a_p (mm)	~2	~2	~4	–
		a_e (mm)	–	3	4	–
Welded & Hardened steel SKD11 (1.2379) 55-63HRC	JC8015 (Recommend to use -M○W type insert)	n (min^{-1})	1,400	1,400	–	–
		V_f (mm/min)	280	350	–	–
		a_p (mm)	~1	~1	–	–
		a_e (mm)	–	3	–	–
Grey cast iron FC250 (GG25) 160-260HB	JC8015	n (min^{-1})	3,180	3,180	3,180	2,860
		V_f (mm/min)	1,160	1,300	1,040	740
		a_p (mm)	5	5	10	16
		a_e (mm)	–	4	5	2
Nodular cast iron FCD700, GM241 (GGG70) 170-300HB	JC8015	n (min^{-1})	3,020	3,020	3,020	2,700
		V_f (mm/min)	980	1,100	910	650
		a_p (mm)	5	5	10	16
		a_e (mm)	–	4	5	2

n: Spindle speed, V_f: Feed speed, a_p: Depth of cut, a_e: Pick feed

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. Use air blow

MAXIMUM PLUNGING DEPTH AND FEED RATE

Materials	Max. D.O.C. Max. Feed rate	Tool dia.: φDc (mm)				
		20	25	30, 32	40	50
Cast iron FC, FCD, GM (GG, GGG)	a_p (mm)	4	5	10	15	15
	f (mm/rev)	0.30	0.40	0.40	0.40	0.40
Cast steel Alloy steel Die steel	a_p (mm)	3	4	8	10	10
	f (mm/rev)	0.25	0.30	0.30	0.30	0.30

Note) In case of using -H type insert (main blade for semi-finishing), plunging is not recommended.

Mirror Ball

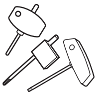
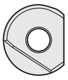
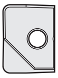
BNM TYPE

1. Ultimate precision indexable ball nose end mill with two effective cutting edge
   Radius form accuracy: within ±0.010mm mounted on holder
   (Radius form accuracy of insert: within ±0.006mm)
2. High precision clamping system
   Easy and strong clamping and accurate location mechanism by using the single precision clamp screw gives high repeatability and rigidity.
3. Full radius insert with improved edge sharpness
   Adopted full radius insert is able to reduce vibration even in perpendicular wall milling and can cut smoothly for intricate shape copy milling with high speed.
4. In case of super finishing application (removal stock below Dc/40), MIRROR RADIUS Insert can be mounted on MIRROR BALL Bodies.

BNM-S type
(Straight Neck)

BNM-T type
(Taper Neck)

■ BODY

Cat. No.	Stock	Fig.	Dimensions (mm)									Parts		Inserts	
												Clamp Screw	Wrench		
			R	φDc	ℓ1	ℓ2	L	φD1	φDs	θκ°	θn° Taper angle				
BNMS-060030T-S10	□	2	3	6	15	30	80	5.4	10	4°14′	8°15′	FSW-2005H	A-06	BNM-060...	
BNMS-080035T-S12	□	2	4	8	18.5	35	92	7.2	12	3°41′	7°45′	FSW-2506H	A-07	BNM-080...	RNM-080...
BNMM-080053T-S12	□				18.5	53	110			2°20′	3°30′				
BNML-080075T-S12	□				18.5	75	132			1°37′	1°30′				
BNMS-100035T-S12	□	2	5	10	21	35	92	9	12	1°55′	5°45′	FSW-3007H	A-08	BNM-100...	RNM-100...
BNMM-100053T-S12	□				21	53	110			1°12′	2°30′				
BNML-100075T-S12	□				21	75	132			0°49′	1°				
BNMS-120026S-S12	●	1	6	12	–	26	83	11	12	–	–	FSW-3509H	A-10	BNM-120...	RNM-120...
BNMM-120053S-S12	●				–	53	110			–	–				
BNMM-120053T-S12	□	2			22	53	110			–	1°30′				
BNML-120085T-S16	□				22	85	145		16	1°27′	1°30′				
BNMS-160032S-S16	●	1	8	16	–	32	92	14	16	–	–	FSW-4013H	A-15	BNM-160...	RNM-160...
BNMM-160063S-S16	●				–	63	123			–	–				
BNMM-160063T-S16	□	2			28	63	123			–	1°30′				
BNML-160100T-S20	□				28	100	166		20	1°13′	1°30′				
BNMS-200038S-S20	●	1	10	20	–	38	104	17	20	–	–	FSW-5016H	A-20W	BNM-200...	RNM-200...
BNMM-200075S-S20	●				–	75	141		20	–	–				
BNMM-200075T-S20	□	2			34	75	141			–	2°				
BNML-200115T-S25	□				34	115	191		25	1°22′	1°50′				

Note) 1. All cutters are supplied without inserts.
2. Please refer page C186-C189 for recommended cutting conditions.

Modular Head Type Please refer Page B153

Clamp Screw	Recommended torque (N•m)
FSW-2005H	0.5
FSW-2506H	0.9
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

BNM TYPE

Fig.1 (Straight Neck)

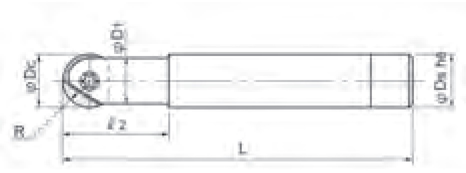
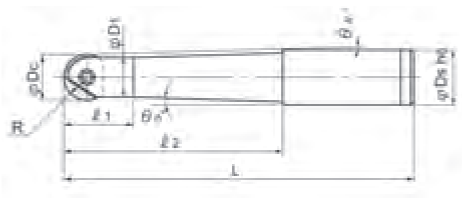
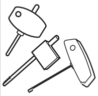
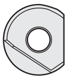
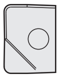


Fig.2 (Taper Neck)



■ BODY

Cat. No.	Stock	Fig.	Dimensions (mm)									Parts		Inserts	
												Clamp Screw	Wrench		
			R	φDc	ℓ1	ℓ2	L	φD1	φDs	θκ°	θn° Taper angle				
BNMS-250045S-S25	●	1	**12.5**	**25**	–	45	121	21	25	–	–	FSW-6020	A-30	BNM-250...	RNM-250...
BNMM-250090S-S25	●	1			–	90	166		25	–	–				
BNMM-250090T-S25	●	2			41	90	166			–	2°20′				
BNML-250135T-S32	●				41	135	215		32	1°38′	1°30′				
BNMS-300053S-S32	☐	1	**15**	**30**	–	53	133	26	32	–	–	FSW-8025	A-40	BNM-300...	RNM-300...
BNMM-300106S-S32	☐	1			–	106	186			–	–				
BNMM-300106T-S32	☐	2			49	106	186			0°38′	3°				
BNML-300160T-S32	☐				49	160	240			0°24′	1°10′				
BNMS-320053S-S32	☐	1	**16**	**32**	–	53	133	26	32	–	–	FSW-8025	A-40	BNM-320...	RNM-320...
BNMM-320106S-S32	☐				–	106	186			–	–				
BNMM-320106T-S32	☐	2			49	106	186			–	3°				
BNML-320160T-S32	☐				49	160	240			–	1°10′				

Modular Head Type **Please refer Page B153**

Note) 1. All cutters are supplied without inserts.
2. Please refer page C186-C189 for recommended cutting conditions.

Clamp Screw	Recommended torque (N•m)
FSW-2005H	0.5
FSW-2506H	0.9
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

C Body carbide shank

BNMTYPE

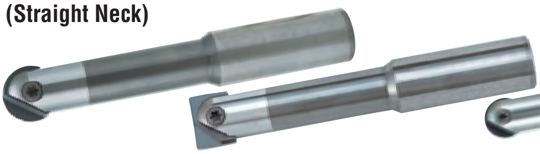
Mirror Ball Carbide Shanks

1. It is possible to machine deeper mold with high quality and high accuracy at higher cutting parameters due to increased tool rigidity and minimize the vibration.
2. By adopting carbide shank, tool rigidity is equal to solid carbide ball nose end mill.
3. Compared with steel shank, the tool life is almost more than double.
4. Carbide shank can be used on shrink-fit type holders.
5. In case of super finishing application (removal stock below Dc/40), MIRROR RADIUS Insert can be mounted on MIRROR BALL Bodies.

Radius form accuracy of insert mounted on holder: within ±0.010mm

BNM-S-C type

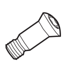
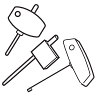
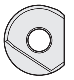
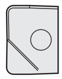
(Straight Neck)



BNM-T-C type

(Taper Neck)

BODY

Cat. No.	Stock	Fig.	Dimensions (mm)									Parts		Inserts	
			R	φDc	ℓ1	ℓ2	L	φD1	φDs	θκ°	θn° Taper angle	Clamp Screw 	Wrench 		
BNMS-060017S-S06C	●	1	3	6	–	17	60	5.4	6	–	–	FSW-2005H	A-06	BNM-060... (BNM-070)	
BNMS-060030T-S10C	●	2			15	30	80		10	4°14′	6°				
BNMM-060035S-S06C	●	1			–	35	92		6	–	–				
BNML-060017S-S06C	●	1			–	17	120			–	–				
BNMS-080025S-S08C	●	1	4	8	–	25	90	7.2	8	–	–	FSW-2506H	A-07	BNM-080...	RNM-080...
BNMM-080035S-S08C	●				–	35	92			–	–				
BNML-080075S-S08C	●				–	75	140			–	–				
BNML-080095S-S08C	●				–	95	160			–	–				
BNML-080075T-S12C	●	2			20	75	132		12	1°37′	2°				
BNMS-100030S-S10C	●	1	5	10	–	30	100	9	10	–	–	FSW-3007H	A-08	BNM-100... (BNM-110)	RNM-100...
BNMM-100043S-S10C	●				–	43	100			–	–				
BNML-100075S-S10C	●				–	75	140			–	–				
BNML-100095S-S10C	●				–	95	160			–	–				
BNML-100140S-S10C	●				–	140	220			–	–				
BNML-100075T-S12C	●	2			23	75	132		12	0°49′	1°30′				
BNMS-120028S-S12C	●	1	6	12	–	28	84	11	12	–	–	FSW-3509H	A-10	BNM-120...	RNM-120...
BNMM-120053S-S12C	●				–	53	110			–	–				
BNML-120095S-S12C	●				–	95	160			–	–				
BNML-120085T-S16C	●	2			27	85	145	10	16	1°27′	2°30′				
BNML-120150S-S12C	●	1			–	150	220	11	12	–	–				
BNMS-160033S-S16C	●	1	8	16	–	33	93	15	16	–	–	FSW-4013H	A-15	BNM-160...	RNM-160...
BNMM-160063T-S20C	●	2			30.5	63	123	14	20	2°5′	4°				
BNML-160070S-S16C	●	1			–	70	140	15	16	–	–				
BNML-160090S-S16C	●				–	90	160			–	–				
BNML-160100T-S20C	●	2			30.5	100	166	14	20	1°15′	2°				
BNML-160110S-S16C	●	1			–	110	180	15	16	–	–				
BNML-160150S-S16C	●				–	150	220			–	–				

Note) 1. All cutters are supplied without inserts.
2. Please refer page C186-C189 for recommended cutting conditions.

Please refer page C175 for ★ Caution for the mounting on shrink-fit holder

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

Mirror Ball

C Body carbide shank

BNMTYPE

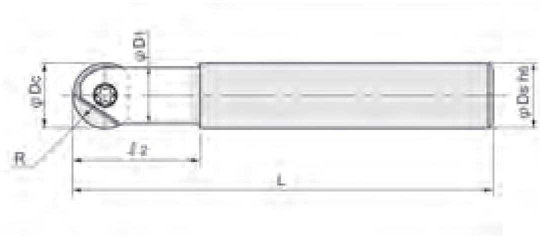


Fig.1 (Straight Neck)

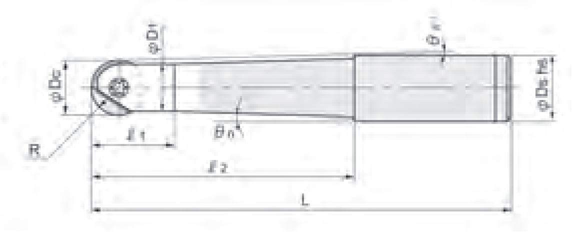
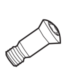
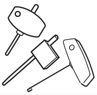
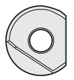
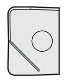


Fig.2 (Taper Neck)

■ BODY

Cat. No.	Stock	Fig.	Dimensions (mm)									Parts		Inserts	
			R	φDc	ℓ1	ℓ2	L	φD1	φDs	θκ°	θn° Taper angle	Clamp Screw 	Wrench 		
BNMS-200039S-S20C	●	1	10	20	–	39	105	19	20	–	–	FSW-5016H	A-20W	BNM-200...	RNM-200...
BNMM-200075S-S20C	●				–	75	141			–	–				
BNML-200105S-S20C	●				–	105	180			–	–				
BNML-200115T-S25C	●	2			36	115	191	17	25	1°22′	2°				
BNML-200125S-S20C	●	1			–	125	200	19	20	–	–				
BNML-200170S-S20C	●				–	170	250			–	–				
BNMM-250090S-S25C	●	1	12.5	25	–	90	166	24	25	–	–	FSW-6020	A-30	BNM-250...	RNM-250...
BNML-250140S-S25C	●				–	140	220			–	–				

Note) 1. All cutters are supplied without inserts.
2. Please refer page C186-C189 for recommended cutting conditions.

Modular Head Type Please refer Page B153

Clamp Screw	Recommended torque (N•m)	Clamp Screw	Recommended torque (N•m)
FSW-2005H	0.5	**FSW-4013H**	3.0
FSW-2506H	0.9	**FSW-5016H**	4.0
FSW-3007H	1.2	**FSW-6020**	5.0
FSW-3509H	2.0	**FSW-8025**	6.0

★ Caution for the mounting on shrink-fit holder (In case of BNM-C Body, RNM-C Body)

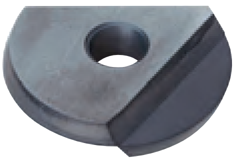
When you use a carbide shank (C Body) on the shrink-fit holder, please shrink-fit only carbide shank without putting insert and clamp screw.

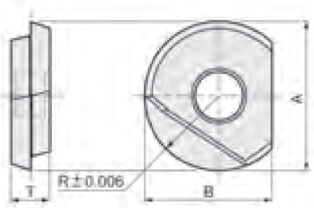
Please mount the insert and tighten the clamp screw after shrink-fit.

Note) If it shrink-fits with the insert and clamp screw, it will be difficult to loose the clamp screw.

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	T
BNM-060	●	●	●	●	**3**	6	5	2
BNM-080	●	●	●	●	**4**	8	7	2.4
BNM-100	●	●	☐	●	**5**	10	8.5	2.6
BNM-120	●	●	●	●	**6**	12	10	3
BNM-160	●	●	☐	●	**8**	16	12	4
BNM-200	●	●	●	●	**10**	20	15	5
BNM-250	●	●		☐	**12.5**	25	18.5	6
BNM-300	●	●		☐	**15**	30	22.5	7
BNM-320	●	●		●	**16**	32	23.5	7

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

Cat. No.	Uncoated	Dimensions (mm)				
	FZ05 **(Z01)**	R	A	B	C	T
BNM-060-S	●	**3**	6	5	–	2
BNM-080-S	●	**4**	8	7	0.5	2.4
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
BNM-320-S	●	**16**	32	23.5	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.

Refer the right table for recommended tightening torque.

Dimensions (mm)	Recommended torque
φDc	(N•m)
6	0.5
8	0.9
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

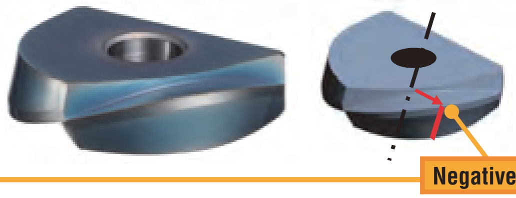
● : Standard stock items ☐ : Stock in Japan ○ : Soon to be deleted

Mirror Ball BNMTYPE

■ INSERT (S type, TG type) Mirror S

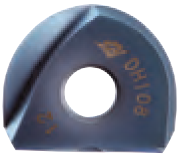
BNM-S: Standard type

BNM-TG: Stronger cutting edge type



BNM-SS Type

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



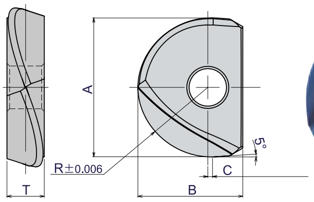
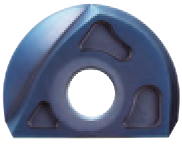
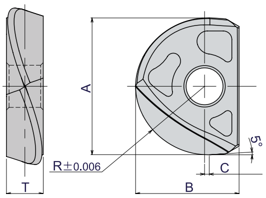


Fig. 2 Above R10
(Tool dia. Above 20mm)





Radius form accuracy of inserts: within ±0.006mm

Cat. No.	PVD coated	Dimensions (mm)				
	DH108 (Z10)	R	A	B	C	T
BNM-060-SS	●	**3**	6	5	–	2
BNM-080-SS	●	**4**	8	7	0.5	2.4
BNM-100-SS	●	**5**	10	8.5	1	2.6
BNM-120-SS	●	**6**	12	10	1	3
BNM-160-SS	●	**8**	16	12	1	4
BNM-200-SS	●	**10**	20	15	1	5
BNM-250-SS	●	**12.5**	25	18.5	1	6
BNM-300-SS	●	**15**	30	22.5	1	7
BNM-320-SS		**16**	32	23.5	1	7

Cat. No.	PVD coated	Dimensions (mm)				
	DH102 (Z01)	R	A	B	C	T
BNM-060-TG	●	**3**	6	5	–	2
BNM-080-TG	●	**4**	8	7	0.5	2.4
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) 1. “Mirror S, Mirror TG” inserts are exclusive use of MIRROR BALL. Please use only in MIRROR BALL body and modular head.
2. BNM-060-SS and BNM-060-TG don’t have straight cutting edge.

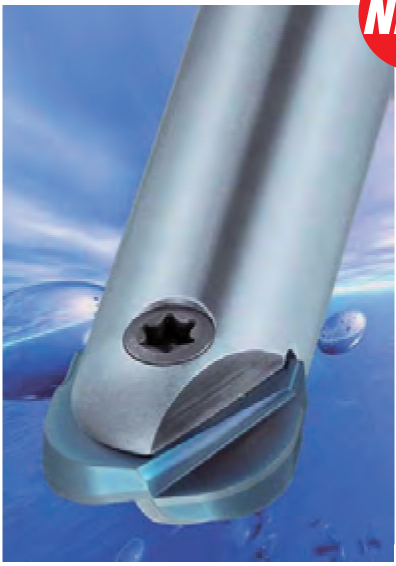
Please refer page C176 for “Instructions for mounting insert”

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

Mirror Ball GRMTYPE

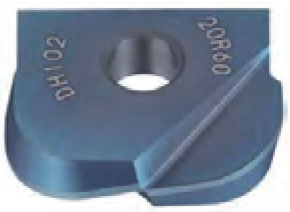
Mirror Series „MIRROR BALL“ Indexable Ball Nose End Mills

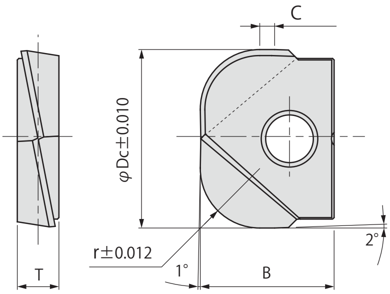
„GRM type“ radius Inserts for MIRROR BALL



NEW GRM

- Reduced the hand finishing and try out times by improved surface quality.
- Body durability is higher than ball nose end mill with same radius, therefore prevents chattering problem, and larger pick feed improved machining efficiency.
- Possible to high precision & high efficient machining even in case of low speed machine.
- Adopted new PVD coated grade “DH102” suitable for high hardened material, and PVD coated grade “JC8015” for general steel.





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	8	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 MBN type (page B153).
2. Please refer page C190-C191 for recommended cutting conditions.

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

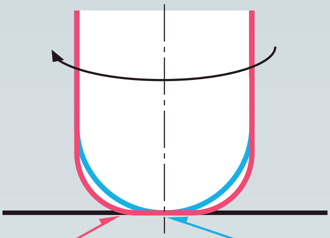
Mirror Ball

GRMTYPE

Application for choice of GRM type insert

For relatively flat surface

● Surface roughness



◎ **GRM**

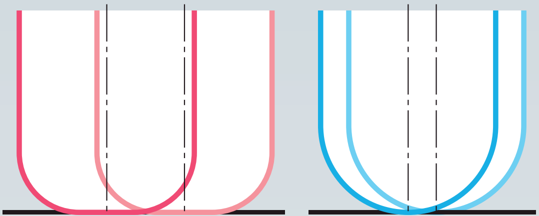
Cutting by periphery edge, therefore able to keep nominal cutting speed.

Ball nose end mill

Cutting speed at the center point becomes "0", therefore generate cutter mark easily.

Control cutter mark and achieved good surface roughness.

● Machining efficiency



◎ **GRM**

Large pick feed

Ball nose end mill

Small pick feed

Improved machining efficiency

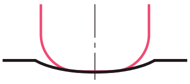
◎ **GRM** Possible to high precision & high efficient machining even in case of low speed machine.

Attention for 3D profile milling

△ **GRM**

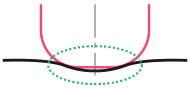
For wide concave surface

Good



For narrow concave surface

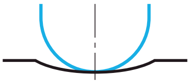
Remains stock removal.



Ball nose end mill

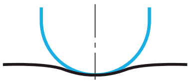
For wide concave surface

Good

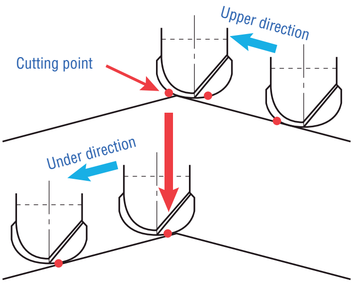


For narrow concave surface

Good



Attention for ramping milling

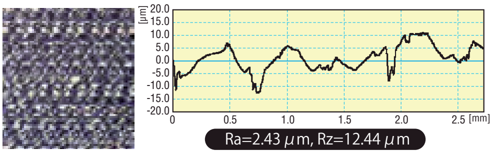


Note) Due to cutting point of insert changes at top of slope, the cutting marks sometimes changes with a program. But there are no problems with the forming accuracy.

Machined surface comparison (flat surface)

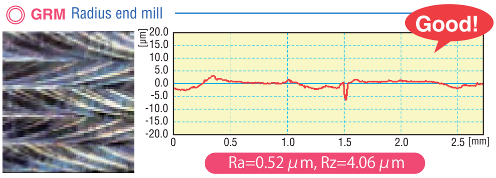
Material: FCD700 GGG70
Tool No.: MBN-300-M16＋MSN-M16-77-S32C
Insert No.: GRM-300-R100 （φ30mm × R10）
$n=8{,}000\mathrm{min}^{-1}$, $f=4{,}800\mathrm{mm/min}$, $f_z=0.6\mathrm{mm/t}$,
$a_p=0.1\mathrm{mm}$, $a_e=0.6\mathrm{mm}$

● Ball nose end mill



Ra=2.43 μm, Rz=12.44 μm

◎ **GRM** Radius end mill



Ra=0.52 μm, Rz=4.06 μm

Mirror Ball BNMTYPE

CONTROLLED TORQUE WRENCH (WITH REPLACEABLE BLADE)

● **Tightening a screw is controlled with proper torque wrench**

Wrenches are pre-set to protect screws and tools against damage during tightening and loosening processes. This wrench is recommended to use especially with Mirror ball.

● **Size: T6, T7, T8, T10**

● **Replaceable blades**

● Controlled torque wrench (with replaceable blade)

Cat. No.	Torx No.	Torque value	Applicable blades	Applicable holders
TQC-06	T6	0.5Nm	B-06	BNM○-06…type RNM○-06…type
TQC-07	T7	0.9Nm	B-07	BNM○-08…type RNM○-08…type
TQC-08	T8	1.2Nm	B-08	BNM○-10…type RNM○-10…type
TQC-10	T10	2.0Nm	B-10	BNM○-12…type RNM○-12…type

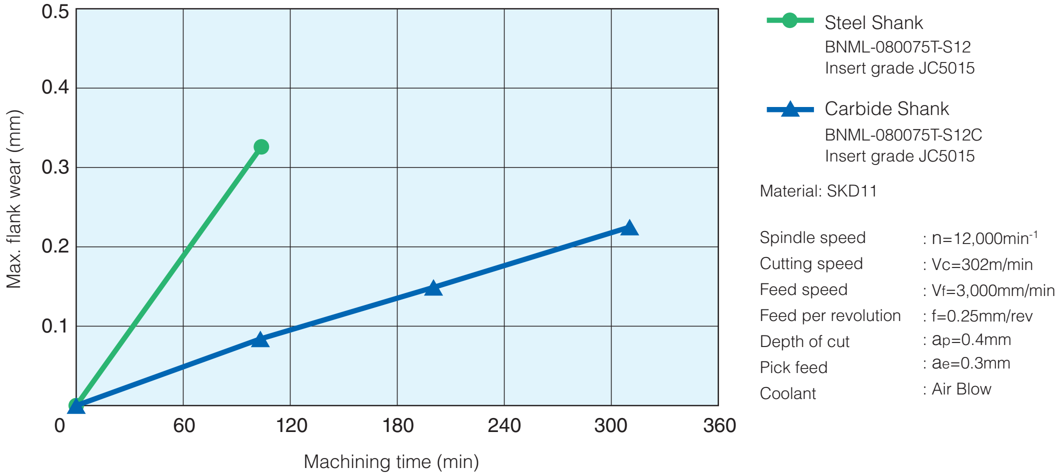
● Blades

Cat. No.	Torx No.	Applicable torque control wrench
B-06	T6	TQC-06
B-07	T7	TQC-07
B-08	T8	TQC-08
B-10	T10	TQC-10

Mirror Ball **BNMTYPE**

CUTTING PERFORMANCE

● Tool Life Comparison "Carbide Shank C Body carbide shank vs Steel Shank"



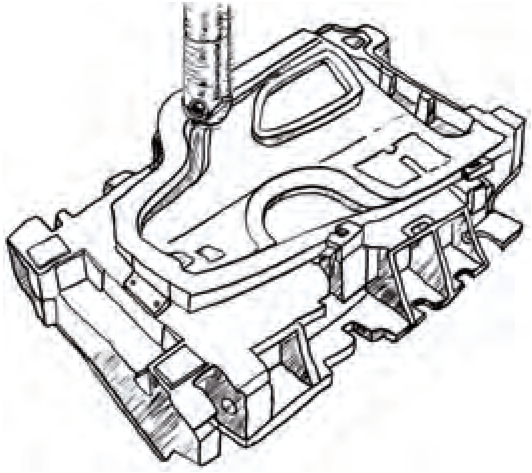
Material: SKD11

Spindle speed	: n=12,000min^{-1}
Cutting speed	: Vc=302m/min
Feed speed	: Vf=3,000mm/min
Feed per revolution	: f=0.25mm/rev
Depth of cut	: ap=0.4mm
Pick feed	: ae=0.3mm
Coolant	: Air Blow

● Tool Life Comparison MIRROR BALL Carbide Shank vs Competitior A's Carbide Shank.

Cutting condition

Work material:	Hardened die steel
Hardness:	60HRC
Part name:	Press die
Cutting speed:	Vc=402m/min
Spindle speed:	n=8,000min^{-1}
Feed speed:	Vf=4,000mm/min
Feed per revolution:	f=0.5mm/rev
Depth of cut:	ap=0.2mm
Pick feed:	ae=0.3mm
Coolant:	Dry
Spindle:	HSK50E



Test results

Tool name	Machining time	Wear of rake face	Wear of flank face
DIJET MIRROR BALL Carbide Shank φ16	**9 hours**	**Normal wear**	**Normal wear**
Competitor A (Carbide shank)	6~7 hours	Worn out	Worn out

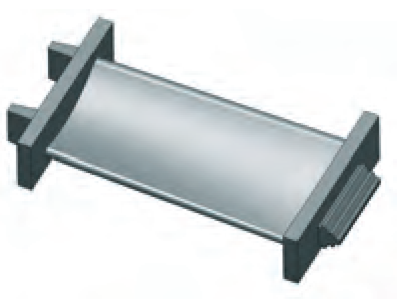
- **DIJET MIRROR BALL Carbide Shank (C-Body) completed the job and the condition of insert was still good after 9 hours.**
- **Competitor A's insert worn out in 4 hours only and could not maintain 0.05 targeting tolerance after 6-7 hours.**

Mirror Ball **BNM**TYPE

CASE STUDIES

1. Replacement of solid carbide ball nose end mill with Mirror ball.

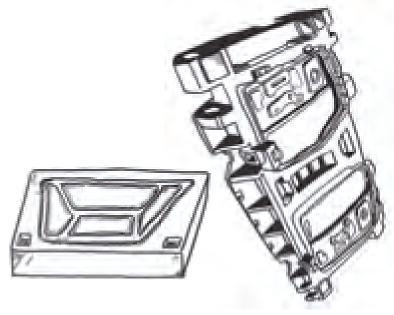
Overhung length: 40mm



Result Mirror ball achieved very good finishing. No chatter marks was observed on blade surface compared with the competitor's solid carbide ball nose end mill.

Work	Part name	Turbine blade
	Material	Stainless steel (SUS420)
	Hardness	—
Tool	Tool No.	BNMM-080035S-S08C
	Grade	BNM-080 (JC5015)
Cutting conditions	Vc, (n)	n=2,000min^{-1}, Vc=50m/min
	Vf, (f)	Vf=800mm/min, f=0.4mm/rev
	ap (mm)	0.15mm
	ae (mm)	0.15mm
	Coolant	Oil coolant
	Machine	Vertical MC

2. Replacement of steel shank body with carbide shank body.

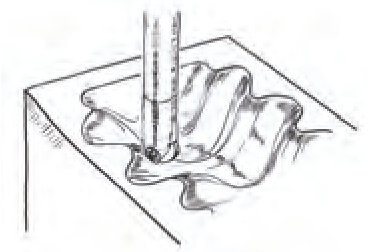


Result Achieved long tool life 5,080m and improved surface roughness compared with exisiting steel shank. Reduced the hand finishing process by 10 hours.

Work	Part name	Stamping die
	Material	GM241 (Cast steel)
	Hardness	250-300 HB
Tool	Tool No.	BNML-300170S-S32C (C Body)
	Grade	BNM-300, JC5015
Cutting conditions	Vc, (n)	6,000min^{-1}, 565m/min
	Vf, (f)	5,000mm/min, 0.83mm/rev
	ap (mm)	0.1mm
	ae (mm)	0.7mm
	Coolant	Dry
	Machine	Double column MC

3. Replacement of solid carbide ball nose end mill.

Semi-Finishing・Finishing by Carbide Shank



Tool life: 2 hours

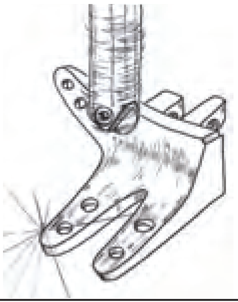
Result Exisiting solid carbide ball nose end mill n=9,000min^{-1}, Vf=2,800mm/min Improved machining time by 20%. Next polishing process is drastically reduced.

Work	Part name	Rubber mold
	Material	SUS630
	Hardness	35HRC
Tool	Tool No.	BNMM-060035S-S06C (C Body)
	Grade	BNM-060, JC5015
Cutting conditions	Vc, (n)	14,400min^{-1}, 271m/min
	Vf, (f)	2,880mm/min, 0.2mm/rev
	ap (mm)	Semi-fnishing 0.1mm, Finishing 0.05mm
	ae (mm)	0.1mm
	Coolant	Mist coolant
	Machine	High speed vertical MC

Mirror Ball BNMTYPE

CASE STUDIES

4. High speed & high precision machining (Aircraft parts)

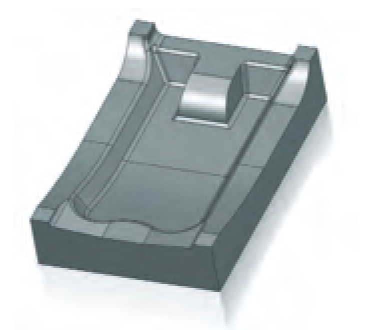
<table>
<tr><td colspan="2" rowspan="8">Required surface roughness Rz: 6.3μm
</td><td rowspan="3">Work</td><td>Part name</td><td>Vertical tail parts</td></tr>
<tr><td>Material</td><td>SCM440</td></tr>
<tr><td>Hardness</td><td>40HRC</td></tr>
<tr><td rowspan="2">Tool</td><td>Tool No.</td><td>BNML-120095S-S12C (C Body)</td></tr>
<tr><td>Grade</td><td>BNM-120, JC5015</td></tr>
<tr><td rowspan="6">Cutting conditions</td><td>Vc, (n)</td><td>10,000min^{-1}, 377m/min</td></tr>
<tr><td>Vf, (f)</td><td>800mm/min, 0.08mm/rev</td></tr>
<tr><td>a_p (mm)</td><td>0.2mm</td></tr>
<tr><td rowspan="3">Result</td><td rowspan="3">No chatter and very smooth cutting. Improved surface quality compared with solid ball nose end mill. Achieved the reduction in machining time.</td><td>a_e (mm)</td><td>0.1mm</td></tr>
<tr><td>Coolant</td><td>Water soluble</td></tr>
<tr><td>Machine</td><td>Vertical MC</td></tr>
</table>

Mirror Ball

Mirror S **BNM**TYPE

■ CASE STUDIES “MIRROR S”

1. Replacement of solid carbide ball nose end mill with Mirror ball.

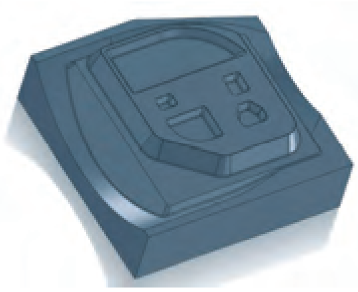


Work	Part name	Upper die
	Material	Die steel
	Hardness	32-35HRC
Tool	Tool No.	BNMM-250090S-S25C
	Grade	BNM-250-S (JC8008)
Cutting conditions	Vc, (n)	n=3,000min^{-1}, Vc=235m/min
	Vf, (f)	Vf=2,500mm/min, f=0.83mm/rev
	ap (mm)	0.3mm
	ae (mm)	0.25mm
	Coolant	Dry
	Machine	Vertical MC

Result After machining 18 hours, BNM-S insert showed just normal wear. Work surface was also good compared with competitor’s tool.

2. Finishing by Mirror ball.

Overhung length 150mm~160mm

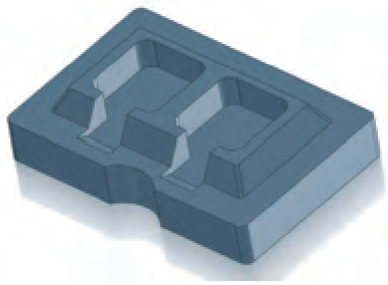


Work	Part name	—
	Material	ZAS
	Hardness	—
Tool	Tool No.	BNML-300160T-S32
	Grade	BNM-300-S (FZ05)
Cutting conditions	Vc, (n)	n=2,200min^{-1}, Vc=207m/min
	Vf, (f)	Vf=2,000mm/min, f=0.9mm/rev
	ap (mm)	0.6mm
	ae (mm)	0.6mm
	Coolant	Air blow
	Machine	Vertical MC

Result Smoother cutting and 2 times longer tool life than competitor A.

3. Replacement of solid carbide ball nose end mill with Mirror ball.

Overhung length: 30 mm with shrink fit holder

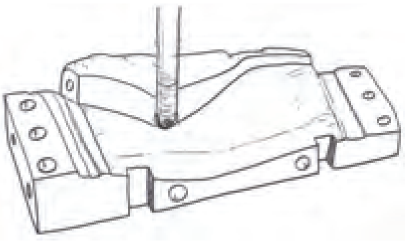


Work	Part name	Insert core
	Material	Die steel (DH21: heat-treated)
	Hardness	48HRC
Tool	Tool No.	BNMS-100030S-S10C
	Grade	BNM-100-S (JC8008)
Cutting conditions	Vc, (n)	n=10,000min^{-1}, Vc=314m/min
	Vf, (f)	Vf=3,000mm/min, f=0.3mm/rev
	ap (mm)	0.1mm
	ae (mm)	0.1mm
	Coolant	Air blow
	Machine	Vertical MC

Result Machining with Mirror ball could give more tool life than the competitor’s solid carbide ball nose end mill.

■ CASE STUDIES “MIRROR S”

4. Super finishing by MIRROR S insert.



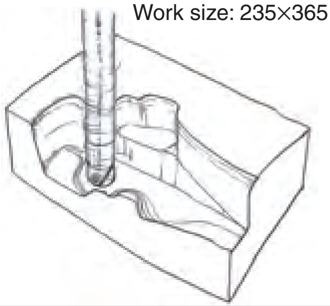
Result

Achieved excellent surface roughness, observed VBmax= below 0.025mm even after 5.7 hours machining. Insert was still in good condition.

Work	Part name	Bumper mold
	Material	S55C
	Hardness	—
Tool	Tool No.	BNML-200105S-S20C
	Grade	BNM-200-S, JC8008
Cutting conditions	Vc, (n)	8,000min^{-1}, 503m/min
	Vf, (f)	4,000mm/min, 0.5mm/rev
	ap (mm)	0.05mm
	ae (mm)	0.4mm
	Coolant	Mist coolant
	Machine	Vertical MC

5. Finishing on high hardened die steel

Finishing on full hardened draw die
Work size: 235×365



Result

No chatter and very smooth cutting. Mirror S could finish entire job for 5.5h. Flatness was within 0.05mm.

Work	Part name	Stamping die
	Material	SKD11
	Hardness	58~62HRC
Tool	Tool No.	BNML-160090S-S16C
	Grade	BNM-160-S, JC8008
Cutting conditions	Vc, (n)	5,000min^{-1}, 250m/min
	Vf, (fz)	2,300mm/min, 0.46mm/rev
	ap (mm)	0.2mm
	ae (mm)	0.3mm
	Coolant	Dry cut
	Machine	Vertical MC

Mirror Ball BNMTYPE

GENERAL RECOMMENDED CUTTING CONDITIONS

Calculation of cutting conditions

1. Spindle speed

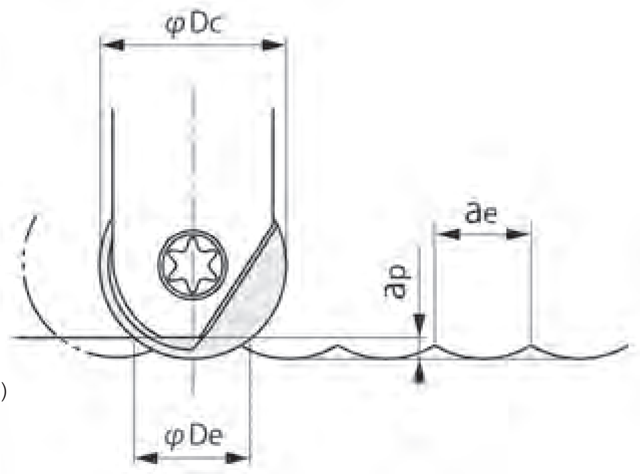
$$n=\frac{Vc\times 1000}{\pi\times De}\ (\mathrm{min}^{-1})$$

$$De=2\times\sqrt{ap\times(Dc-ap)}\,(\mathrm{mm})$$

2. Feed speed

$$Vf=n\times f\ (\mathrm{mm/min})$$

$$f=h\ \mathrm{max.}\times\frac{Dc}{\sqrt{ap\times(Dc-ap)}}\ (\mathrm{mm/rev})$$



n = Spindle speed (min^{-1})
Vc = Cutting speed (m/min), refer Table 1.
De = Effective tool diameter (mm), refer Table 2.
ap = Axial depth of cut (mm)
ae = Pick feed, radial depth of cut (mm)
Vf = Feed speed (mm/min)
f = feed per revolution (mm/rev), refer Table 1.
h max. = Max. chip thickness (mm), refer Table 3.

Table 1. Nominal cutting speed and feed values

Work Materials	Hardness	Insert Grades			Cutting speed Vc (m/min)	Nominal feed rate: f (mm/rev)									Max depth of cut ap (mm)	Max pick feed ae (mm)
						Tool dia. Dc (mm)										
		JC8003 DH103	JC10000	KT9		6	8	10	12	16	20	25	30	32		
Grey cast iron (FC250, FC300)	160~260HB	◎			200~400	0.2	0.3	0.4	0.5	0.6	0.6	0.7	0.7	0.7	Dc/10	Dc/10
Nodular cast iron (FCD600, FCD700)	170~300HB	◎			150~350	0.2	0.3	0.4	0.5	0.6	0.6	0.7	0.7	0.7	Dc/15	Dc/15
Carbon steel (S50C, S55C)	180~280HB	○			180~230	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.6	Dc/15	Dc/15
Low alloy steel (SCM440)	180~280HB	○			150~200	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.6	Dc/15	Dc/15
Mold steel (HPM, NAK)	280~400HB	◎			110~170	0.15	0.25	0.3	0.4	0.4	0.4	0.5	0.5	0.5	Dc/20	Dc/20
Tool & Die steel (SKD61, SKD11)	180~255HB	○			130~180	0.15	0.25	0.3	0.4	0.5	0.5	0.6	0.6	0.6	Dc/20	Dc/20
Hardened steel (SKD61, SKD11)	40~55HRC	◎			70~ 90	0.15	0.25	0.3	0.4	0.5	0.5	0.6	0.6	0.6	Dc/30	Dc/30
Stainless steel (SUS304, SUS316)	150~250HB	○			90~130	0.15	0.25	0.3	0.4	0.4	0.4	0.5	0.5	0.5	Dc/20	Dc/20
Copper alloy	80~150HB			◎	150~200	0.25	0.4	0.5	0.6	0.7	0.7	0.8	0.8	0.8	Dc/10	Dc/10
Aluminium alloy	30~100HB			◎	200~300	0.25	0.4	0.5	0.6	0.7	0.7	0.8	0.8	0.8	Dc/6	Dc/6
Graphite			◎		200~400	0.3	0.5	0.6	0.7	0.8	0.8	0.9	0.9	0.9	Dc/5	Dc/5

Note) 1. Data is applicable to short series tools and over φ12mm middle series tools.
2. Refer table 4 for additional data in case of using long series tools and up to φ12mm middle series tools.

◎:First choice
○:Second choice

Mirror Ball

BNMTYPE

Table 2. Effective tool diameter chart

Tool dia. φDc (mm)	Effective tool diameter: De (mm)													
	Axial depth of cut: ap (mm)													
	0.2	**0.3**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**	**5.5**	**6.0**
6	2.2	2.6	3.3	4.5										
8	2.5	3	3.9	5.3	6.2									
10	2.8	3.4	4.4	6	7.1	8								
12	3.1	3.7	4.8	6.6	7.9	8.9	9.7							
16	3.6	4.3	5.6	7.7	9.3	10.6	11.6	12.5						
20	4	4.9	6.2	8.7	10.5	12	13.2	14.3	15.2	16				
25	4.5	5.4	7	9.8	11.9	13.6	15	16.2	17.3	18.3	19.2	20		
30	4.9	6	7.7	10.8	13.1	15	16.6	18	19.3	20.4	21.4	22.4	23.2	24
32	5	6.2	7.9	11.1	13.5	15.5	17.2	18.7	20	21.2	22.2	23.2	24.1	25

Table 3. Maximum chip thickness chart

Work Materials	Hardness	Max. chip thickness: h max (mm)								
		Tool dia.: Dc (mm)								
		6	**8**	**10**	**12**	**16**	**20**	**25**	**30**	**32**
Grey cast iron (FC250, FC300)	160~260HB	0.07	0.09	0.12	0.15	0.18	0.18	0.21	0.21	0.21
Nodular cast iron (FCD600, FCD700)	170~300HB	0.05	0.07	0.10	0.12	0.15	0.15	0.17	0.17	0.17
Carbon steel (S50C, S55C)	180~280HB	0.05	0.07	0.10	0.10	0.12	0.12	0.15	0.15	0.15
Low alloy steel (SCM440)	180~280HB	0.05	0.07	0.10	0.10	0.12	0.12	0.15	0.15	0.15
Mold steel (HPM, NAK)	280~400HB	0.03	0.05	0.065	0.09	0.09	0.09	0.11	0.11	0.11
Tool & Die steel (SKD61, SKD11)	180~255HB	0.03	0.05	0.065	0.09	0.11	0.11	0.13	0.13	0.13
Hardened die steel (SKD61, SKD11)	40~55HRC	0.02	0.04	0.05	0.07	0.09	0.09	0.11	0.11	0.11
Stainless steel (SUS304, SUS316)	150~250HB	0.03	0.05	0.065	0.09	0.09	0.09	0.11	0.11	0.11
Copper alloy	80~150HB	0.10	0.12	0.15	0.18	0.21	0.21	0.24	0.24	0.24
Aluminium alloy	30~100HB	0.12	0.15	0.18	0.22	0.26	0.26	0.30	0.30	0.30
Graphite		0.15	0.20	0.24	0.28	0.32	0.32	0.36	0.36	0.36

Table 4. Reduction ratio of recommended cutting conditions

Tool dia. φDc (mm)	Short series				Middle series				Long series			
	ℓ2	ℓ2/Dc	min^{-1} %	Feed %	ℓ2	ℓ2/Dc	min^{-1} %	Feed %	ℓ2	ℓ2/Dc	min^{-1} %	Feed %
6	30	5.0	100	100	35	5.8	100	100	70	11.7	45	45
8	35	4.4	100	100	53	6.6	60	65	75	9.4	50	50
10	35	3.5	100	100	53	5.3	70	80	75	7.5	60	65
12	26	2.2	100	100	53	4.4	90	90	85	7.1	65	65
16	32	2.0	100	100	63	3.9	100	100	100	6.3	70	70
20	38	1.9	100	100	75	3.8	100	100	115	5.8	75	75
25	45	1.8	100	100	90	3.6	100	100	135	5.4	80	80
30	53	1.8	100	100	106	3.5	100	100	160	5.3	80	90
32	53	1.7	100	100	106	3.3	100	100	160	5.0	80	90

Note) In case of using long series tools, recommend to reduce cutting conditions as per the above percentages.

Mirror Ball **BNMTYPE**

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● BNM type insert + Carbide shank holder (C-Body)

Work Materials	Hardness	Insert Grades	Cutting speed Vc (m/min)	Nominal feed rate f (mm/rev) Tool dia. Dc (mm)									Max depth of cut ap (mm)	Max depth of cut ap (mm)
				6	**8**	**10**	**12**	**16**	**20**	**25**	**30**	**32**		
Grey cast iron (FC250, FC300)	160~260HB	DH103	400~500	0.4	0.5	0.5	0.6	0.8	0.8	1.0	1.0	1.0	0.1~0.3	Dc/40
Nodular cast iron (FCD600, FCD700)	170~300HB	DH103	300~400	0.3	0.4	0.4	0.5	0.6	0.6	0.8	0.8	0.8	0.1~0.3	Dc/40
Carbon steel (S50C, S55C)	180~280HB	DH103	300~400	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.7	0.1~0.3	Dc/50
Low alloy steel (SCM440)	180~280HB	DH103	300~400	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.7	0.1~0.3	Dc/50
Mold steel (HPM, NAK)	280~400HB	DH103	300~350	0.25	0.3	0.3	0.4	0.5	0.5	0.6	0.6	0.6	0.1~0.2	Dc/50
Tool & Die steel (SKD61, SKD11)	180~255HB	DH103	300~350	0.25	0.3	0.3	0.4	0.4	0.4	0.6	0.6	0.6	0.1~0.2	Dc/50
Hardened die steel (SKD61, SKD11)	40~55HRC	DH103	250~350	0.25	0.3	0.3	0.4	0.5	0.5	0.6	0.6	0.6	0.1~0.2	Dc/50
Hardened die steel (SKD61, SKD11)	55HRC~	DH103	150~250	0.2	0.25	0.3	0.4	0.5	0.5	0.6	0.6	0.6	0.1~0.2	Dc/50
Stainless steel (SUS304, SUS316)	150~250HB	DH103	200~300	0.25	0.35	0.45	0.6	0.65	0.7	0.8	0.8	0.8	0.1~0.2	Dc/50
Copper alloy	80~150HB	KT9	300~400	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.7	0.1~0.5	Dc/40
Aluminium alloy	30~100HB	KT9	400~500	0.35	0.5	0.5	0.6	0.7	0.7	0.8	0.8	0.8	0.1~0.5	Dc/40
Graphite		JC10000	600~800	0.4	0.6	0.6	0.7	0.8	0.8	0.9	0.9	0.9	0.1~0.5	Dc/40

Note) This data is applicable to short series tools and middle series tools.

Mirror Ball

BNMTYPE

■ RECOMMENDED CUTTING CONDITIONS

● BNM-SS, BNM-TG type insert Carbide shank holder (C-Body)

Work Materials	Insert Grades	Cutting speed Vc (m/min)	Nominal feed rate f (mm/rev)									Max depth of cut ap (mm)	Max pick feed ae (mm)
			Tool dia. Dc (mm)										
			6	8	10	12	16	20	25	30	32		
Greycastiron (FC250, FC300) 160~260HB	DH102 DH108	400~500	0.2~0.35	0.25~0.4	0.3~0.5	0.4~0.6	0.5~0.7	0.6~0.8	0.6~0.8	0.8~1.0	0.8~1.0	0.02Dc	0.025Dc
Nodular cast iron (FCD600, FCD700) 170~300HB	DH102 DH108	300~400	0.2~0.3	0.25~0.35	0.3~0.4	0.4~0.5	0.5~0.6	0.5~0.7	0.5~0.7	0.6~0.8	0.6~0.8	0.02Dc	0.025Dc
Carbon steel (S50C, S55C) 180~280HB	DH108	300~400	0.2~0.3	0.25~0.35	0.3~0.4	0.3~0.5	0.4~0.6	0.4~0.6	0.4~0.7	0.5~0.8	0.5~0.8	0.02Dc	0.02Dc
Low alloy steel (SCM440) 180~280HB	DH108	300~400	0.2~0.3	0.25~0.35	0.3~0.4	0.3~0.5	0.4~0.6	0.4~0.6	0.4~0.7	0.5~0.8	0.5~0.8	0.02Dc	0.02Dc
Mold steel (HPM, NAK) 280~400HB	DH108	300~400	0.2~0.3	0.25~0.35	0.3~0.4	0.3~0.5	0.4~0.6	0.4~0.6	0.4~0.7	0.5~0.8	0.5~0.8	0.02Dc	0.02Dc
Tool & Die steel (SKD61, SKD11) 180~255HB	DH108	300~400	0.2~0.3	0.25~0.35	0.3~0.4	0.3~0.5	0.4~0.6	0.4~0.6	0.4~0.7	0.5~0.8	0.5~0.8	0.02Dc	0.02Dc
Hardened die steel (SKD61, SKD11) 40~55HRC	DH102 DH108	200~300	0.15~0.25	0.2~0.3	0.25~0.3	0.3~0.4	0.4~0.5	0.4~0.5	0.4~0.6	0.4~0.7	0.4~0.7	0.015Dc	0.02Dc
Hardened die steel (SKD61, SKD11) 56~63HRC	DH102 DH108	150~250	0.15~0.25	0.2~0.3	0.25~0.3	0.3~0.4	0.4~0.5	0.4~0.5	0.4~0.6	0.4~0.7	0.4~0.7	0.01Dc	0.02Dc
Stainless steel (SUS304, SUS316) 150~250HB	DH108	250~350	0.2~0.3	0.25~0.35	0.3~0.4	0.3~0.5	0.4~0.6	0.4~0.6	0.4~0.7	0.5~0.8	0.5~0.8	0.02Dc	0.02Dc
Copper alloy 80~150HB	JC20003 FZ05	300~400	0.2~0.35	0.25~0.4	0.3~0.5	0.4~0.6	0.5~0.7	0.6~0.8	0.6~0.8	0.8~1.0	0.8~1.0	0.02Dc	0.025Dc
Aluminium alloy 30~100HB		400~500	0.2~0.35	0.25~0.4	0.3~0.5	0.4~0.6	0.5~0.7	0.6~0.8	0.6~0.8	0.8~1.0	0.8~1.0	0.03Dc	0.03Dc
Graphite	JC20003	600~800	0.2~0.35	0.25~0.4	0.3~0.5	0.4~0.6	0.5~0.7	0.6~0.8	0.6~0.8	0.8~1.0	0.8~1.0	0.03Dc	0.03Dc

Note) This data is applicable to short series tools and middle series tools.

Mirror Ball GRMTYPE

■ H.S.C. RECOMMENDED CUTTING CONDITIONS

● BNM-C (carbide shank) with GRM insert

Work Materials	Grades	Cutting speed Vc (m/min)	Tool dia. (mm)				Depth of cut ap (mm)	Profile milling Max. Pick ae (mm)	Face milling Pick ae (mm)
			φ16 x R5		φ20 x R6				
			n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)			
Grey cast iron (160-260HB)	DH102	750	15,000	10,000	12,000	9,000	0.05–0.15	0.02D	~0.20D
Nodular cast iron (170-300HB)	DH102 (JC8015)	600	12,000	7,000	9,600	6,700	0.05–0.15	0.02D	~0.20D
Carbon steel (180-280HB)	DH102 (JC8015)	600	12,000	7,000	9,600	6,700	0.05–0.15	0.02D	~0.15D
Low alloy steel (180-280HB)	DH102 (JC8015)	600	12,000	7,000	9,600	6,700	0.05–0.15	0.02D	~0.15D
Tool & die steel (180-255HB)	DH102 (JC8015)	600	12,000	7,000	9,600	6,700	0.05–0.15	0.02D	~0.15D
Mold steel (30-36HRC)	DH102 (JC8015)	550	11,000	5,500	8,800	4,400	0.05–0.15	0.015D	~0.15D
Mold steel (38-43HRC)	DH102	500	10,000	5,000	8,000	4,000	0.05–0.15	0.015D	~0.15D
Hardened die steel (40-55HRC)	DH102	450	9,000	4,500	7,200	3,600	0.05–0.15	0.015D	~0.10D
Hardened die steel (56-63HRC)	DH102	300	6,000	3,000	4,800	2,400	0.05–0.1	0.015D	~0.10D
Stainless steel (150-250HB)	DH102 (JC8015)	400	8,000	4,800	6,400	3,800	0.05–0.15	0.02D	~0.15D

Work Materials	Grades	Cutting speed Vc (m/min)	Tool dia. (mm)				Depth of cut ap (mm)	Profile milling Max. Pick ae (mm)	Face milling Pick ae (mm)
			φ25 x R8		φ30 x R10				
			n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)			
Grey cast iron (160-260HB)	DH102	750	9,600	8,000	8,000	8,000	0.05–0.15	0.02D	~0.20D
Nodular cast iron (170-300HB)	DH102 (JC8015)	600	7,700	6,000	6,500	6,000	0.05–0.15	0.02D	~0.20D
Carbon steel (180-280HB)	DH102 (JC8015)	600	7,700	6,000	6,500	6,000	0.05–0.15	0.02D	~0.15D
Low alloy steel (180-280HB)	DH102 (JC8015)	600	7,700	6,000	6,500	6,000	0.05–0.15	0.02D	~0.15D
Tool & die steel (180-255HB)	DH102 (JC8015)	600	7,700	6,000	6,500	6,000	0.05–0.15	0.02D	~0.15D
Mold steel (30-36HRC)	DH102 (JC8015)	550	7,000	4,200	5,800	4,000	0.05–0.15	0.015D	~0.15D
Mold steel (38-43HRC)	DH102	500	6,400	3,800	5,300	3,700	0.05–0.15	0.015D	~0.15D
Hardened die steel (40-55HRC)	DH102	450	5,750	3,450	4,800	3,360	0.05–0.15	0.015D	~0.10D
Hardened die steel (56-63HRC)	DH102	300	3,850	2,300	3,200	2,200	0.05–0.1	0.015D	~0.10D
Stainless steel (150-250HB)	DH102 (JC8015)	400	5,100	3,600	4,200	3,300	0.05–0.15	0.02D	~0.15D

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 (mm)	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 GRMTYPE

■ RECOMMENDED CUTTING CONDITIONS

● BNM-C (carbide shank) with GRM insert

Work Materials	Grades	Cutting speed Vc (m/min)	Tool dia. (mm)				Depth of cut ap (mm)	Profile milling Max. Pick ae (mm)	Face milling Pick ae (mm)
			φ16 x R5		φ20 x R6				
			n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)			
Grey cast iron (160-260HB)	DH102 (JC8015)	450	9,000	4,500	7,200	4,300	0.1–0.3	0.02D	～0.25D
Nodular cast iron (170-300HB)	DH102 (JC8015)	350	7,000	3,500	5,600	3,000	0.1–0.2	0.02D	～0.25D
Carbon steel (180-280HB)	JC8015	350	7,000	3,500	5,600	3,000	0.1–0.2	0.02D	～0.20D
Low alloy steel (180-280HB)	JC8015	350	7,000	3,500	5,600	3,000	0.1–0.2	0.02D	～0.20D
Tool & die steel (180-255HB)	JC8015	350	7,000	3,500	5,600	3,000	0.1–0.2	0.02D	～0.20D
Mold steel (30-36HRC)	DH102 (JC8015)	300	6,000	2,400	4,800	2,200	0.1–0.2	0.015D	～0.20D
Mold steel (38-43HRC)	DH102 (JC8015)	280	5,600	2,200	4,500	2,000	0.1–0.2	0.015D	～0.20D
Hardened die steel (40-55HRC)	DH102	250	5,000	2,000	4,000	1,800	0.05–0.15	0.015D	～0.15D
Hardened die steel (56-63HRC)	DH102	200	4,000	1,400	3,200	1,300	0.05–0.1	0.015D	～0.15D
Stainless steel (150-250HB)	JC8015	300	6,000	3,000	4,800	2,400	0.1–0.2	0.02D	～0.20D

Work Materials	Grades	Cutting speed Vc (m/min)	Tool dia. (mm)				Depth of cut ap (mm)	Profile milling Max. Pick ae (mm)	Face milling Pick ae (mm)
			φ25 x R5		φ30 x R10				
			n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)			
Grey cast iron (160-260HB)	DH102 (JC8015)	450	6,000	4,000	5,000	4,000	0.1–0.3	0.02D	～0.25D
Nodular cast iron (170-300HB)	DH102 (JC8015)	350	4,500	2,700	4,000	2,800	0.1–0.2	0.02D	～0.25D
Carbon steel (180-280HB)	JC8015	350	4,500	2,700	4,000	2,800	0.1–0.2	0.02D	～0.20D
Low alloy steel (180-280HB)	JC8015	350	4,500	2,700	4,000	2,800	0.1–0.2	0.02D	～0.20D
Tool & die steel (180-255HB)	JC8015	350	4,500	2,700	4,000	2,800	0.1–0.2	0.02D	～0.20D
Mold steel (30-36HRC)	DH102 (JC8015)	300	3,800	1,900	3,200	1,800	0.1–0.2	0.015D	～0.20D
Mold steel (38-43HRC)	DH102 (JC8015)	280	3,600	1,800	3,000	1,700	0.1–0.2	0.015D	～0.20D
Hardened die steel (40-55HRC)	DH102	250	3,200	1,600	2,700	1,400	0.05–0.15	0.015D	～0.15D
Hardened die steel (56-63HRC)	DH102	200	2,600	1,300	2,000	1,000	0.05–0.1	0.015D	～0.15D
Stainless steel (150-250HB)	JC8015	300	3,850	2,100	3,200	2,000	0.1–0.2	0.02D	～0.20D

n: Spindle speed, V_f: 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 (mm)	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 RNMTYPE

1. High precision indexable end mill with two effective cutting edges.
   Corner radius accuracy: within 0.010mm
   (In case of mounting RNM type insert)
2. High precision and high rigid clamping system, as same eccentric mechanism of MIRROR BALL.
   This is very well proven mechanism in industry.
3. Excellent bottom edge run-out. Establishment of high precision below 5μm which no one can duplicate. (In case of mounting RNM type insert)
4. Realization of high precision machining. Superior surface quality and minimum deflection are better than those of competitors.
5. Insert locates accurately in any of the two radial positions.
   It is entered into the body. Unlike some competitor's products.

Fig.1 (Taper Neck)

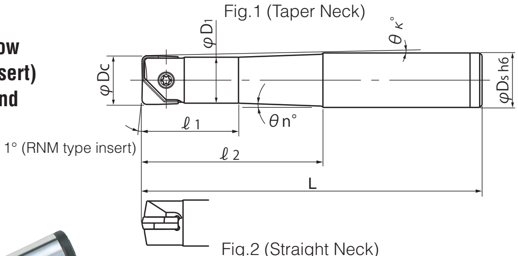
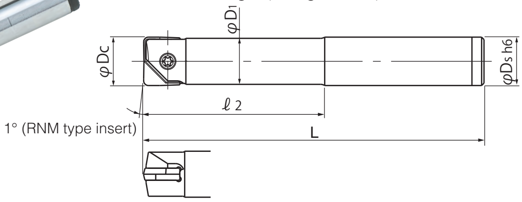
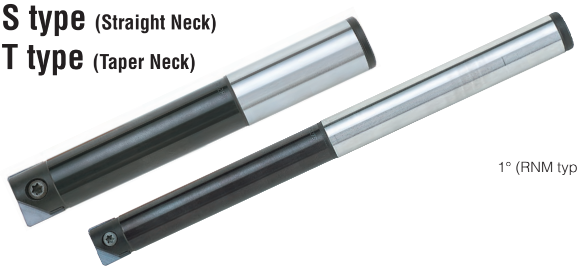


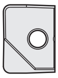
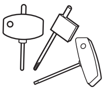
Fig.2 (Straight Neck)



RNM-S type (Straight Neck)
RNM-T type (Taper Neck)



■ BODY

Cat. No.	Stock	Dimensions (mm)								Parts			Fig.
		φDc	L	ℓ1	ℓ2	φD1	φDs	θκ°	θn° Taper angle	Inserts	Clamp screw	Wrench	
													
RNMM-080053T-S12	☐	8	110	18.5	53	7.2	12	2°10′	2°30′	RNM-080...	FSW-2506H	A-07	1
RNML-080075T-S12	☐		140	18.5	75			1°32′	2°				
RNMM-100053T-S12	☐	10	110	21	53	9	12	1°5′	2°	RNM-100...	FSW-3007H	A-08	1
RNML-100075T-S12	☐		140	21	75			0°46′	1°				
RNMM-120053S-S12	☐	12	110	–	53	11	12	–	–	RNM-120...	FSW-3509H	A-10	2
RNML-120095T-S16	☐		160	22	95		16	1°12′	1°15′	RNM-130...			1
RNMM-160070S-S16	☐	16	140	–	70	15	16	–	–	RNM-160... RNM-170...	FSW-4013H	A-15	2
RNMM-160090S-S16	☐		160	–	90			–	–				
RNML-160100S-S16	☐		200	–	100			–	–				
RNMM-200075S-S20	☐	20	141	–	75	19	20	–	–	RNM-200... RNM-210...	FSW-5016H	A-20W	2
RNMM-200105S-S20	☐		180	–	105			–	–				
RNML-200125S-S20	☐		250	–	125			–	–				
RNMM-250090S-S25	☐	25	166	–	90	24	25	–	–	RNM-250... RNM-260...	FSW-6020	A-30	2
RNMM-250140S-S25	☐		220	–	140			–	–				
RNML-250150S-S25	☐		300	–	150			–	–				
RNMM-300106S-S32	☐	30	186	–	106	29	32	–	–	RNM-300...	FSW-8025	A-40	2
RNMM-300140S-S32	☐		220	–	140			–	–				
RNMM-320106S-S32	☐	32	186	–	106	31	32	–	–	RNM-320...	FSW-8025	A-40	2
RNMM-320140S-S32	☐		220	–	140			–	–				

Note) 1. All cutters are supplied without inserts.
2. Please refer page C204 for recommended cutting conditions.

Modular Head Type **Please refer Page B163**

Clamp Screw	Recommended torque (N•m)	Clamp Screw	Recommended torque (N•m)
FSW-2005H	0.5	FSW-4013H	3.0
FSW-2506H	0.9	FSW-5016H	4.0
FSW-3007H	1.2	FSW-6020	5.0
FSW-3509H	2.0	FSW-8025	6.0

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

Mirror Radius

C Body carbide shank

RNMTYPE

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

1. By adopting carbide shank, tool rigidity is equal to solid carbide radius end mill.
2. Tool life increased to twice compared with MIRROR RADIUS steel shank.
3. Carbide shank can be used on shrink-fit type holders.
4. Insert locates accurately in any of the two radial positions. It is mounted into the cutter body.

RNM-S-C type (Straight Neck)
RNM-T-C type (Taper Neck)

Fig.1 (Taper Neck)

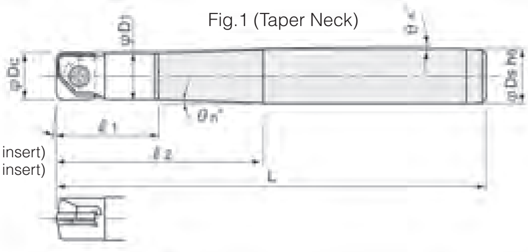


Fig.2 (Straight Neck)

■ BODY

Cat. No.	Stock	Dimensions (mm)								Parts			Fig.
		φDc	L	ℓ1	ℓ2	φD1	φDs	θκ°	θn° Taper angle	Inserts	Clamp screw	Wrench	
RNMS-060015U-S06C	●	6	60	–	15	5.7	6	–	–	RNM-060... HRM-060...	FSW-2005H	A-06	2
RNMM-060030U-S06C	●		80	–	30								
RNMS-080020U-S08C	●	8	70	–	20	7.6	8	–	–	RNM-080... HRM-080/090... FRM-080...	FSW-2506H	A-07	2
RNMM-080040U-S08C	●		90	–	40		8	–	–				2
RNMM-080053T-S12C	●		110	20	53	7.8	12	2°12′	2°				1
RNML-080075S-S08C	●		140	–	75		8	–	–				2
RNMS-100025U-S10C	●	10	75	–	25	9.5	10	–	–	RNM-100... HRM-100/110... FRM-100...	FSW-3007H	A-08	2
RNMM-100050U-S10C	●		100	–	50			–	–				2
RNMM-100050S-S10C	●		110	–	50	9.8		–	–				2
RNMM-100053T-S12C	●		110	22.5	53		12	1°7′	1°				1
RNML-100075S-S10C	●		140	–	75		10	–	–				2
RNMS-120030U-S12C	●	12	80	–	30	11.5	12	–	–	RNM-120... RNM-130... HRM-120/130... FRM-120...	FSW-3509H	A-10	2
RNMM-120060U-S12C	●		110	–	60			–	–				2
RNMM-120053S-S12C	●		110	–	53	11.8		–	–				2
RNML-120095S-S12C	●		160	–	95			–	–				
RNMS-160035U-S16C	●	16	90	–	35	15.5	16	–	–	RNM-160... RNM-170... HRM-160/170... FRM-160... FRM-170...	FSW-4013H	A-15	2
RNMM-160070S-S16C	●		140	–	70	15.8		–	–				2
RNMM-160090S-S16C	●		160	–	90			–	–				
RNML-160120S-S16C	●		210	–	120			–	–				
RNML-160150S-S16C	●		220	–	150			–	–				

Note) 1. All cutters are supplied without inserts.
2. Please refer page C205-C213 or recommended cutting conditions.

Please refer page C194 for
"Caution for the mounting onshrink-fit holder"

Modular Head Type **Please refer Page B163**

Clamp Screw	Recommended torque (N•m)	Clamp Screw	Recommended torque (N•m)
FSW-2005H	0.5	FSW-4013H	3.0
FSW-2506H	0.9	FSW-5016H	4.0
FSW-3007H	1.2	FSW-6020	5.0
FSW-3509H	2.0	FSW-8025	6.0

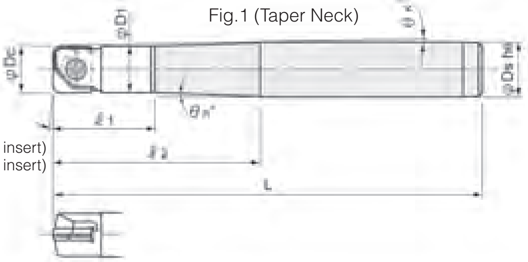
● : Standard stock items ☐ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted

Mirror Radius C Body carbide shank RNMTYPE

1. By adopting carbide shank, tool rigidity is equal to solid carbide radius end mill.
2. Tool life increased to twice compared with MIRROR RADIUS steel shank.
3. Carbide shank can be used on shrink-fit type holders.
4. Insert locates accurately in any of the two radial positions. It is mounted into the cutter body.

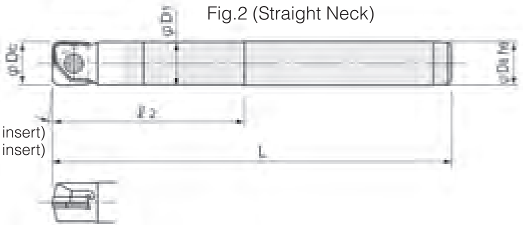
RNM-S-Ctype (Straight Neck)
RNM-T-Ctype (Taper Neck)

Fig.1 (Taper Neck)



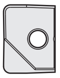
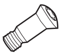
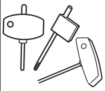
1° (RNM type insert)
3° (HRM type insert)

Fig.2 (Straight Neck)



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

■ BODY

Cat. No.	Stock	Dimensions (mm)								Parts			Fig.
		φDc	L	ℓ1	ℓ2	φD1	φDs	θκ°	θn° Taper angle	Inserts 	Clamp screw 	Wrench 	
RNMS-200040U-S20C	●	20	105	–	40	19.5	20	–	–	RNM-200… RNM-210… HRM-200/220… FRM-200/210…	FSW-5016H	A-20W	2
RNMM-200075S-S20C	●		141	–	75	19.8		–	–				2
RNMM-200105S-S20C	●		180	–	105			–	–				
RNML-200150S-S20C	●		220	–	150			–	–				
RNML-200170S-S20C	●		250	–	170			–	–				
RNMM-250090S-S25C	●	25	166	–	90	24.8	25	–	–	RNM-250… RNM-260… FRM-250…	FSW-6020	A-30	2
RNMM-250140S-S25C	●		220	–	140			–	–				
RNML-250190S-S25C	□		260	–	190			–	–				
RNMM-300106S-S32C	●	30	186	–	106	29.8	32	–	–	RNM-300… FRM-300…	FSW-8025	A-40	2
RNMM-320106S-S32C	●	32	186	–	106	31.8	32	–	–	RNM-320… FRM-320…	FSW-8025	A-40	2

Modular Head Type Please refer Page B163

Note) 1. All cutters are supplied without inserts.
2. Please refer page C205-C213 for recommended cutting conditions.

Clamp Screw	Recommended torque (N•m)	Clamp Screw	Recommended torque (N•m)
FSW-2005H	0.5	FSW-4013H	3.0
FSW-2506H	0.9	FSW-5016H	4.0
FSW-3007H	1.2	FSW-6020	5.0
FSW-3509H	2.0	FSW-8025	6.0

★ Caution for the mounting on shrink-fit holder (In case of BNM-C Body, RNM-C Body)

When you use a carbide shank (C Body) on the shrink-fit holder, please shrink-fit only carbide shank without putting insert and clamp screw.

Please mount the insert and tighten the clamp screw after shrink-fit.

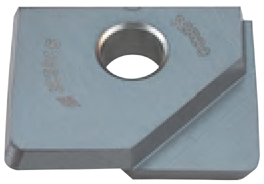
Note) If it shrink-fits with the insert and clamp screw, it will be difficult to loose the clamp screw.

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

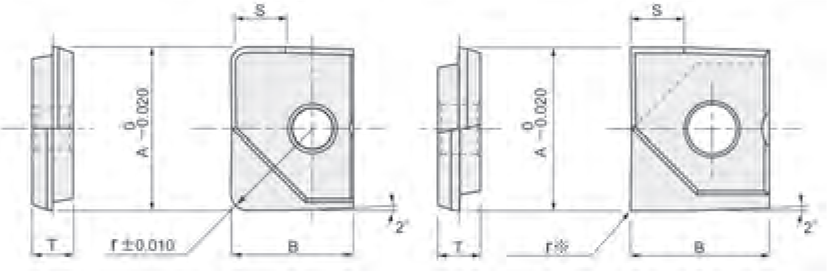
Mirror Radius RNMTYPE

■ INSERTS

Radius form accuracy of insert:
within ±0.010mm



● RNM-□□□-R0



Cat. No.	PVD coated		Diamond coated	Uncoated	Dimensions (mm)				
	JC8015 (Z10~20)	**DH103 (Z05)**	**JC10000**	**KT9 (K10)**	r	S	A	B	T
RNM-060-R03	●	●			**0.3**	2	6	5	2
RNM-060-R05	●	●			**0.5**				
RNM-060-R10	●	●			**1**				
RNM-080-R03	●	●		☐	**0.3**	2.7	8	7	2.4
RNM-080-R05	●	●	●	●	**0.5**				
RNM-080-R10	●	●	☐	●	**1**				
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**				

2 inserts per case, but grade JC10000 insert is packed in 1 piece per case.

※ Corner radius: Below 0.1mm

Note) Please refer page C204 for "Instructions for mounting insert."

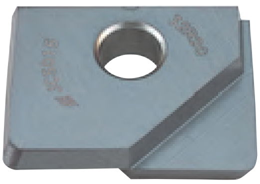
● : Standard stock items ☐ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted

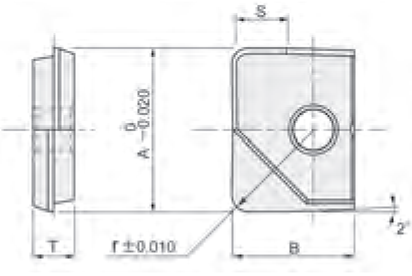
Mirror Radius

RNMTYPE

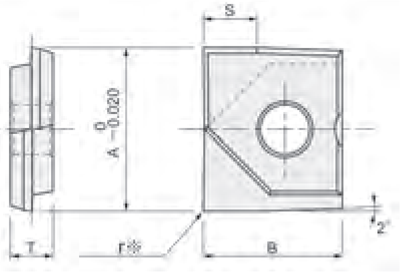
INSERTS

Radius form accuracy of insert:
within ±0.010mm





● RNM-□□□-R0



Cat. No.	PVD coated		Diamond coated	Uncoated	Dimensions (mm)				
	JC8015 (Z10~20)	DH103 (Z05)	JC10000	KT9 (K10)	r	S	A	B	T
RNM-200-R15	●	●		□	1.5	6.7	20	15	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	□				2				
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 grade JC10000 insert is packed in 1 piece per case.

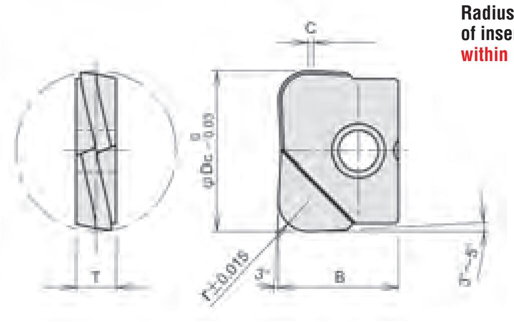
※ Corner radius: Below 0.1mm

Note) Please refer page C204 for "Instructions for mounting insert."

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

Mirror Radius HRMTYPE

INSERTS



Radius form accuracy of insert:
within ±0.015mm

Cat. No.	PVD coated	Dimensions (mm)				
	JC8015 (Z10~20)	φDc	r	B	C	T
HRM-060-R05	●	**6**	0.5	5	–	2
HRM-060-R10	●		1			
HRM-060-R15	●		1.5			
HRM-080-R20	●	**8**	2	7	0.3	2.4
HRM-090-R20	●	**9**	2	7	0.3	2.4
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

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

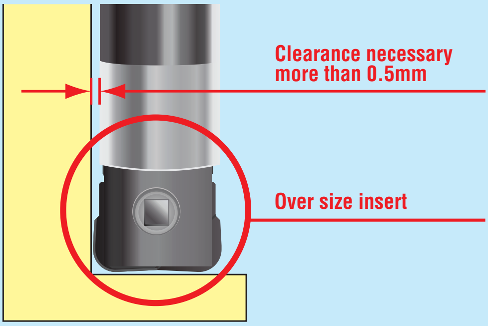
2 inserts per case

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

Features of “MIRROR RADIUS” Over size inserts

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

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



Please refer page C204 for “Instructions for mounting insert”

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

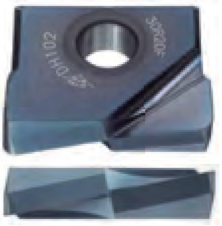
Mirror Radius FRMTYPE

NEW FRM

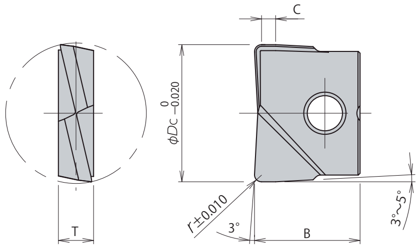
FRM type insert for MIRROR RADIUS RNM/MRN type.

- Adopted new PVD coated grade “DH102” suitable for high hardened material, and PVD coated grade “JC8015” suitable for general steel.
- Adopting positive rake cutting edge achieved low cutting force and sharpness. And available large size over 25mm.
- Intensive tool management can be possible from roughing to finishing with same body by using inserts properly.

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



Corner radius accuracy of inserts: **below ±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)				
	JC8015	DH102	φDc	r	B	C	T
FRM-060-R05	●	●	6	0.5	5	0.8	2
FRM-060-R10	●	●		1			
FRM-080-R05	●	●	8	0.5	7	1.2	2.4
FRM-080-R10	●	●		1			
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 B163).

Please see page C204 for Attention to mounting insert.

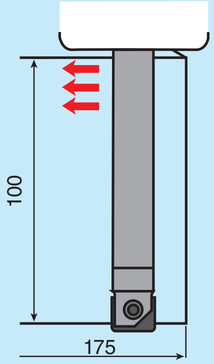
● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted

Mirror Radius

FRMTYPE

■ CUTTING PERFORMANCE OF FRM-F TYPE INSERT

Machining accuracy



- ◦ Tool dia.: φ16mm (Carbide shank)
- ◦ Material: DH31 (1.2344), 48HRC
  Work size: 100mm×175mm
- ◦ n=3,383min^{-1}, Vc=170m/min, Vf=1,200mm/min,
  f=0.35mm/rev, ap=0.8mm, ae=0.15mm
- ◦ Overhung length ℓ =105mm, Dry

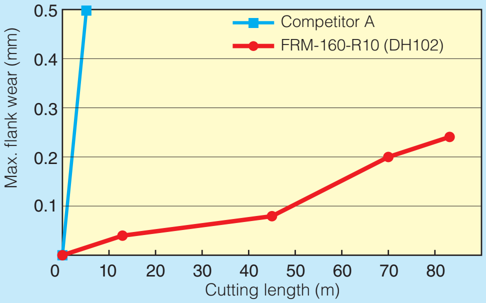
※ Measuring deflection at the center of work material.


DIJET achieved 4 times better deflection!

Tool life

■ SKD11 (1.2379), 60HRC

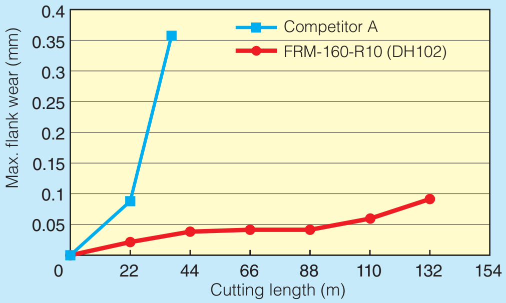
- ◦ Tool dia.: φ16mm (Carbide shank)
- ◦ n=2,785min^{-1}, Vc=140m/min, Vf=975mm/min,
  f=0.35mm/rev, ap=0.8mm, ae=0.15mm
- ◦ Overhung length ℓ =105mm, Dry



Achieved 8 times longer tool life

■ DH31 (1.2344), 48HRC

- ◦ Tool dia.: φ16mm (Carbide shank)
- ◦ n=3,383min^{-1}, Vc=170m/min, Vf=1,200mm/min,
  f=0.35mm/rev, ap=0.8mm, ae=0.15mm
- ◦ Overhung length ℓ =105mm, Dry



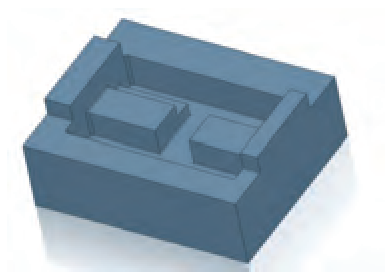
Achieved 3 times longer tool life

Mirror Radius RNMTYPE

CASE STUDIES

1. Replacement of solid carbide ball nose end mill with Mirror radius

Overhung length: 30mm

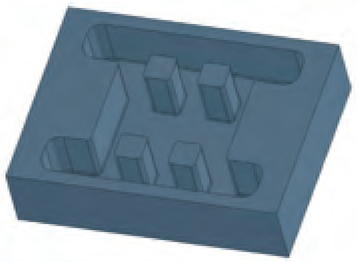


Result

Finished entire job for 5 hours by 1 insert and still able to continue. Reduced the polishing process by improved surface quality.

Work	Part name	—
	Material	Die steel (DH21: Heat treated)
	Hardness	48HRC
Tool	Tool No.	RNMM-060030U-S06C
	Grade	RNM-060-R10, JC8015
Cutting conditions	Vc, (n)	Semi-finishing: n=5,000min^{-1}, Vc=94m/min Finishing: n=10,000min^{-1}, Vc=188m/min
	Vf, (fz)	Semi-finishing: Vf=1,500mm/min, f=0.3mm/min Finishing: Vf=2,000mm/min, f=0.2mm/min
	ap (mm)	Semi-finishing: 0.25mm Finishing: 0.05mm
	ae (mm)	Semi-finishing: 3.5mm Finishing: 0.3mm
	Coolant	Air blow
	Machine	Vertical MC

2. Improved efficiency



Result

Achieved 3 times faster feed speed than competitor A

Work	Part name	Plastic mold
	Material	Mold steel (P20)
	Hardness	30-33HRC
Tool	Tool No.	RNMM-200075S-S20C
	Grade	RNM-200-R03, JC8015
Cutting conditions	Vc, (n)	n=3,200min^{-1}, Vc=200m/min
	Vf, (fz)	Vf=1,600mm/min, f=0.5mm/rev
	ap (mm)	0.05mm
	ae (mm)	10-12mm
	Coolant	Air blow
	Machine	Vertical MC

3. Replacement of solid carbide end mill with Mirror radius (Roughing for inner side wall).

Overhung length: 60mm
Work dia.: φ60

Result

Achieved 100m tool life and reduced machining time compared with competitor's solid carbide end mill.

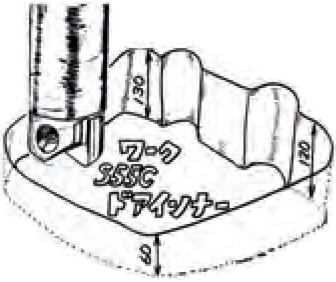
Work	Part name	Electrode
	Material	Copper (Cu)
	Hardness	—
Tool	Tool No.	RNMM-120060U-S12C
	Grade	RNM-120-R03, JC8003
Cutting conditions	Vc, (n)	n=3,000min^{-1}, Vc=113m/min
	Vf, (fz)	Vf=1,000mm/min, f=0.3mm/rev
	ap (mm)	0.5mm
	ae (mm)	5.8mm
	Coolant	Water soluble
	Machine	Vertical MC

Mirror Radius RNMTYPE

■ CASE STUDIES

4. High speed and high accuracy machining

Finishing for inner side wall

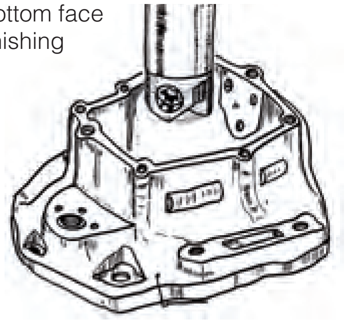


Result Achieved excellent surface accuracy with 1.7 times higher cutting speed. Deflection was below 0.005mm. RNM could finish entire job by single process.

Work	Part name	Injection mold for door inner panel
	Material	S55C
	Hardness	—
Tool	Tool No.	RNML-250150S-S25
	Grade	RNM-250-R10, JC8015
Cutting conditions	Vc, (n)	5,000min^{-1}, 393m/min
	Vf, (fz)	2,500mm/min, 0.5mm/rev
	ap (mm)	0.5mm
	ae (mm)	0.1mm
	Coolant	Dry cut
	Machine	Double column MC

5. Replacement of solid carbide ball nose end mill with Mirror radius

Bottom face finishing



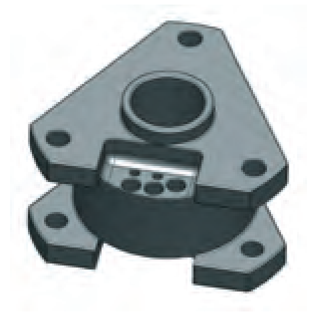
Result 2 times higher feed speed than exisiting solid carbide end mill. Observed smoother cutting and better surface roughness.

Work	Part name	Clutch case
	Material	Aluminium alloy (ADC)
	Hardness	—
Tool	Tool No.	RNMM-160100S-S16
	Grade	RNM-160-R10, JC8015
Cutting conditions	Vc, (n)	5,000min^{-1}, 251m/min
	Vf, (fz)	1,200mm/min
	ap (mm)	0.7+0.5mm 2pass
	ae (mm)	10mm
	Coolant	Wet cutting
	Machine	Vertical MC

Mirror Radius HRMTYPE

■ CASE STUDIES

6. Replacement of solid carbide ball nose end mill with Mirror radius



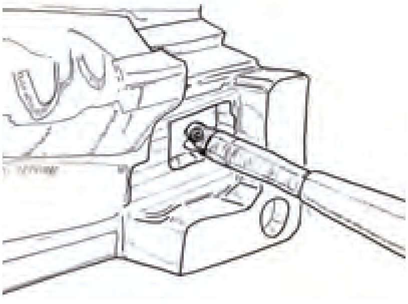
Work	Part name	Electric parts
	Material	S50C
	Hardness	–
Tool	Tool No.	RNMS-060015U-S06C
	Grade	HRM-060-R15, JC8015
Cutting conditions	Vc, (n)	n=8,000min^{-1}, Vc=150m/min
	Vf, (fz)	Vf=6,400mm/min, f=0.8mm/rev
	ap (mm)	0.2mm
	ae (mm)	0.2mm
	Coolant	Water soluble (External)
	Machine	Vertical MC

Result

3.3 times more productivity and 1.2 times longer tool life than exisiting solid carbide ball nose end mill.

7. Improved efficiency on mold steel

Overhung length: 285mm



Work	Part name	Injection mold
	Material	Pre hardened steel
	Hardness	28HRC
Tool	Tool No.	RNMM-160070S-S16C
	Grade	HRM-160-R30, JC8015
Cutting conditions	Vc, (n)	3,600min^{-1}, 181m/min
	Vf, (fz)	4,000mm/min, 1.1mm/rev
	ap (mm)	0.5mm (30' ramping until 70mm)
	ae (mm)	8mm
	Coolant	Air blow
	Machine	Horizontal MC (22kW)

Result

Reduced the machining time 1/2 of the competitor's.
Less vibration and stable machining

Mirror Radius

RNMTYPE

RECOMMENDED CUTTING CONDITIONS

● RNM type insert

Work Materials	Insert Grades	Cutting speed Vc (m/min)	Nominal feed rate: f (mm/rev)								
			Maximum ap or ae (mm)								
			Tool dia. Dc (mm)								
			6	8	10	12/13	16/17	20/21	25/26	30	32
Grey cast iron (FC250, FC300) 160~260HB	JC8003 DH103 JC8015	250	0.25	0.35	0.4	0.45	0.5	0.5	0.5	0.5	0.5
			0.2	0.3	0.3	0.4	0.5	0.7	0.8	1.0	1.0
Nodular cast iron (FCD600, FCD700) 170~300HB	JC8003 DH103 JC8015	200	0.2	0.3	0.35	0.35	0.4	0.4	0.4	0.4	0.4
			0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Carbon steel (S50C, S55C) 180~280HB	JC8003 DH103 JC8015	200	0.2	0.3	0.35	0.35	0.4	0.4	0.4	0.4	0.4
			0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Low alloy steel (SCM440) 180~280HB	JC8003 DH103 JC8015	180	0.26	0.28	0.32	0.32	0.36	0.36	0.36	0.36	0.36
			0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Mold steel (HPM, NAK) 280~400HB	JC8003 DH103 JC8015	150	0.18	0.25	0.28	0.28	0.32	0.32	0.32	0.32	0.32
			0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Tool & Die steel (SKD61, SKD11) 180~255HB	JC8003 DH103 JC8015	150	0.18	0.25	0.28	0.28	0.32	0.32	0.32	0.32	0.32
			0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Hardened die steel (SKD61, SKD11) 40~55HRC	JC8003 DH103	80	0.13	0.2	0.23	0.23	0.25	0.25	0.25	0.25	0.25
			0.2	0.3	0.3	0.3	0.3	0.4	0.5	0.6	0.6
Stainless steel (SUS304, SUS316) 150~250HB	JC8003 DH103 JC8015	130	0.13	0.2	0.23	0.23	0.25	0.25	0.25	0.25	0.25
			0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.8
Copper alloy 80~150HB	JC8003 DH103 KT9	250	0.25	0.35	0.4	0.4	0.5	0.5	0.5	0.5	0.5
			0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.6	1.6
Aluminium alloy 30~100HB	JC8003 DH103 KT9	300	0.25	0.35	0.4	0.4	0.5	0.5	0.5	0.5	0.5
			0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.6	1.6
Graphite	JC8003 DH103 JC10000	300	0.25	0.35	0.4	0.4	0.5	0.5	0.5	0.5	0.5
			0.3	0.4	0.5	0.6	0.8	1.0	1.2	1.6	1.6

Note) This data is applicable to short series tools and middle series tools.

★ 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. Please use torque wrenches to tighten the clamp screw.

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

Dimensions (mm) φDc	Recommended torque (N·m)
6	0.5
8	0.9
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

Mirror Radius

HRM/FRM TYPE

■ RECOMMENDED CUTTING CONDITIONS

● HRM, FRM type insert + Carbide shank holder (C-Body)

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

Work Materials	Insert Grades	Tool dia. (mm)									
		φ6×R1.5					φ8×R2/φ9×R2				
		ℓ (mm)	a_e (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ(mm)	a_e (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	15	2.1	0.20	9,000	8,000	20	2.8	0.40	7,500	8,200
		30	2.1	0.15	9,000	7,200	40	2.8	0.40	7,500	6,750
		–	–	–	–	–	60	2.8	0.25	7,500	6,750
		–	–	–	–	–	80	2.8	0.20	7,500	6,750
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8015	15	2.1	0.20	8,500	7,600	20	2.8	0.40	7,100	7,800
		30	2.1	0.15	8,500	6,800	40	2.8	0.40	7,100	6,400
		–	–	–	–	–	60	2.8	0.25	7,100	6,400
		–	–	–	–	–	80	2.8	0.20	7,100	6,400
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	15	2.1	0.20	8,500	7,600	20	2.8	0.40	7,100	7,800
		30	2.1	0.15	8,500	6,800	40	2.8	0.40	7,100	6,400
		–	–	–	–	–	60	2.8	0.25	7,100	6,400
		–	–	–	–	–	80	2.8	0.20	7,100	6,400
Stainless steel SUS304 Below 250HB	JC8015	15	2.1	0.20	8,000	6,400	20	2.8	0.40	6,700	7,300
		30	2.1	0.15	8,000	5,600	40	2.8	0.40	6,700	6,000
		–	–	–	–	–	60	2.8	0.25	6,700	6,000
		–	–	–	–	–	80	2.8	0.20	6,700	6,000
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8015	15	2.1	0.15	6,900	5,500	20	2.8	0.20	6,000	6,600
		30	2.1	0.10	6,900	4,800	40	2.8	0.20	6,000	4,800
		–	–	–	–	–	60	2.8	0.15	6,000	4,800
		–	–	–	–	–	80	2.8	0.10	6,000	4,800
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	15	2.1	0.20	7,400	6,600	20	2.8	0.40	6,400	7,600
		30	2.1	0.15	7,400	5,900	40	2.8	0.40	6,400	5,700
		–	–	–	–	–	60	2.8	0.25	6,400	5,700
		–	–	–	–	–	80	2.8	0.20	6,400	5,700

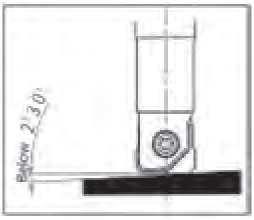
Depth of cut adjustment by corner radius a_p× ratio	Corner radius			Corner radius		
		R0.5	a_p×0.65		R0.5	a_p×0.60
		R1	a_p×0.80		R1	a_p×0.70
		R1.5	a_p×1.0		R2	a_p×1.0

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

ℓ: Overhung length, a_p: Depth of cut, a_e: Pick feed, 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 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 30% above ap, n, Vf.
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 slotting with overhung length exceeding 5 x Dc, recommend to reduce depth of cut and feed speed.



★ 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. Please use torque wrenches to tighten the clamp screw.

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

Dimensions (mm)	Recommended torque
φDc	(N•m)
6	0.5
8	0.9
10	1.2
12	2.0
16	3.0
20	4.0

Mirror Radius HRM / FRM TYPE

■ RECOMMENDED CUTTING CONDITIONS

● HRM, FRM type insert + Carbide shank holder (C-Body)

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

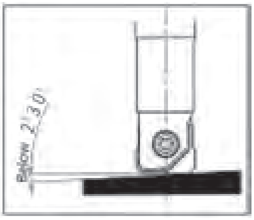
Work Materials	Insert Grades	Tool dia. (mm)									
		φ10×R2/φ11×R2					φ12×R2/φ13×R2				
		ℓ (mm)	a_e (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)	ℓ (mm)	a_e (mm)	a_p (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	25	4.2	0.40	6,000	7,200	30	5.6	0.50	5,000	6,000
		50	4.2	0.40	6,000	6,000	60	5.6	0.40	5,000	5,000
		75	4.2	0.25	6,000	6,000	90	5.6	0.25	5,000	5,000
		100	4.2	0.20	6,000	6,000	120	5.6	0.20	5,000	5,000
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8015	25	4.2	0.40	5,700	6,800	30	5.6	0.40	4,700	5,600
		50	4.2	0.40	5,700	5,700	60	5.6	0.40	4,700	4,700
		75	4.2	0.25	5,700	5,700	90	5.6	0.25	4,700	4,700
		100	4.2	0.20	5,700	5,700	120	5.6	0.20	4,700	4,700
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	25	4.2	0.40	5,700	6,800	30	5.6	0.40	4,700	5,600
		50	4.2	0.40	5,700	5,700	60	5.6	0.40	4,700	4,700
		75	4.2	0.25	5,700	5,700	90	5.6	0.25	4,700	4,700
		100	4.2	0.20	5,700	5,700	120	5.6	0.20	4,700	4,700
Stainless steel SUS304 Below 250HB	JC8015	25	4.2	0.40	5,400	6,400	30	5.6	0.40	4,500	5,400
		50	4.2	0.40	5,400	5,400	60	5.6	0.40	4,500	4,500
		75	4.2	0.25	5,400	5,400	90	5.6	0.25	4,500	4,500
		100	4.2	0.20	5,400	5,400	120	5.6	0.20	4,500	4,500
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8015	25	4.2	0.20	4,700	5,600	30	5.6	0.20	4,000	4,800
		50	4.2	0.20	4,700	4,700	60	5.6	0.20	4,000	4,000
		75	4.2	0.15	4,700	4,700	90	5.6	0.15	4,000	4,000
		100	4.2	0.10	4,700	4,700	120	5.6	0.10	4,000	4,000
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	25	4.2	0.40	5,100	6,100	30	5.6	0.40	4,200	5,000
		50	4.2	0.40	5,100	5,100	60	5.6	0.40	4,200	4,200
		75	4.2	0.25	5,100	5,100	90	5.6	0.25	4,200	4,200
		100	4.2	0.20	5,100	5,100	120	5.6	0.20	4,200	4,200

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

ℓ: Overhung length, a_p: Depth of cut, a_e: Pick feed, 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 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 30% above ap, n, Vf.
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 slotting with overhung length exceeding 5 x Dc, recommend to reduce depth of cut and feed speed.



★ 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. Please use torque wrenches to tighten the clamp screw.

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

Dimensions (mm)	Recommended torque
φDc	(N•m)
6	0.5
8	0.9
10	1.2
12	2.0
16	3.0
20	4.0

Mirror Radius HRM/FRM TYPE

■ RECOMMENDED CUTTING CONDITIONS

● HRM, FRM type insert + Carbide shank holder (C-Body)

※ 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					φ20×R3/φ22×R3				
		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	35	7.0	0.60	3,800	4,500	40	9.8	0.60	3,000	3,600
		80	7.0	0.60	3,800	3,800	100	9.8	0.60	3,000	3,000
		120	7.0	0.40	3,800	3,800	150	9.8	0.40	3,000	3,000
		160	7.0	0.30	3,800	3,800	200	9.8	0.30	3,000	3,000
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8015	35	7.0	0.60	3,500	4,200	40	9.8	0.60	2,800	3,300
		80	7.0	0.60	3,500	3,500	100	9.8	0.60	2,800	2,800
		120	7.0	0.40	3,500	3,500	150	9.8	0.40	2,800	2,800
		160	7.0	0.30	3,500	3,500	200	9.8	0.30	2,800	2,800
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015	35	7.0	0.60	3,500	4,200	40	9.8	0.60	2,800	3,300
		80	7.0	0.60	3,500	3,500	100	9.8	0.60	2,800	2,800
		120	7.0	0.40	3,500	3,500	150	9.8	0.40	2,800	2,800
		160	7.0	0.30	3,500	3,500	200	9.8	0.30	2,800	2,800
Stainless steel SUS304 Below 250HB	JC8015	35	7.0	0.60	3,400	4,000	40	9.8	0.60	2,700	3,200
		80	7.0	0.60	3,400	3,400	100	9.8	0.60	2,700	2,700
		120	7.0	0.40	3,400	3,400	150	9.8	0.40	2,700	2,700
		160	7.0	0.30	3,400	3,400	200	9.8	0.30	2,700	2,700
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8015	35	7.0	0.30	3,000	3,600	40	9.8	0.30	2,400	2,800
		80	7.0	0.30	3,000	3,000	100	9.8	0.30	2,400	2,400
		120	7.0	0.25	3,000	3,000	150	9.8	0.25	2,400	2,400
		160	7.0	0.20	3,000	3,000	200	9.8	0.20	2,400	2,400
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015	35	7.0	0.60	3,200	3,800	40	9.8	0.60	2,500	3,000
		80	7.0	0.60	3,200	3,200	100	9.8	0.60	2,500	2,500
		120	7.0	0.40	3,200	3,200	150	9.8	0.40	2,500	2,500
		160	7.0	0.30	3,200	3,200	200	9.8	0.30	2,500	2,500

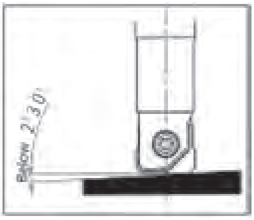
Depth of cut adjustment by corner radius (ap× ratio)	Corner radius			Corner radius		
		R1	ap×0.50		R1	ap×0.50
		R1.5	ap×0.60		R1.5	ap×0.60
		R2	ap×0.75		R2	ap×0.75
		R3	ap×1.0		R3	ap×1.0

※ 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 50-55HRC (Hardened die steel), recommend to reduce 30% above ap, n, Vf.
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 slotting with overhung length exceeding 5 x Dc, recommend to reduce depth of cut and feed speed.



★ 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. Please use torque wrenches to tighten the clamp screw.

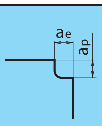
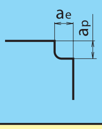
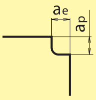
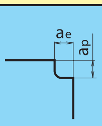
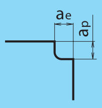
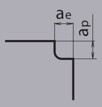
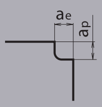
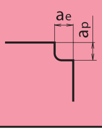
Recommend to use Torque control wrenches (C180)
See the right table for recommended tightening torque.

Dimensions (mm) φDc	Recommended torque (N・m)
6	0.5
8	0.9
10	1.2
12	2.0
16	3.0
20	4.0

Mirror Radius FRMTYPE

RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● FRM type insert + Carbide shank holder (C-Body)

Work Materials	Insert Grades	Type of machining	Cutting speed Vc (m/min)	Tool dia. (mm)					
				φ8		φ10		φ12	
				n (min^{-1})	V$_f$ (mm/min)	n (min^{-1})	V$_f$ (mm/min)	n (min^{-1})	V$_f$ (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015		300	11,940	3,580	9,550	2,860	7,960	2,380
			a$_p$ (mm)	0.20		0.25		0.30	
			a$_e$ (mm)	0.08		0.10		0.12	
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015		300	11,940	3,580	9,550	2,860	7,960	2,380
			a$_p$ (mm)	0.20		0.25		0.30	
			a$_e$ (mm)	0.08		0.10		0.12	
Stainless steel SUS304 Below 250HB	JC8015		280	11,150	3,350	8,910	2,670	7,420	2,220
			a$_p$ (mm)	0.20		0.25		0.30	
			a$_e$ (mm)	0.08		0.10		0.12	
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 DH102		300	11,940	3,580	9,550	2,860	7,960	2,380
			a$_p$ (mm)	0.20		0.25		0.30	
			a$_e$ (mm)	0.08		0.10		0.12	
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102		280	11,150	3,350	8,910	2,670	7,420	2,220
			a$_p$ (mm)	0.20		0.25		0.30	
			a$_e$ (mm)	0.08		0.10		0.12	
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102		250	9,950	1,000	7,960	800	6,630	800
			a$_p$ (mm)	0.20		0.25		0.30	
			a$_e$ (mm)	0.08		0.10		0.12	
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102		200	7,950	800	6,360	640	5,300	640
			a$_p$ (mm)	0.20		0.25		0.30	
			a$_e$ (mm)	0.08		0.10		0.12	
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 DH102		350	13,930	4,180	11,140	3,900	9,280	3,710
			a$_p$ (mm)	0.20		0.25		0.30	
			a$_e$ (mm)	0.10		0.15		0.20	

ℓ: Overhung length, a$_p$: Depth of cut, a$_e$: Pick feed, Vc: Cutting speed, n: Spindle speed, V$_f$: Feed speed

■ NOTE

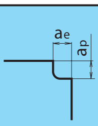
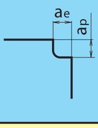
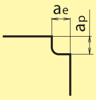
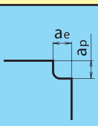
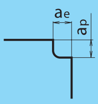
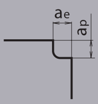
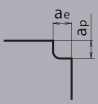
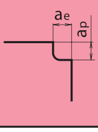
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung length over 3 x Dc, cutting speed and feed speed to be reduced according to the right table.
4) Use air blow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

Overhung length ℓ/Dc	Vc (m/min)	V$_f$ (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 FRMTYPE

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● FRM type insert + Carbide shank holder (C-Body)

Work Materials	Insert Grades	Type of machining	Cutting speed Vc (m/min)	Tool dia. (mm)					
				φ16		φ20		φ21	
				n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015		300	5,970	2,390	4,770	1,910	4,550	1,820
			a_p (mm)	0.40		0.50		0.50	
			a_e (mm)	0.16		0.20		0.10	
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015		300	5,970	2,390	4,770	1,910	4,550	1,820
			a_p (mm)	0.40		0.50		0.50	
			a_e (mm)	0.16		0.20		0.10	
Stainless steel SUS304 Below 250HB	JC8015		280	5,570	2,230	4,560	1,820	4,240	1,700
			a_p (mm)	0.40		0.50		0.50	
			a_e (mm)	0.16		0.20		0.10	
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 DH102		300	5,970	2,390	4,770	1,910	4,550	1,820
			a_p (mm)	0.40		0.50		0.50	
			a_e (mm)	0.16		0.20		0.10	
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102		280	5,570	1,670	4,560	1,370	4,240	1,270
			a_p (mm)	0.40		0.50		0.50	
			a_e (mm)	0.16		0.20		0.10	
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102		250	4,970	750	3,980	600	3,790	570
			a_p (mm)	0.40		0.50		0.50	
			a_e (mm)	0.16		0.20		0.10	
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102		200	3,980	600	3,180	480	3,000	450
			a_p (mm)	0.40		0.50		0.50	
			a_e (mm)	0.16		0.20		0.10	
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 DH102		350	6,960	3,480	5,570	3,340	5,300	3,180
			a_p (mm)	0.40		0.50		0.50	
			a_e (mm)	0.20		0.25		0.20	

ℓ: Overhung length, a_p: Depth of cut, a_e: Pick feed, Vc: Cutting speed, n: Spindle speed, V_f: Feed speed

■ NOTE

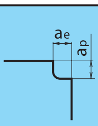
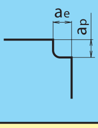
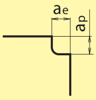
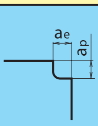
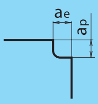
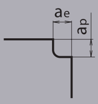
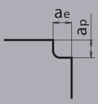
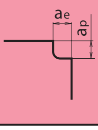
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung length over 3 x Dc, cutting speed and feed speed to be reduced according to the right table.
4) Use air blow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

Overhung length ℓ/Dc	Vc (m/min)	V_f (mm/min)
~3Dc 3Dc or less	100%	100%
3Dc~5Dc Over 3Dc, upto5Dc	70%	70%
5Dc~10Dc Over 5Dc, upto 10Dc	50%	50%

Mirror Radius **FRM TYPE**

■ RECOMMENDED CUTTING CONDITIONS / SIDE FACE FINISHING

● FRM type insert + Carbide shank holder (C-Body)

Work Materials	Insert Grades	Type of machining	Cutting speed Vc (m/min)	Tool dia. (mm)					
				φ25		φ30		φ32	
				n (min^{-1})	V$_f$ (mm/min)	n (min^{-1})	V$_f$ (mm/min)	n (min^{-1})	V$_f$ (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015		300	3,820	1,530	3,180	1,270	2,980	1,190
			a_p (mm)	0.80		1.0		1.2	
			a_e (mm)	0.10		0.10		0.10	
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015		300	3,820	1,530	3,180	1,270	2,980	1,190
			a_p (mm)	0.80		1.0		1.2	
			a_e (mm)	0.10		0.10		0.10	
Stainless steel SUS304 Below 250HB	JC8015		280	3,560	1,420	2,970	1,190	2,780	1,110
			a_p (mm)	0.80		1.0		1.2	
			a_e (mm)	0.10		0.10		0.10	
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 DH102		300	3,820	1,530	3,180	1,270	2,980	1,190
			a_p (mm)	0.80		1.0		1.2	
			a_e (mm)	0.10		0.10		0.10	
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102		280	3,560	1,070	2,970	890	2,780	830
			a_p (mm)	0.80		1.0		1.2	
			a_e (mm)	0.10		0.10		0.10	
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102		250	3,180	480	2,650	400	2,480	370
			a_p (mm)	0.60		0.80		1.0	
			a_e (mm)	0.10		0.10		0.10	
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102		200	2,540	380	2,120	320	1,990	300
			a_p (mm)	0.60		0.80		1.0	
			a_e (mm)	0.10		0.10		0.10	
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 DH102		350	4,450	2,670	3,710	2,230	3,480	2,090
			a_p (mm)	0.80		1.0		1.2	
			a_e (mm)	0.20		0.20		0.20	

ℓ: Overhung length, a_p: Depth of cut, a_e: Pick feed, Vc: Cutting speed, n: Spindle speed, V$_f$: Feed speed

■ NOTE

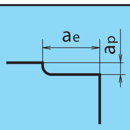
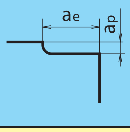
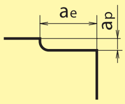
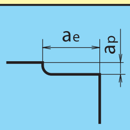
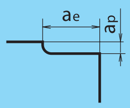
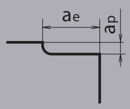
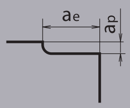
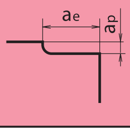
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung length over 3 x Dc, cutting speed and feed speed to be reduced according to the right table.
4) Use air blow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

Overhung length ℓ/Dc	Vc (m/min)	V$_f$ (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 FRMTYPE

RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

FRM type insert + Carbide shank holder (C-Body)

Work Materials	Insert Grades	Type of machining	Cutting speed Vc (m/min)	Tool dia. (mm)					
				φ8		φ10		φ12	
				n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015		260	10,340	3,100	8,280	2,480	6,900	2,070
			a_p (mm)	0.15		0.15		0.20	
			a_e (mm)	1.0		1.2		1.5	
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015		260	10,340	3,100	8,280	2,480	6,900	2,070
			a_p (mm)	0.15		0.15		0.20	
			a_e (mm)	1.0		1.2		1.5	
Stainless steel SUS304 Below 250HB	JC8015		240	9,550	2,860	7,640	2,290	6,360	1,900
			a_p (mm)	0.15		0.15		0.20	
			a_e (mm)	1.0		1.2		1.5	
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 DH102		260	10,340	3,100	8,280	2,480	6,900	2,060
			a_p (mm)	0.15		0.15		0.20	
			a_e (mm)	1.0		1.2		1.5	
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102		240	9,550	2,860	7,640	2,290	6,360	1,900
			a_p (mm)	0.15		0.15		0.20	
			a_e (mm)	1.0		1.2		1.5	
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102		190	7,560	760	6,050	610	5,040	600
			a_p (mm)	0.10		0.10		0.15	
			a_e (mm)	0.70		0.90		1.1	
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102		130	5,170	520	4,140	410	3,450	410
			a_p (mm)	0.10		0.10		0.15	
			a_e (mm)	0.60		0.90		1.2	
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 DH102		300	11,940	3,580	9,450	3,310	7,960	3,180
			a_p (mm)	0.15		0.15		0.20	
			a_e (mm)	1.2		1.5		1.8	

ℓ: Overhung length, a_p: Depth of cut, a_e: Pick feed, Vc: Cutting speed, n: Spindle speed, V_f: Feed speed

NOTE

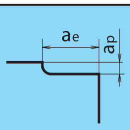
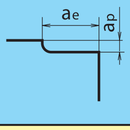
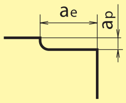
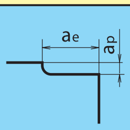
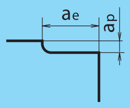
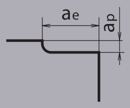
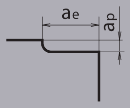
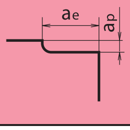
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung length over 3 x Dc, cutting speed and feed speed to be reduced according to the right table.
4) Use air blow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

Overhung length ℓ/Dc	Vc (m/min)	V_f (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 **FRM** TYPE

RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

● FRM type insert + Carbide shank holder (C-Body)

Work Materials	Insert Grades	Type of machining	Cutting speed V_c (m/min)	Tool dia. (mm)					
				φ16		φ20		φ21	
				n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015		260	5,170	2,070	4,140	1,660	3,940	1,570
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	2.0		2.5		2.5	
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015		260	5,170	2,070	4,140	1,660	3,940	1,570
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	2.0		2.5		2.5	
Stainless steel SUS304 Below 250HB	JC8015		240	4,770	1,910	3,810	1,520	3,640	1,450
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	2.0		2.5		2.5	
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 DH102		260	5,170	2,070	4,140	1,660	3,940	1,570
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	2.0		2.5		2.5	
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102		240	4,770	1,430	3,810	1,140	3,640	1,090
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	2.0		2.5		2.5	
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102		190	3,780	570	3,020	450	2,880	430
			a_p (mm)	0.15		0.15		0.15	
			a_e (mm)	1.4		1.8		1.8	
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102		130	2,590	390	2,070	310	1,970	290
			a_p (mm)	0.15		0.15		0.15	
			a_e (mm)	1.2		1.5		1.5	
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 DH102		300	5,970	2,390	4,770	1,910	4,550	1,820
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	2.4		3.0		3.0	

ℓ: Overhung length, a_p: Depth of cut, a_e: Pick feed, V_c: Cutting speed, n: Spindle speed, V_f: Feed speed

NOTE

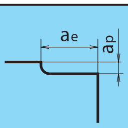
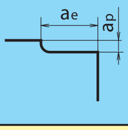
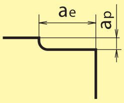
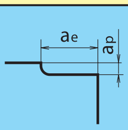
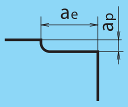
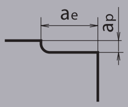
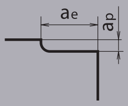
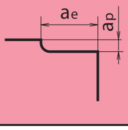
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) In case of overhung length over 3 x Dc, cutting speed and feed speed to be reduced according to the right table.
4) Use air blow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

Overhung length ℓ/Dc	V_c (m/min)	V_f (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 FRMTYPE

■ RECOMMENDED CUTTING CONDITIONS / BOTTOM FACE FINISHING

● FRM type insert + Carbide shank holder (C-Body)

Work Materials	Insert Grades	Type of machining	Cutting speed Vc (m/min)	Tool dia. (mm)					
				φ25		φ30		φ32	
				n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015		260	3,310	1,320	2,750	1,100	2,580	1,030
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	3.0		4.0		4.2	
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015		260	3,310	1,320	2,750	1,100	2,580	1,030
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	3.0		4.0		4.2	
Stainless steel SUS304 Below 250HB	JC8015		240	3,050	1,220	2,540	1,020	2,380	950
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	3.0		4.0		4.2	
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 DH102		260	3,310	1,320	2,750	1,100	2,580	1,030
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	3.0		4.0		4.2	
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102		240	3,050	910	2,540	760	2,380	710
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	3.0		4.0		4.2	
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102		190	2,420	360	2,010	300	1,890	280
			a_p (mm)	0.15		0.15		0.15	
			a_e (mm)	2.2		2.7		2.8	
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102		130	1,650	250	1,380	200	1,290	190
			a_p (mm)	0.15		0.15		0.15	
			a_e (mm)	1.8		2.2		2.3	
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 DH102		300	3,820	1,900	3,180	1,590	2,980	1,490
			a_p (mm)	0.20		0.20		0.20	
			a_e (mm)	3.0		4.0		4.2	

ℓ: Overhung length, a_p: Depth of cut, a_e: Pick feed, Vc: Cutting speed, 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 feed speed.
3) In case of overhung length over 3 x Dc, cutting speed and feed speed to be reduced according to the right table.
4) Use air blow to flash out the chips out.

Overhung length ℓ/Dc	Vc (m/min)	V_f (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%

Under Cutter

DUMTYPE

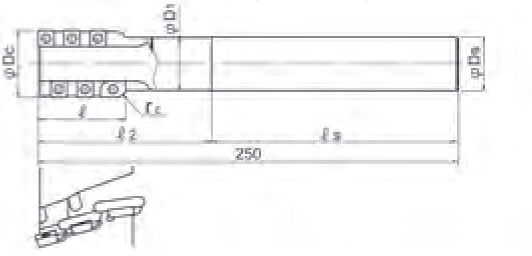
Side relief cutting for blanking dies and shearing dies.
R6 corner radius insert can reduce the risk of cracking
at edge of dies after hardening.

Under Milling

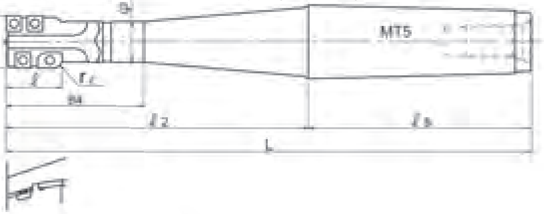
DUM-6R type
(Straight shank)

DUM-W※R type
(Straight shank · with corner radius)

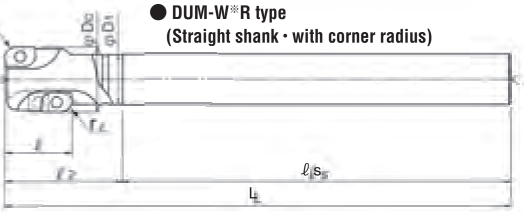
● DUM-6R type (Straight shank)



● DUM-MT type (MT shank)



● DUM-W※R type
(Straight shank · with corner radius)



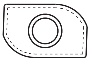
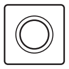
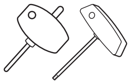
■ BODY

Cat. No.	Stock	No. of Applicable Inserts			Dimensions (mm)								
		Insert with corner radius											
		Bottom Side (R)	Shank Side (L)	Peripheral	φDc	r_ε	ℓ	ℓ_2	ℓ_s	L	φD_1	φDs	Md
DUM-25023S20-W2R	☐	1	1	—	**25**	R2	23.5	48.5	201.5	250	19.3	20	—
DUM32034S25-6R	☐	—	1	3	**32**	R6	34	83	167		24.5	25	
DUM32050S25-6R *C Body (Carbide shank)	☐		1	5			50	—	—		24.5		
DUM320184T-MT5	☐		1	3			34	184	136	320	24.5	MT5	M20×2.5
DUM-32033S25-W6R	☐	1	1	1			33	58	192	250	24.5	25	—
DUM36038S32-6R	☐	—	1	3	**36**		38	89	161		31	32	
DUM36050S32-6R	☐		1	5			50	101	149				
DUM40040S32-6R	☐		2	8	**40**		40	91	159		31.5		
DUM40052S32-6R	☐		2	10			52	103	147			32	
DUM50020S42-6R	☐		2	2	**50**		20	70	180		41	42	
DUM50036S42-6R	☐		2	6			36	87	163		40		
DUM50050S42-6R	☐		2	10			50	107	143		40		
DUM-50055S42-W6R	☐	2	2	8			55.7	90	160		41		

Note) 1. All cutters are supplied without inserts.
2. Please refer page C216 for recommended cutting conditions.

Under Cutter **DUM**TYPE

PARTS

Applicable holders	Applicable inserts			Parts	
	Bottom side (R)	Shank side (L)	Peripheral	Clamp screw	Wrench
					
DUM-6R type	—	APGW150360L	SPGA090304 or SPMA090304	DSW-4085	A-15T
DUM-MT5 type					
DUM-W2R type	ZPMT13T320R	ZPMT13T320L		DSW-307	A-10
DUM-W6R type	APGW150360R	APGW150360L		DSW-4085	A-15T

Note) All cutters are supplied without inserts.

Clamp screw	Recommended torque (N•m)
DSW-4085	3.6
DSW-307	1.4

INSERTS

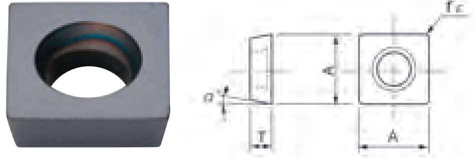


Fig.1 Peripheral insert

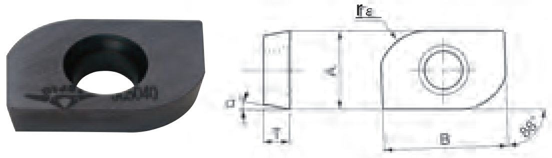


Fig.2 Shank side insert

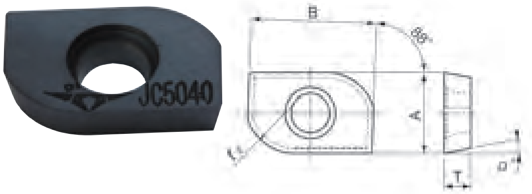


Fig.3 Bottom side insert

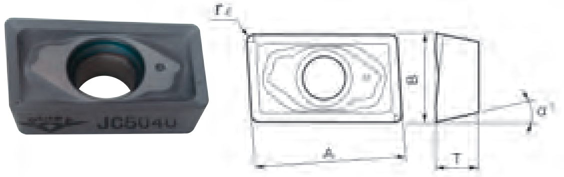


Fig.4 Shank side insert

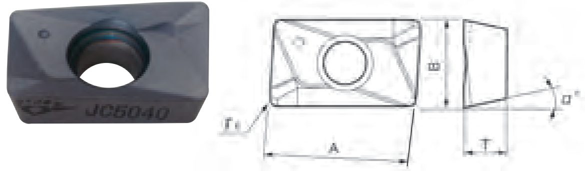


Fig.5 Bottom side insert

Cat. No.	PVD coated		Dimensions (mm)					Fig.
	JC5015	**JC5040**	A	B	T	rε	α°	
SPGA090304		●	9.525	—	3.18	0.4	11°	1
SPMA090304	●		9.525	—	3.18	0.4	11°	1
APGW150360L	●	●	9.525	15	3.18	6.0	11°	2
APGW150360R		●	9.525	15	3.18	6.0	11°	3
ZDMT13T320L	●	●	12.9	7.938	3.97	2.0	15°	4
ZPMT13T320R	●	●	13.3	7.938	3.97	2.0	11°	5

10 inserts per case

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

Under Cutter

DUMTYPE

RECOMMENDED CUTTING CONDITIONS

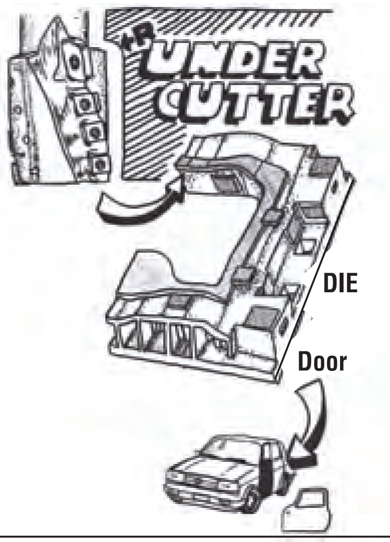
Tool dia. φDc (mm)	Work Materials / Max. depth of cut (mm) / Cutting conditions	Cast iron (FC, FCD)		Die steel (SKD)	
		ap=1Dc, ae=1mm	**ap=1Dc, ae=2mm**	**ap=1Dc, ae=1mm**	**ap=1Dc, ae=2mm**
25	n (min^{-1})	1,000	—	900	—
	Vf (min/min)	350	—	270	—
32	n (min^{-1})	800	650	600	—
	Vf (min/min)	300	170	170	—
36	n (min^{-1})	700	570	620	530
	Vf (min/min)	280	150	190	110
40	n (min^{-1})	800	640	720	560
	Vf (min/min)	450	290	350	200
50	n (min^{-1})	700	570	640	510
	Vf (min/min)	420	280	350	220

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

Under Cutter DUMTYPE

CASE STUDIES

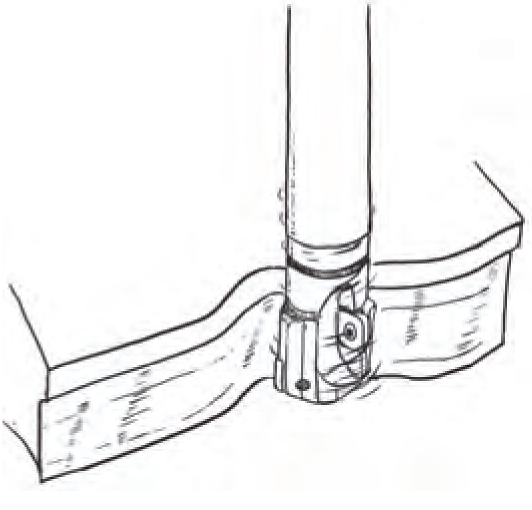
Side relief milling



Result Observed smooth cutting and normal wear on the insert after machined 4 dies.

Work	Part name	Trimming die
	Material	SKD11
	Hardness	—
Tool	Tool No.	DUM50050S42-6R
	Grade	APGW150360L, JC5040 SPGA090304, JC5040
Cutting conditions	Spindle speed	600 (min^{-1})
	Cutting speed	94 (m/min)
	Feed speed	200~400 (mm/min)
	Feed rate	0.33~0.67 (mm/rev)
	Depth of cut	ap=30 (mm), ae=1.5 (mm)
	Coolant	Dry

Overhung length: 160mm



Result Drastically improved productivity compared with HSS end mill.

Work	Part name	Trimming die
	Material	—
	Hardness	—
Tool	Tool No.	DUM-25023S20-W2R
	Grade	ZPMT13T320R, JC5040 ZDMT13T320L, JC5040
Cutting conditions	Spindle speed	1,000 (min^{-1})
	Cutting speed	78.5 (m/min)
	Feed speed	200~400 (mm/min)
	Feed rate	0.2~0.4 (mm/rev)
	Depth of cut	ap=10~20 (mm), ae=1~1.5 (mm)
	Coolant	Dry

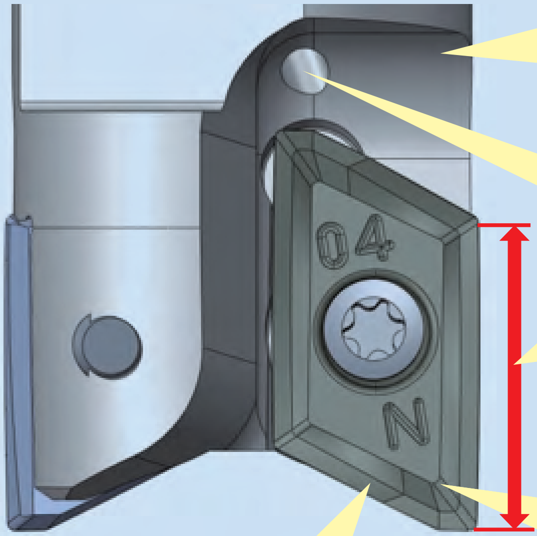
Aero Chipper

ALX TYPE

Possible for Highprecision & High efficient machining forAluminium & 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 15 mm D.O.C

High Efficiency

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

Multi-purpose

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

G-Body 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 compared with competitor‘s tool. Make it difficult to be damaged even under severe cutting conditions. Also rust-proof and anti-welding effect is much improved.

Aero Chipper ALXTYPE

CUTTING PERFORMANCE of DIJET against competitor

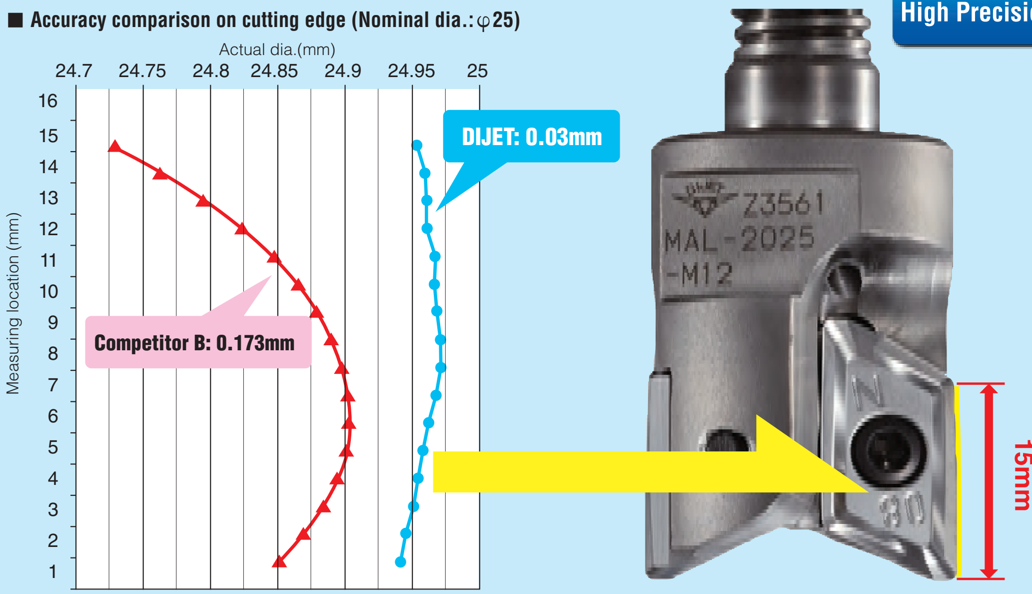
Aerospace Tooling

G-Body

Accuracy on cutting edge

High Precision

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

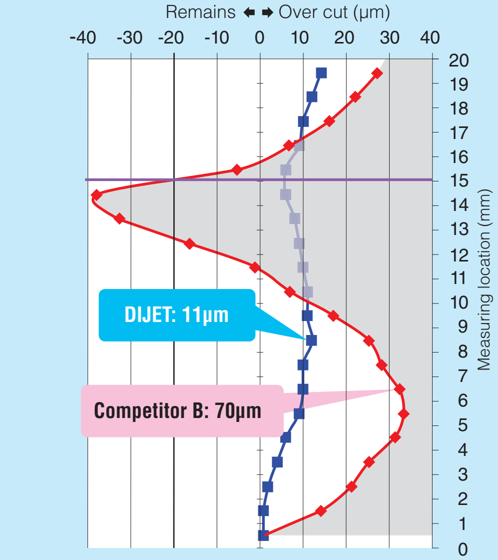


AERO CHIPPER showed much precise dimensions on insert than competitor B'sinsert.
Accuracy on cutting edge DIJET: 0.03mm, Competitor B: 0.173mm

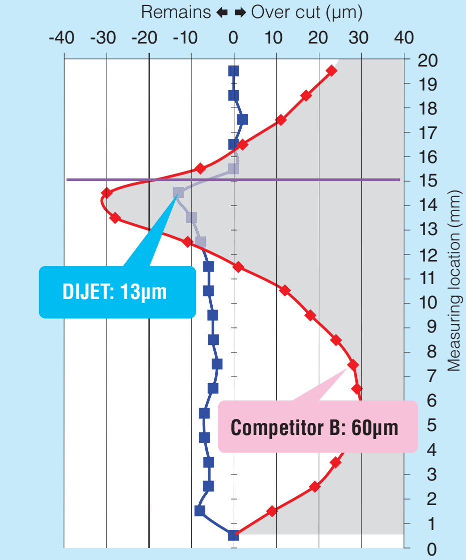
Machining accuracy

High Precision

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



Accuracy comparison on machined wall (ap=15mm, fz=0.6mm/t)



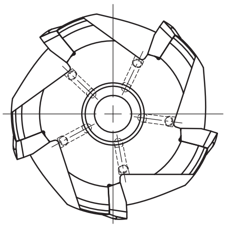
Tool dia.: φ25 (DIJET: Modular head MAL + MSN carbide shank holder)
Work material: A5056 n=20,000 (min^{-1}), Vc=1,570 (m/min), ap=15 (mm) (2 times), ae=3 (mm), Wet, Down cut

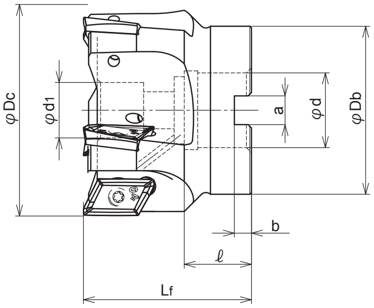
During 15mm cutting length, AERO CHIPPER showed 4 times better accuracy.

Aero Chipper ALXTYPE

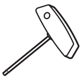
G-Body **Through Coolant Hole**

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





BODY / FACE MILL TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)								Weight (kg)	Max. spindle speed (min^{-1})	Insert	Parts	
				φDc	Lf	φDb	φd	φd1	a	b	ℓ				Clamp Screw 	Wrench 
Metric Bore	**ALX4050R-22**	●	4	**50**	50	45	22	16.5	10.4	5	20	0.4	24,000	XOGT1605○○PD○R	DSW-4085	A-15T
	ALX5063R-22	●	5	**63**	50	50	22	16.5	10.4	5	20	0.6	21,000			

Note) 1. Please refer page C224-C225 for recommended cutting conditions
2. All cutters are supplied without inserts
3. Body must be modified to 1.5mm radius or 1.2mm chamfer at corner to use 3.0mm or 3.2mm corner radius insert.
4. 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.

Modular Head Type Please refer Page B147

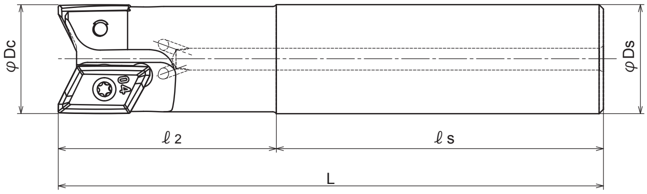
Clamp screw	Recommended torque (N • m)
DSW-4085	3.6

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

Aero Chipper ALXTYPE

G-Body Through Coolant Hole

Face Milling · Pocket Milling · Slotting · Shoulder Milling · Helical Interpolation



BODY / END MILL TYPE

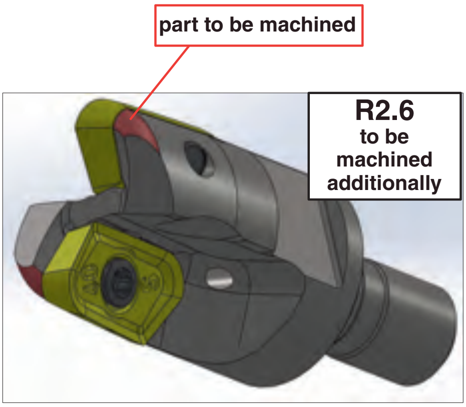
Type	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	ℓ2	ℓs	L	φDs	Max. spindle speed (min^{-1})	Insert	Parts Clamp Screw	Parts Wrench
Regular type	**ALXM1020S20**	●	1	**20**	35	75	110	20	15,000	XOGT1605○PD○R	DSW-4075	A-15T
	ALXM2025S25	●	2	**25**	50	75	125	25	40,000		DSW-4085	
	ALXM2028S25	●	2	**28**	50	75	125	25	36,000			
	ALXM2032S32	●	2	**32**	50	100	150	32	33,000			
	ALXM2035S32	●	2	**35**	50	100	150	32	31,000			
	ALXM3040S32	●	3	**40**	80	90	170	32	28,000			

Note)
1. Please refer page C224-C225 for recommended cutting conditions
2. All cutters are supplied without inserts
3. Body must be modified to 1.5mm radius or 1.2mm chamfer at corner to use 3.0mm or 3.2mm corner radius insert.
4. 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.

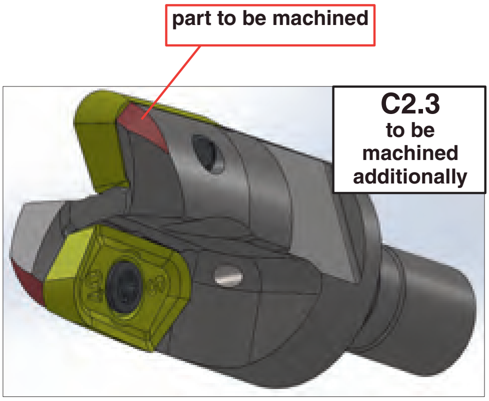
Modular Head Type Please refer Page B147

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



R2.6
to be machined additionally



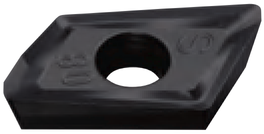
C2.3
to be machined additionally

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

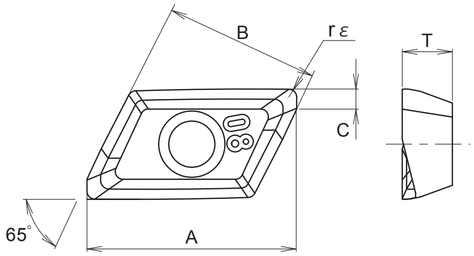
Aero Chipper ALX TYPE

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	2.0	●	
XOGT160525PDFR	G	20.3	16.35	3.0	5	2.5	●	
XOGT160530PDFR	G	20.1	16.35	3.3	5	3.0	●	
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	0.2		●
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	2.0		●
XOGT160530PDER	G	20.1	16.35	3.3	5	3.0		●
XOGT160532PDER	G	19.9	16.35	3.5	5	3.2		●

10 inserts per case

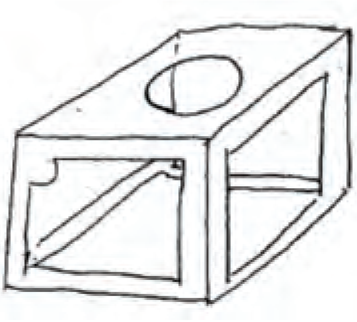
●: Standard stock items　☐: Stock in Japan　◎: Soon to be stocked　○: Soon to be deleted

Aero Chipper ALXTYPE

CASE STUDIES

1. Pocket milling for Aluminium alloy

Work size: 580×600×760



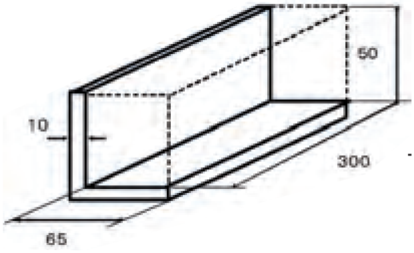
Result

Metal removal rate was maximum Q=2,250cc/min. Low spindle load and good surface roughness.

Work	Part name	Test piece
	Material	A5052
	Hardness	-
Tool	Tool No.	ALX4050R-22
	Grade	XOGT160504PDFR (FZ05)
Cutting conditions	V_c, (n)	1,885m/min (12,000min^{-1})
	V_f, (f z)	9,000mm/min (0.19mm/t)
	a_p (mm)	5mm
	a_e (mm)	50mm
	Coolant	Water soluble (External)
	Machine	Horizontal MC

2.Titanium alloy (Thin shape work)

Overhung length: 100mm



Result

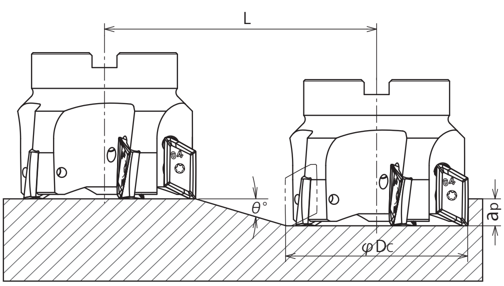
Metal removal rate was maximum Q=32cc/min. No chattering on such thin shape work.

Work	Part name	Aircraft parts
	Material	Ti-6Al-4V
	Hardness	41HRC
Tool	Tool No.	ALX5063R
	Grade	XOGT160508PDER (JC5118)
Cutting conditions	V_c, (n)	40m/min (200min^{-1})
	V_f, (f z)	100mm/min (0.1mm/t)
	a_p (mm)	8mm
	a_e (mm)	40mm
	Coolant	Water soluble (External)
	Machine	Vertical MC

Aero Chipper ALXTYPE

INSTRUCTIONS FOR PROFILE MILLING

Ramping

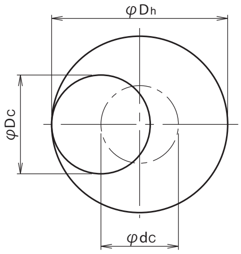


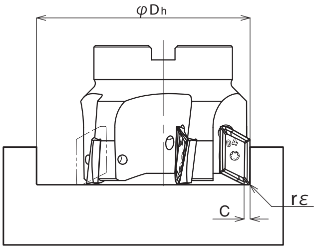
Tool dia. (mm)	Aluminium alloy		Stainless steel		Titanium alloy		Max. depth of cut (mm)
	Max. ramping angle (°)	Total cutting length (mm)	Max. ramping angle (°)	Total cutting length (mm)	Max. ramping angle (°)	Total cutting length (mm)	
φDc	θ°	L	θ°	L	θ°	L	ap
20	16	28	10	45	10	45	8
25	11	41	9	51	9	51	8
28	9	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
50	4	114	4	114	4	114	8
63	3	153	3	153	3	153	8

■ NOTE

1) In case of ramping, apply 70% or less feed per tooth from slotting application. (Page C225)
2) In case of Titanium alloy and Stainless steel, feed per tooth up to 0.05mm is recommended.
3) In case of Titanium alloy and Stainless steel, recommended wet cutting.

Helical Interpolation





- ● Calculation of tool pass dia.

  φdc=φDh−φDc
  Tool pass dia. Bore dia. Tool dia.

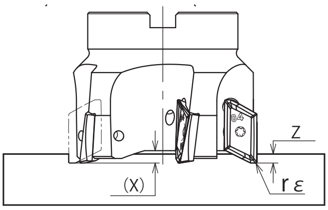
  - ● Max. bore dia.
    φDh=(φDc−rφ−0.3)×2
  - ● Min.bore dia.
    φDh=(φDc−C 0.3)×2
- ● Depth of cut per one circuit should not exceed max. depth of cut ap
- ● Down cutting is recommended, so tool pass rotation should be counter clockwise.

Tool dia. (mm)	Min. bore dia. (mm)	Max. bore dia. (mm)	Helical interpolation depth/tool path rev. (mm)		
φDc	φDh min.	φDh max.	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
50	96.8	98.6	10	10	10
63	122.8	124.6	10	10	10

■ NOTE

1) Min. & Max. bore dia. at this table is for insert corner radius R0.4, so in case ofthe 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 C225).
3) In case of Titanium alloy and Stainless steel, feed per tooth up to 0.05mm is recommended.
4) Incase of Titanium alloy and Stainless steel, recommended wet cutting.

Drilling



Insert corner radius (mm)	Max. drilling depth: Z (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 Z axis feed speed from standard cutting condition table.
3) Long consecutive chips may come out in case of drilling, confirm the safe condition sufficiently.

Aero Chipper

ALX TYPE

RECOMMENDED CUTTING CONDITIONS

FACE MILL TYPE

Work Materials	Insert Grades	Tool dia. (mm)									
		50					63				
		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)
Aluminium alloy 50-110HB	FZ05	100	8	35	6,300	5,040	100	8	45	5,000	5,000
		150	4	35	6,300	3,020	150	4	45	5,000	3,000
		200	3	35	6,300	1,760	200	3	45	5,000	1,750
Stainless steel Below 250HB	JC5118	100	3	35	950	380	100	2	45	760	380
		150	2	35	950	190	150	2	45	760	190
Titanium alloy 35-43HRC	JC5118	100	8	35	380	122	100	8	45	300	120
		150	4	35	380	106	150	4	45	300	105
		200	2	35	380	91	200	2	45	300	90

ℓ: Overhunglength, a_p: Axialdepthofcut, a_e: Widthofcut,n: Spindlespeed,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.
3. In case of full slotting, recommend to reduce spindles peed and feed speed by70% of above figures. And depth of cut ap up to 8mm is recommended.

END MILL TYPE

Work Materials	Insert Grades	Type of machining	Tool dia.(mm)											
			20				25				28			
			a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Aluminium alloy 50-110HB	FZ05	Shoulder Milling	12	4	14,000	2,800	12	5	12,000	4,800	12	5.6	11,000	4,400
			8	14	14,000	2,520	8	18	12,000	4,320	8	20	11,000	3,960
		Slotting	6	20	12,000	2,400	6	25	10,000	4,000	8	28	9,200	3,680
Stainless steel Below250HB	JC5118	Shoulder Milling	5	4	2,400	240	5	5	1,900	380	5	6	1,700	340
			2	14	2,400	240	2	8	1,900	380	2	20	1,700	340
		Slotting	2	20	2,000	100	2	25	1,600	160	2	28	1,400	140
Titaniumalloy 35-43HRC	JC5118	Shoulder Milling	12	4	950	95	12	5	764	153	12	5.6	685	137
			8	14	950	76	8	18	764	122	8	20	685	110
		Slotting	6	20	800	64	6	25	640	102	8	28	570	91

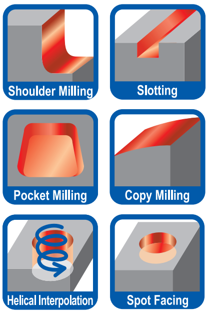
Work Materials	Insert Grades	Type of machining	Tool dia.(mm)											
			32				35				40			
			a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Aluminium alloy 50-110HB	FZ05	Shoulder Milling	12	6.4	9,500	3,800	12	7	9,000	3,600	12	8	7,800	4,680
			8	22	9,500	3,420	8	25	9,000	3,240	8	28	7,800	4,210
		Slotting	8	32	8,000	3,200	8	35	7,200	2,880	8	40	6,400	3,840
Stainless steel Below250HB	JC5118	Shoulder Milling	8	6	1,500	300	8	7	1,355	271	3	8	1,200	360
			3	22	1,500	300	3	25	1,355	271	2	28	1,200	360
		Slotting	2	35	1,200	120	2	35	1,100	110	1	40	1,000	150
Titanium alloy 35-43HRC	JC5118	Shoulder Milling	12	6.4	600	120	12	7	545	109	12	8	480	144
			8	22	600	96	8	25	545	87	8	28	480	115
		Slotting	8	32	500	80	8	35	450	72	8	40	400	96

a_p: Axial depth of cut, a_e: Width 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.

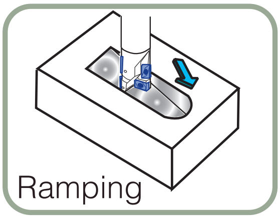
Super End Chipper **SEC**TYPE

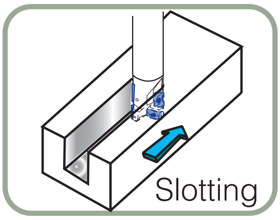
The multi-purpose indexable end mill for intelligent milling in all directions.

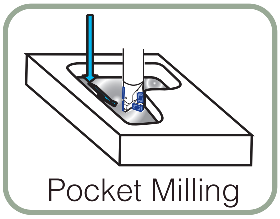


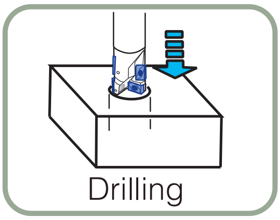
1. Ramping, plunge milling, copy milling and also drilling capability.
2. Excellent performance in opened and closed slotting, spot facing and cavity milling.
3. Large depth of cut and low cutting force at higher feed rate for high productivity.
4. Secure cutter geometry, insert geometry and grades are solutions in any operation.
5. Polished insert for Aluminium is also available.

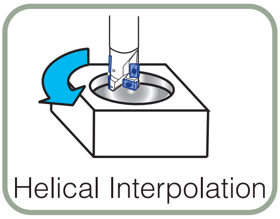
■ Versatility of "SUPER END CHIPPER"

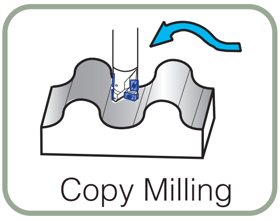

Ramping

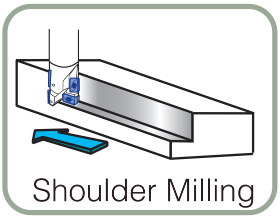

Slotting

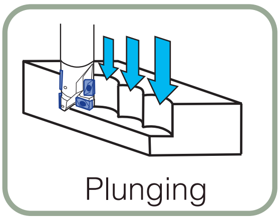

Pocket Milling


Drilling


Helical Interpolation


Copy Milling

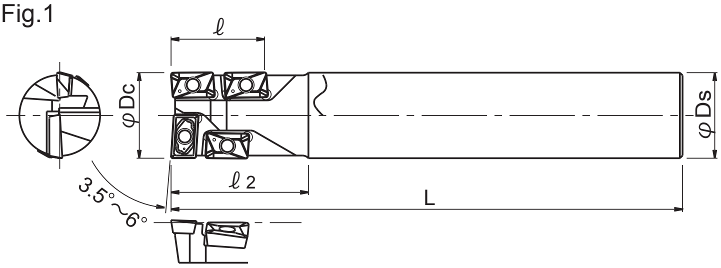

Shoulder Milling


Plunging

Super End Chipper

SECTYPE

Fig.1



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

■ BODY

	Cat. No.	Stock	No. of Inserts		Dimensions (mm)						Inserts		Parts		Fig.
			Central	Peripheral	φDc	ℓ	ℓ1	ℓ 2	L	φDs	Central	Peripheral	Clamp Screw	Wrench	
Standard type	**SECM1616S16**	●	1	3	**16**	16	–	50	130	16	ZDMT08T208L○	ZPMT09T208R○	TSW-2250	A-07SD	1
	SECM2021S20	●			**20**	21	–	55	130	20	ZDMT100308L○	ZCMT100308R○	ESW-206	A-08SD	1
	SECM2121S20	☐			**21**	21	–	35	130	20	ZDMT100308L○	ZCMT100308R○	ESW-206	A-08SD	1
	SECM2427S25	☐			**24**	27	–	60	140	25	ZDMT13T3○○L○	ZPMT13T3○○R○	DSW-307	A-10	1
	SECM2527S25	●			**25**	27	–	60	140	25	ZDMT13T3○○L○	ZPMT13T3○○R○	DSW-307	A-10	1
	SECM2627S25	☐			**26**	27	–	40	140	25	ZDMT13T3○○L○	ZPMT13T3○○R○	DSW-307	A-10	1
	SECM3034S32	☐			**30**	34.5	–	70	150	32	ZPMT150408L○	ZPMT160408R○	TSW-408	A-15	1
	SECM3234S32	●			**32**	34.5	–	70	150	32	ZPMT1604○○L○	ZPMT1604○○R○	TSW-408	A-15	1
	SECM3334S32	☐			**33**	34.5	–	50	150	32	ZPMT1604○○L○	ZPMT1604○○R○	TSW-408	A-15	1
Medium long type	**SECML1616S15**	●	1	3	**16**	16	–	30	150	15	ZDMT08T208L○	ZPMT09T208R○	TSW-2250	A-07SD	1
	SECML1616S16	●			**16**	16	–	65	150	16	ZDMT08T208L○	ZPMT09T208R○	TSW-2250	A-07SD	1
	SECML2021S20	●			**20**	21	–	65	150	20	ZDMT100308L○	ZCMT100308R○	ESW-206	A-08SD	1
	SECML2121S20	☐			**21**	21	–	35	150	20	ZDMT100308L○	ZCMT100308R○	ESW-206	A-08SD	1
	SECML2427S25	☐			**24**	27	–	70	180	25	ZDMT13T3○○L○	ZPMT13T3○○R○	DSW-307	A-10	1
	SECML2527S25	●			**25**	27	–	70	180	25	ZDMT13T3○○L○	ZPMT13T3○○R○	DSW-307	A-10	1
	SECML2627S25	☐			**26**	27	–	40	180	25	ZDMT13T3○○L○	ZPMT13T3○○R○	DSW-307	A-10	1
	SECML3234S32	●			**32**	34.5	–	80	190	32	ZPMT1604○○L○	ZPMT1604○○R○	TSW-408	A-15	1
	SECML3334S32	☐			**33**	34.5	–	50	190	32	ZPMT1604○○L○	ZPMT1604○○R○	TSW-408	A-15	1

Note) 1. All cutters are supplied without inserts.
2. Please refer page C232-C236 for recommended cutting conditions.
3. Body must be modified to 1.5mm radius or 1.2mm chamfer at corner to use 3.0mm or 3.2mm corner radius insert.

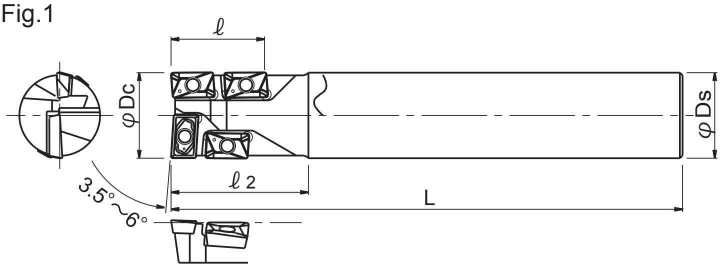
Modular Head Type **Please refer Page B141**

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

Super End Chipper

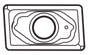
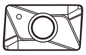
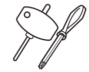
SECTYPE

Fig.1



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

■ BODY

	Cat. No.	Stock	No. of Inserts		Dimensions (mm)						Inserts		Parts		Fig.
			Central	Peripheral	φDc	ℓ	ℓ1	ℓ2	L	φDs	Central	Peripheral	Clamp Screw	Wrench	
															
Long type	**SECL1616S15**	●	1	3	**16**	16	–	30	180	15	ZDMT08T208L○	ZPMT09T208R○	TSW-2250	A-07SD	1
	SECL1616S16	●			**16**	16	–	75	180	16	ZDMT08T208L○	ZPMT09T208R○	TSW-2250	A-07SD	1
	SECL2021S20	●			**20**	21	–	75	185	20	ZDMT100308L○	ZCMT100308R○	ESW-206	A-08SD	1
	SECL2121S20	□			**21**	21	–	35	185	20	ZDMT100308L○	ZCMT100308R○	ESW-206	A-08SD	1
	SECL2427S25	□			**24**	27	–	75	220	25	ZDMT13T3○○L○	ZPMT13T3○○R○	DSW-307	A-10	1
	SECL2527S25	●			**25**	27	–	75	220	25	ZDMT13T3○○L○	ZPMT13T3○○R○	DSW-307	A-10	1
	SECL2627S25	□			**26**	27	–	40	220	25	ZDMT13T3○○L○	ZPMT13T3○○R○	DSW-307	A-10	1
	SECL3034S32	□			**30**	34.5	–	100	180	32	ZPMT150408L○	ZPMT160408R○	TSW-408	A-15	1
	SECL3234S32	●			**32**	34.5	–	90	230	32	ZPMT1604○○L○	ZPMT1604○○R○	TSW-408	A-15	1
	SECL3334S32	□			**33**	34.5	–	50	230	32	ZPMT1604○○L○	ZPMT1604○○R○	TSW-408	A-15	1

Modular Head Type **Please refer Page B141**

Note) 1. All cutters are supplied without inserts.
2. Please refer page C232-C236 for recommended cutting conditions.
3. Body must be modified to 1.5mm radius or 1.2mm chamfer at corner to use 3.0mm or 3.2mm corner radius insert.

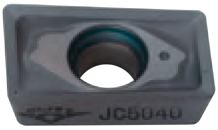
● Standard stock items □: Stock in Japan ○: Soon to be deleted

Super End Chipper SEC TYPE

INSERTS

SERIES EXPANSION: POLISHED INSERT FOR ALUMINIUM

Z※MT-L type


(Central Insert)

Z※MT-LP type

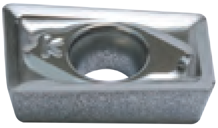
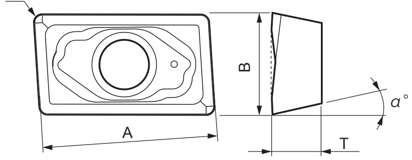

(Central Insert, Polished)

Fig.1 Central Insert



Z※MT-R type


(Peripheral Insert)

Z※MT-RP type

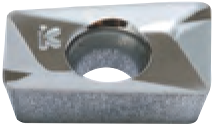
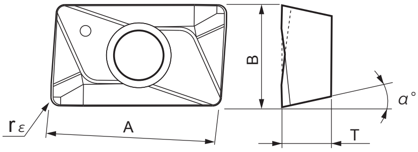

(Central Insert, Polished)

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

10 inserts per case

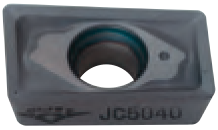
Super End Chipper

SEC TYPE

INSERTS

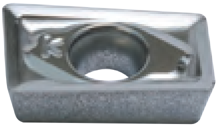
SERIES EXPANSION: POLISHED INSERT FOR ALUMINIUM

Z※MT-L type



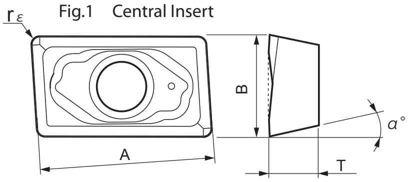
(Central Insert)

Z※MT-LP type



(Central Insert, Polished)

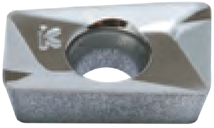
Fig.1 Central Insert



Z※MT-R type

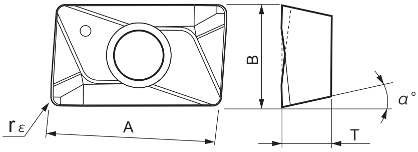
(Peripheral Insert)

Z※MT-RP type



(Central Insert, Polished)

Fig.2 Peripheral Insert



Cat. No.	PVD coated		Uncoated	Dimensions (mm)					Fig.
	JC5015	**JC5040**	**FZ15**	A	B	T	α°	rε	
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

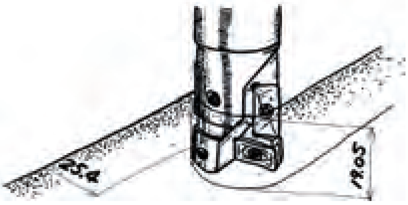
● Standard stock items ☐: Stock in Japan ○: Soon to be deleted

Super End Chipper SECTYPE

CASE STUDIES

1. Deep machining for injection mold

Plunging and Side milling

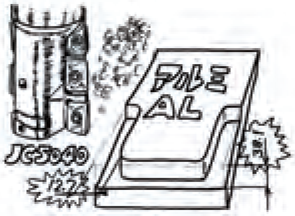


Result Increased the productivity by 5 times against dia. 50.8 radius cutter with 5 flutes.

Work	Part name	Injection mold
	Material	P20
	Hardness	30-34HRC
Tool	Tool No.	SECL3234S32
	Grade	JC5040
Cutting conditions	Vc, (n)	1,400 (min^{-1}), 141 (m/min)
	Vf, (f z)	508 (mm/min), 0.36 (mm/rev)
	ap (mm)	19.05 (mm)
	ae (mm)	25.4 (mm)
	Coolant	Airblow
	Machine	Vertical MC

2. High efficient machining for aluminium

Shoulder milling

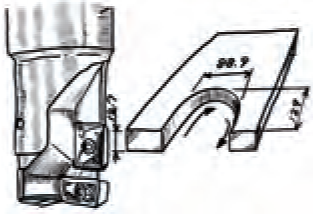


Result Increased the productivity by 2.4 times against exsiting indexable end mill.

Work	Part name	Aluminium plate
	Material	Aluminium alloy
	Hardness	—
Tool	Tool No.	SECML3234S32
	Grade	JC5040
Cutting conditions	Vc, (n)	2,500 (min^{-1}), 251 (m/min)
	Vf, (f z)	762 (mm/min), 0.3 (mm/rev)
	ap (mm)	38.1 (mm)
	ae (mm)	12.7 (mm)
	Coolant	Wetcut
	Machine	Vertical MC

3. Slot milling

U groove milling

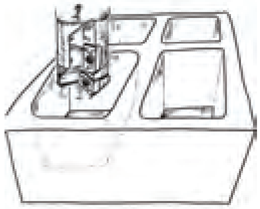


Result Increased feed speed by 1.6 times andi mproved tool life by 2 times compared with competitor.

Work	Part name	Heat resistant plate
	Material	Heat resistant alloy
	Hardness	—
Tool	Tool No.	SECML2527S25
	Grade	JC5040
Cutting conditions	Vc, (n)	1,400 (min^{-1}), 110 (m/min)
	Vf, (f z)	635 (mm/min), 0.45 (mm/rev)
	ap (mm)	12.7 (mm)
	ae (mm)	25.4 (mm)
	Coolant	Water soluble
	Machine	Vertical MC

4. High efficient machining

Pocket milling



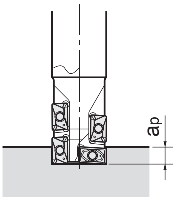
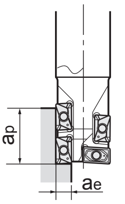
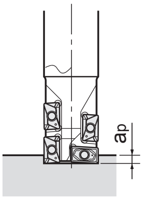
Result Increased chip removal rate and tool life by 3 times. Q=8,000cm^3/corner.

Work	Part name	Cavity mold
	Material	S53C
	Hardness	—
Tool	Tool No.	SECM3334S32
	Grade	JC5040
Cutting conditions	Vc, (n)	1,200 (min^{-1}),124 (m/min)
	Vf, (f z)	320 (mm/min), 0.26 (mm/rev)
	ap (mm)	12 (mm)
	ae (mm)	23−33 (mm)
	Coolant	Dry cut
	Machine	Vertical MC

Super End Chipper SEC TYPE

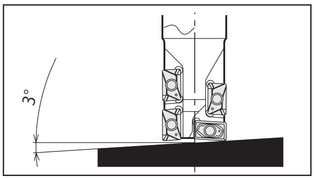
■ RECOMMENDED CUTTING CONDITIONS

● φ30, φ32, φ33mm

Type of Machining							
Work Materials	Insert Grades	Cutting conditions	Slotting		Shoulder milling		Drilling
Carbon steel S50C, S55C (C50, C55) 150-280HB	JC5040	n (min^{-1})	1,490	1,390	1,590	1,590	1,490
		V_f (mm/min)	450	310	550	400	370
		ap (mm)	~6	6~16	~8	8~34	~5
		ae (mm)	—	—	~16	~6	—
Alloy steel SCM440 (1.7223) 150-280HB	JC5040	n (min^{-1})	1,490	1,390	1,590	1,590	1,490
		V_f (mm/min)	420	280	480	350	300
		ap (mm)	~6	6~16	~8	8~34	~5
		ae (mm)	—	—	~16	~6	—
Mold steel NAK, P20 (1.2311, P20) 280-400HB	JC5040 JC5015	n (min^{-1})	1,290	1,190	1,290	1,290	1,290
		V_f (mm/min)	320	240	390	260	250
		ap (mm)	~5	5~16	~8	8~34	~5
		ae (mm)	—	—	~16	~6	—
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) 150-255HB	JC5040	n (min^{-1})	1,190	1,100	1,290	1,290	1,190
		V_f (mm/min)	300	220	390	260	240
		ap (mm)	~5	5~16	~8	8~34	~5
		ae (mm)	—	—	~16	~6	—
Stainless steel SUS304, SUS316 150-250HB	JC5015 (JC5040)	n (min^{-1})	1,100	1,000	1,190	1,190	1,100
		V_f (mm/min)	275	200	360	240	165
		ap (mm)	~5	5~16	~8	8~34	~5
		ae (mm)	—	—	~16	~6	—
Cast iron FC250, FC300 (GG25, GG30) 160-260HB	JC5015 (JC5040)	n (min^{-1})	1,690	1,590	1,790	1,790	1,690
		V_f (mm/min)	680	480	700	540	500
		ap (mm)	~8	8~16	~8	8~34	~5
		ae (mm)	—	—	~16	~6	—
Nodular cas tiron FCD600, FCD700 (GGG60, GGG70) 170-300HB	JC5015 (JC5040)	n (min^{-1})	1,490	1,390	1,590	1,590	1,490
		V_f (mm/min)	520	350	560	400	370
		ap (mm)	~8	8~16	~8	8~34	~5
		ae (mm)	—	—	~16	~6	—
Aluminium alloy 50-110HB	FZ15	n (min^{-1})	3,000	3,000	3,000	3,000	3,000
		V_f (mm/min)	1,200	900	1,500	900	900
		ap (mm)	~8	8~16	~8	8~34	~5
		ae (mm)	—	—	~16	~6	—

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

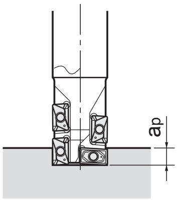
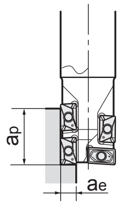
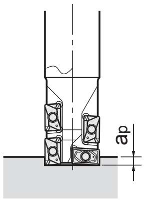
Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case of using medium long, long and extra long type, refer page C236 for instructions for use of SEC type.
3. In case of ramping, ramping angle up to 3° is recommended. (Refer right picture)



Super End Chipper SECTYPE

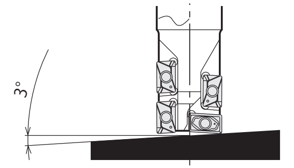
RECOMMENDED CUTTING CONDITIONS

● φ24, φ25, φ26mm

Type of Machining							
Work Materials	Insert Grades	Cutting conditions	Slotting		Shoulder milling		Drilling
Carbon steel S50C, S55C (C50, C55) 150-280HB	JC5040	n (min^{-1})	1,910	1,780	2,040	2,040	1,910
		V_f (mm/min)	520	350	610	400	470
		a_p (mm)	~5	5~12	~7	7~27	~4
		a_e (mm)	—	—	~12	~5	—
Alloy steel SCM440 (1.7223) 150-280HB	JC5040	n (min^{-1})	1,910	1,780	2,040	2,040	1,910
		V_f (mm/min)	480	320	550	360	380
		a_p (mm)	~5	5~12	~7	7~27	~4
		a_e (mm)	—	—	~12	~5	—
Mold steel NAK, P20 (1.2311, P20) 280-400HB	JC5040 JC5015	n (min^{-1})	1,530	1,400	1,650	1,650	1,530
		V_f (mm/min)	380	250	440	290	300
		a_p (mm)	~4	4~12	~7	7~27	~4
		a_e (mm)	—	—	~12	~5	—
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) 150-255HB	JC5040	n (min^{-1})	1,530	1,400	1,650	1,650	1,530
		V_f (mm/min)	380	250	440	290	300
		a_p (mm)	~4	4~12	~7	7~27	~4
		a_e (mm)	—	—	~12	~5	—
Stainless steel SUS304, SUS316 150-250HB	JC5015 (JC5040)	n (min^{-1})	1,400	1,270	1,530	1,530	1,400
		V_f (mm/min)	320	200	380	270	210
		a_p (mm)	~4	4~12	~7	7~27	~4
		a_e (mm)	—	—	~12	~5	—
Cast iron FC250, FC300 (GG25, GG30) 160-260HB	JC5015 (JC5040)	n (min^{-1})	2,040	1,910	2,160	2,160	2,040
		V_f (mm/min)	700	470	750	540	600
		a_p (mm)	~5	5~12	~7	7~27	~4
		a_e (mm)	—	—	~12	~5	—
Nodular cast iron FCD600, FCD700 (GGG60, GGG70) 170-300HB	JC5015 (JC5040)	n (min^{-1})	1,910	1,780	2,040	2,040	1,910
		V_f (mm/min)	570	390	650	460	480
		a_p (mm)	~5	5~12	~7	7~27	~4
		a_e (mm)	—	—	~12	~5	—
Aluminium alloy 50-110HB	FZ15	n (min^{-1})	3,820	3,820	3,820	3,820	3,820
		V_f (mm/min)	1,340	960	1,900	960	1,150
		a_p (mm)	~5	5~12	~7	7~27	~4
		a_e (mm)	—	—	~12	~5	—

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

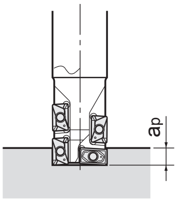
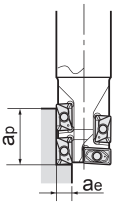
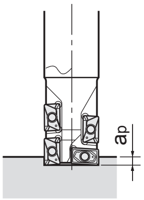
Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case of using medium long, long and extra long type, refer page C236 for instructions for use of SEC type.
3. In case of ramping, ramping angle up to 3° is recommended. (Refer right picture)



Super End Chipper SECTYPE

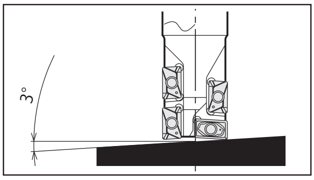
RECOMMENDED CUTTING CONDITIONS

● φ20, φ21mm

Type of Machining							
Work Materials	Insert Grades	Cutting conditions	Slotting		Shoulder milling		Drilling
Carbon steel S50C, S55C (C50, C55) 150-280HB	JC5040	n (min^{-1})	2,390	2,230	2,550	2,550	2,390
		V_f (mm/min)	600	380	680	510	480
		ap (mm)	~4	4~10	~5	5~21	~3
		ae (mm)	—	—	~10	~4	—
Alloy steel SCM440 (1.7223) 150-280HB	JC5040	n (min^{-1})	2,390	2,230	2,550	2,550	2,390
		V_f (mm/min)	540	350	630	460	430
		ap (mm)	~4	4~10	~5	5~21	~3
		ae (mm)	—	—	~10	~4	—
Mold steel NAK, P20 (1.2311, P20) 280-400HB	JC5040 JC5015	n (min^{-1})	1,910	1,750	2,070	2,070	1,910
		V_f (mm/min)	430	275	520	370	340
		ap (mm)	~3	3~10	~5	5~21	~3
		ae (mm)	—	—	~10	~4	—
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) 150-255HB	JC5040	n (min^{-1})	1,910	1,750	2,070	2,070	1,910
		V_f (mm/min)	430	275	520	370	340
		ap (mm)	~3	3~10	~5	5~21	~3
		ae (mm)	—	—	~10	~4	—
Stainless steel SUS304, SUS316 150-250HB	JC5015 (JC5040)	n (min^{-1})	1,750	1,590	1,910	1,910	1,750
		V_f (mm/min)	385	240	430	305	260
		ap (mm)	~3	3~10	~5	5~21	~3
		ae (mm)	—	—	~10	~4	—
Cast iron FC250, FC300 (GG25, GG30) 160-260HB	JC5015 (JC5040)	n (min^{-1})	2,500	2,390	2,700	2,700	2,500
		V_f (mm/min)	750	530	810	610	630
		ap (mm)	~4	4~10	~5	5~21	~3
		ae (mm)	—	—	~10	~4	—
Nodular cast iron FCD600, FCD700 (GGG60, GGG70) 170-300HB	JC5015 (JC5040)	n (min^{-1})	2,390	2,230	2,550	2,550	2,390
		V_f (mm/min)	600	400	700	500	480
		ap (mm)	~4	4~10	~5	5~21	~3
		ae (mm)	—	—	~10	~4	—
Aluminium alloy 50-110HB	FZ15	n (min^{-1})	4,780	4,780	4,780	4,780	4,780
		V_f (mm/min)	1,440	1,100	1,900	1,100	1,100
		ap (mm)	~4	4~10	~5	5~21	~3
		ae (mm)	—	—	~10	~4	—

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

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case of using medium long, long and extra long type, refer page C236 for instructions for use of SEC type.
3. In case of ramping, ramping angle up to 3° is recommended. (Refer right picture)

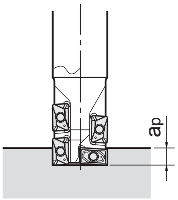
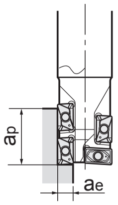
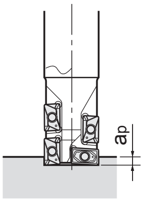


Super End Chipper

SEC TYPE

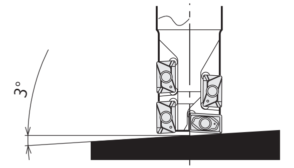
RECOMMENDED CUTTING CONDITIONS

● φ 16mm

Type of Machining							
Work Materials	Insert Grades	Cutting conditions	Slotting		Shoulder milling		Drilling
Carbon steel S50C, S55C (C50, C55) 150-280HB	JC5040	n (min^{-1})	2,790	2,590	2,980	2,980	2,790
		Vf (mm/min)	560	310	630	450	420
		ap (mm)	~3	3~8	~5	5~16	~2
		ae (mm)	—	—	~8	~3	—
Alloy steel SCM440 (1.7223) 150-280HB	JC5040	n (min^{-1})	2,790	2,590	2,980	2,980	2,790
		Vf (mm/min)	500	280	570	410	380
		ap (mm)	~3	3~8	~5	5~16	~2
		ae (mm)	—	—	~8	~3	—
Mold steel NAK, P20 (1.2311, P20) 280-400HB	JC5040 JC5015	n (min^{-1})	2,190	1,990	2,390	2,390	2,190
		Vf (mm/min)	390	250	480	330	260
		ap (mm)	~2.5	3~8	~5	5~16	~2
		ae (mm)	—	—	~8	~3	—
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) 150-255HB	JC5040	n (min^{-1})	2,190	1,990	2,390	2,390	2,190
		Vf (mm/min)	390	250	480	330	260
		ap (mm)	~2.5	3~8	~5	5~16	~2
		ae (mm)	—	—	~8	~3	—
Stainless steel SUS304, SUS316 150-250HB	JC5015 (JC5040)	n (min^{-1})	1,990	1,790	2,190	2,190	1,990
		Vf (mm/min)	350	220	430	280	240
		ap (mm)	~2.5	3~8	~5	5~16	~2
		ae (mm)	—	—	~8	~3	—
Cast iron FC250, FC300 (GG25, GG30) 160-260HB	JC5015 (JC5040)	n (min^{-1})	2,980	2,790	3,180	3,180	2,980
		Vf (mm/min)	720	500	760	570	520
		ap (mm)	~3	3~8	~5	5~16	~2
		ae (mm)	—	—	~8	~3	—
Nodular cast iron FCD600, FCD700 (GGG60, GGG70) 170-300HB	JC5015 (JC5040)	n (min^{-1})	2,790	2,590	2,980	2,980	2,790
		Vf (mm/min)	560	310	630	450	420
		ap (mm)	~3	3~8	~5	5~16	~2
		ae (mm)	—	—	~8	~3	—
Aluminium alloy 50-110HB	FZ15	n (min^{-1})	6,000	6,000	6,000	6,000	6,000
		Vf (mm/min)	1,440	1,100	1,800	1,100	1,100
		ap (mm)	~3	3~8	~5	5~16	~2
		ae (mm)	—	—	~8	~3	—

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

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case of using medium long, long and extra long type, refer page C236 for instructions for use of SEC type.
3. In case of ramping, ramping angle up to 3° is recommended. (Refer right picture)



Super End Chipper SECTYPE

INSTRUCTIONS FOR USE OF SEC TYPE

1. The cutting parameters to be adjusted according the machine rigidity or work rigidity.
2. Apply below table figures for the use of Medium long, Long and Extralong type tools.

Type	Depth of cut ap	Spindle speed n	Feed speed Vf
Medium Long (ML)	80%	90%	80%
Long (L)	Up to 30%	70%	70%
Extra Long (EL, XL)	Up to 1mm	50%	60%

Tool dia. (mm)	A1 (mm) (Fig. 1)	Depth of cut: T (mm) (Fig. 2)
16	5.2	~5.2 or 11.8~15.5
20, 21	5.5	~5.5 or 14.0~17.5
24, 25, 26	7.0	~7.0 or 16.8~23.2
30, 32, 33	8.6	~8.6 or 20.3~28.1

Fig.1

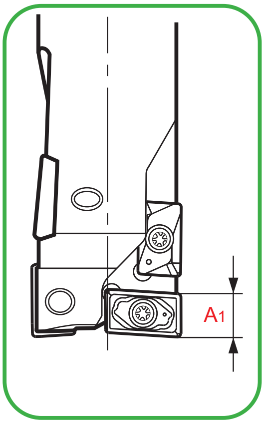
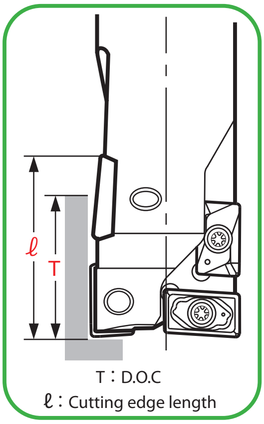


Fig.2



Side Chipper SICTYPE

1. The same insert of Super End Chipper can be used.
2. 3D insert geometry gives low cutting force and excellent chip ejection for high productivity.
3. Series expansion: Polished insert and PCD insert for Aluminium.

Face Milling
Shoulder Milling
Slotting

Fig.1

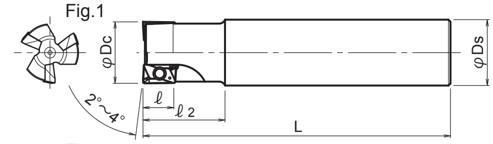
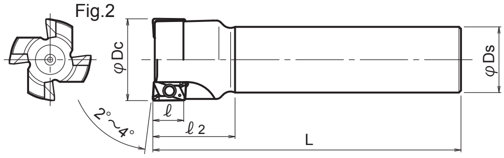


Fig.2



BODY / END MILL - MEDIUM TYPE

Cat. No.	Stock	No. of Inserts	Dimensions (mm)					Inserts	Fig.
			φDc	ℓ	ℓ2	L	φDs		
SICM1610S16-2N	●	2	16	10	25	100	16	ZCMT1003○○R○ JDA-ZCGT1003○○	1
SICM2010S20-3N	●	3	20	10	25	110	20		1
SICM2510S25-4N	●	4	25	10	32	120	25		1
SICM2513S25-3N	●	3		13				ZPMT13T3○○R○	1
SICM3016S32-3N	●	3	30	15	40	150	32	ZPMT1604○○R○	1
SICM3210S32-5N	●	5	32	10	40	150	32	ZCMT1003○○R○ JDA-ZCGT1003○○	1
SICM3216S32-3N	●	3		15				ZPMT1604○○R○	1
SICM4010S32-6N	●	6	40	10	40	150	32	ZCMT1003○○R○ JDA-ZCGT1003○○	2
SICM4016S32-4N	●	4		15				ZPMT1604R	2
SICM5010S32-7N	□	7	50	10	40	150	32	ZCMT1003○○R○ JDA-ZCGT1003○○	2
SICM5016S32-5N	●	5		15				ZPMT1604○○R○	2

Note) 1. All cutters are supplied without inserts.
2. Please refer page C240-C245 for recommended cutting conditions.
3. Body must be modified to 1.5mm radius or 1.2mm chamfer at corner to use 3.0mm or 3.2mm corner radius insert.

Modular Head Type Please refer Page B135

BODY / END MILL - LONG TYPE

Cat. No.	Stock	No. of Inserts	Dimensions (mm)					Inserts	Fig.
			φDc	ℓ	ℓ2	L	φDs		
SICL1610S16-2N	●	2	16	10	25	150	16	ZCMT1003○○R○ JDA-ZCGT1003○○	1
SICL2010S20-2N	●	2	20	10	40	180	20		1
SICL2010S20-3N	●	3							1
SICL2513S25-2N	●	2	25	13	35	210	25	ZPMT13T3○○R○	1
SICL2513S25-3N	●	3							1
SICL3016S25-3N	●	3	30	15	65	250	25	ZPMT1604○○R○	2
SICL3216S32-2N	□	2	32	15	65	250	32	ZPMT1604○○R○	1
SICL3216S32-3N	●	3							1
SICL4016S32-4N	●	4	40	15	65	250	32	ZPMT1604○○R○	2
SICL5016S42-5N	□	5	50	15	65	250	42	ZPMT1604○○R○	2

Note) 1. All cutters are supplied without inserts.
2. Please refer page C240-C245 for recommended cutting conditions.
3. Body must be modified to 1.5mm radius or 1.2mm chamfer at corner to use 3.0mm or 3.2mm corner radius insert.

Modular Head Type Please refer Page B135

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

Side Chipper

SIC TYPE

Face Milling Shoulder Milling Slotting

Fig.1

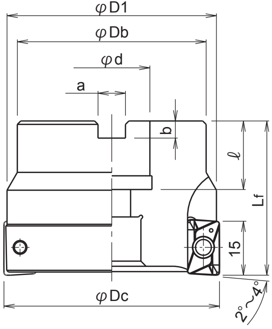
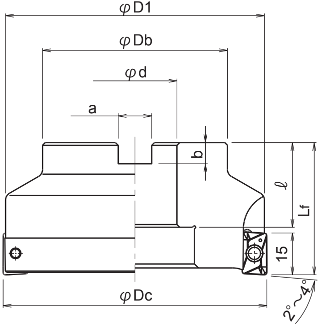


Fig.2



BODY / FACE MILL TYPE

Cat. No.	Stock	No. of Inserts	Dimensions (mm)								Weight (kg)	Inserts	Fig.
			φDc	φD1	φDb	L_f	φd	a	b	ℓ			
SIC-4050R-22	●	4	**50**	47.6	45	45	22	10.4	6.3	20	0.4	ZPMT1604○○R○	1
SIC-5063R-22	●	5	**63**	61	55	45	22	10.4	6.3	20	0.8		1
SIC-6080R-27	●	6	**80**	78	60	50	27	12.4	7	22	1.0		2
SIC-8100R-32	●	8	**100**	98	70	50	32	14.4	8	32	1.7		2
SIC-8125R-40	●	8	**125**	123	85	63	40	16.4	9	35	3.2		2

Modular Head Type **Please refer Page B135**

Note) 1. All cutters are supplied without inserts.
2. Please refer page C240-C245 for recommended cutting conditions.
3. Body must be modified to 1.5mm radius or 1.2mm chamfer at corner to use 3.0mm or 3.2mm corner radius insert.

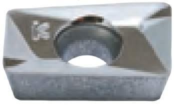
Side Chipper **SIC**TYPE

■ INSERTS

SERIES EXPANSION: POLISHED INSERT FOR ALUMINIUM

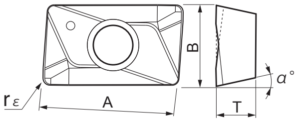
Z※MT-R type

Z※MT-RP type



Polished Insert

Peripheral Insert



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

Cat.No.	PVD coated			Un-coated	Dimensions (mm)					Parts	
	JC5015	**JC5040**	**JC8050**	**FZ15**	A	B	T	α°	rε	Clamp Screw	Wrench
ZCMT100304R	●	●			10.4	6.35	3.4	7	0.4	ESW-206	A-08SD
ZCMT100308R	●	●			10.4	6.35	3.4	7	0.8	ESW-206	A-08SD
ZCMT100308RP				●	10.4	6.35	3.4	7	0.8	ESW-206	A-08SD
ZPMT13T308R	●	●			13.3	7.938	3.97	11	0.8	DSW-307	A-10
ZPMT13T308RP				●	13.3	7.938	3.97	11	0.8	DSW-307	A-10
ZPMT13T316R	●	●			13.3	7.938	3.97	11	1.6	DSW-307	A-10
ZPMT13T316RP				☐	13.3	7.938	3.97	11	1.6	DSW-307	A-10
ZPMT13T320R	●	●			13.3	7.938	3.97	11	2.0	DSW-307	A-10
ZPMT13T320RP				☐	13.3	7.938	3.97	11	2.0	DSW-307	A-10
ZPMT160404R	●	●			16	9.525	4.76	11	0.4	TSW-408	A-15 (End mill type) A-15T (Face mill type)
ZPMT160408R	●	●	●		16	9.525	4.76	11	0.8	TSW-408	
ZPMT160408RP				●	16	9.525	4.76	11	0.8	TSW-408	
ZPMT160416R	●	●			16	9.525	4.76	11	1.6	TSW-408	
ZPMT160416RP				☐	16	9.525	4.76	11	1.6	TSW-408	
ZPMT160420R	●	●			16	9.525	4.76	11	2.0	TSW-408	
ZPMT160420RP				☐	16	9.525	4.76	11	2.0	TSW-408	
ZPMT160430R	●	●			16	9.525	4.76	11	3.0	TSW-408	
ZPMT160430RP				☐	16	9.525	4.76	11	3.0	TSW-408	
ZPMT160432R	●	●			16	9.525	4.76	11	3.2	TSW-408	
ZPMT160432RP				☐	16	9.525	4.76	11	3.2	TSW-408	

10 inserts per case

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

Side Chipper

SIC TYPE

RECOMMENDED CUTTING CONDITIONS / SHOULDER MILLING

● SICM○○10 TYPE (END MILL TYPE)

Work Materials	Insert Grades	Cutting conditions	φ16	φ20	φ25	φ32	φ40	φ50
Carbon steel S50C, S55C (C50, C55) 150-280HB	JC5040	n (min^{-1})	2,990	2,390	1,910	1,500	1,200	960
		V_f (mm/min)	720	860	920	900	870	810
		a_p (mm)	3	3	3	3	3	3
		a_e (mm)	5	6	8	10	12	15
Alloy steel SCM440 (1.7223) 150-280HB	JC5040	n (min^{-1})	2,990	2,390	1,910	1,500	1,200	960
		V_f (mm/min)	600	720	770	750	720	680
		a_p (mm)	3	3	3	3	3	3
		a_e (mm)	5	6	8	10	12	15
Mold steel NAK, P20 (1.2311, P20) 280-400HB	JC5040 JC5015	n (min^{-1})	2,390	1,910	1,530	1,200	960	770
		V_f (mm/min)	480	580	620	600	580	540
		a_p (mm)	2	2	2	2	2	2
		a_e (mm)	5	6	8	10	12	15
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) 150-255HB	JC5040	n (min^{-1})	2,390	1,910	1,530	1,200	960	770
		V_f (mm/min)	480	580	620	600	580	540
		a_p (mm)	2	2	2	2	2	2
		a_e (mm)	5	6	8	10	12	15
Stainless steel SUS304, SUS316 150-250HB	JC5015 (JC5040)	n (min^{-1})	2,190	1,750	1,400	1,100	880	700
		V_f (mm/min)	440	530	560	550	530	490
		a_p (mm)	2	2	2	2	2	2
		a_e (mm)	5	6	8	10	12	15
Cast iron FC250, FC300 (GG25, GG30) 160-260HB	JC5015 (JC5040)	n (min^{-1})	3,190	2,250	2,040	1,600	1,280	1,020
		V_f (mm/min)	900	1,070	1,140	1,120	1,080	1,000
		a_p (mm)	3	3	3	3	3	3
		a_e (mm)	5	6	8	10	12	15
Nodular cast iron FCD600, FCD700 (GGG60, GGG70) 170-300HB	JC5015 (JC5040)	n (min^{-1})	2,990	2,390	1,910	1,500	1,200	960
		V_f (mm/min)	720	860	920	900	870	810
		a_p (mm)	3	3	3	3	3	3
		a_e (mm)	5	6	8	10	12	15
Aluminium alloy 50-110HB	FZ15	n (min^{-1})	6,000	4,780	3,820	3,000	2,400	1,900
		V_f (mm/min)	1,800	2,150	2,300	2,250	2,000	1,900
		a_p (mm)	3	3	3	3	3	3
		a_e (mm)	5	6	8	10	12	15

n: Spindle speed, V_f: Feed speed, a_p: Depth of cut, a_e: Width of cut

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case of using long type holder, reduce depth of cut by 60% to 40% or feed speed.

Side Chipper SIC TYPE

■ RECOMMENDED CUTTING CONDITIONS / SLOTTING

● SICM○○10 TYPE (END MILL TYPE)

Work Materials	Insert Grades	Cutting conditions	φ16	φ20	φ25	φ32	φ40	φ50
Carbon steel S50C, S55C (C50, C55) 150-280HB	JC5040	n (min^{-1})	2,790	2,230	1,790	1,400	1,120	900
		V_f (mm/min)	560	670	720	700	680	630
		a_p (mm)	~3	~3	~3	~3	~3	~3
Alloy steel SCM440 (1.7223) 150-280HB	JC5040	n (min^{-1})	2,790	2,230	1,790	1,400	1,120	900
		V_f (mm/min)	450	540	580	560	540	510
		a_p (mm)	~3	~3	~3	~3	~3	~3
Mold steel NAK, P20 (1.2311, P20) 280-400HB	JC5040 (JC5015)	n (min^{-1})	2,190	1,750	1,400	1,100	880	700
		V_f (mm/min)	350	420	450	440	430	400
		a_p (mm)	~2	~2	~2	~2	~2	~2
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) 150-255HB	JC5040	n (min^{-1})	2,190	1,750	1,400	1,100	880	700
		V_f (mm/min)	350	420	450	440	430	400
		a_p (mm)	~2	~2	~2	~2	~2	~2
Stainless steel SUS304, SUS316 150-250HB	JC5015 (JC5040)	n (min^{-1})	1,990	1,600	1,280	1,000	800	640
		V_f (mm/min)	320	390	410	400	390	360
		a_p (mm)	~2	~2	~2	~2	~2	~2
Cast iron FC250, FC300 (GG25, GG30) 160-260HB	JC5015 (JC5040)	n (min^{-1})	2,990	2,390	1,910	1,500	1,200	960
		V_f (mm/min)	720	860	920	900	860	810
		a_p (mm)	~3	~3	~3	~3	~3	~3
Nodular cast iron FCD600, FCD700 (GGG60, GGG70) 170-300HB	JC5015 (JC5040)	n (min^{-1})	2,790	2,230	1,790	1,400	1,120	900
		V_f (mm/min)	560	670	720	700	680	630
		a_p (mm)	~3	~3	~3	~3	~3	~3
Aluminium alloy 50-110HB	FZ15	n (min^{-1})	6,000	4,780	3,820	3,000	2,400	1,900
		V_f (mm/min)	1,200	1,430	1,530	1,500	1,440	1,330
		a_p (mm)	~3	~3	~3	~3	~3	~3

n: Spindle speed, V_f: Feed speed, a_p: Depth of cut, a_e: Width of cut

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case of using long type holder, reduce depth of cut by 60% to 40% or feed speed.

Side Chipper SIC TYPE

RECOMMENDED CUTTING CONDITIONS / SHOULDER MILLING

● SICM○○16 TYPE (END MILL TYPE)

Work Materials	Insert Grades	Cutting conditions	φ30	φ32	φ40	φ50
Carbon steel S50C, S55C (C50, C55) 150-280HB	JC5040	n (min^{-1})	1,600	1,500	1,200	960
		V_f (mm/min)	870	810	870	870
		ap (mm)	5	5	5	5
		ae (mm)	9	10	12	15
Alloy steel SCM440 (1.7223) 150-280HB	JC5040	n (min^{-1})	1,600	1,500	1,200	960
		V_f (mm/min)	720	680	720	720
		ap (mm)	5	5	5	5
		ae (mm)	9	10	12	15
Mold steel NAK, P20 (1.2311, P20) 280-400HB	JC5040 JC5015	n (min^{-1})	1,280	1,200	960	770
		V_f (mm/min)	580	540	580	580
		ap (mm)	3	3	3	3
		ae (mm)	9	10	12	15
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) 150-255HB	JC5040	n (min^{-1})	1,280	1,200	960	770
		V_f (mm/min)	580	540	580	580
		ap (mm)	3	3	5	3
		ae (mm)	9	10	12	15
Stainless steel SUS304, SUS316 150-250HB	JC5015 (JC5040)	n (min^{-1})	1,170	1,100	800	700
		V_f (mm/min)	530	500	480	530
		ap (mm)	3	3	3	3
		ae (mm)	9	10	12	15
Cas tiron FC250, FC300 (GG25, GG30) 160-260HB	JC5015 (JC5040)	n (min^{-1})	1,700	1,600	1,280	1,020
		V_f (mm/min)	1,020	960	1,020	1,020
		ap (mm)	5	5	5	5
		ae (mm)	9	10	12	15
Nodular cas tiron FCD600, FCD700 (GGG60, GGG70) 170-300HB	JC5015 (JC5040)	n (min^{-1})	1,600	1,500	1,200	960
		V_f (mm/min)	870	810	870	870
		ap (mm)	5	5	5	5
		ae (mm)	9	10	12	15
Aluminium alloy 50-110HB	FZ15	n (min^{-1})	3,200	3,000	2,400	1,900
		V_f (mm/min)	1,920	1,800	1,920	1,900
		ap (mm)	5	5	5	5
		ae (mm)	9	10	12	15

n: Spindle speed, V_f: Feed speed, ap: Depth of cut, ae: Width of cut

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case of using long type holder, reduce depth of cut by 60% to 40% or feed speed.

Side Chipper SICTYPE

■ RECOMMENDED CUTTING CONDITIONS / SLOTTING

● SICM○○16 TYPE (END MILL TYPE)

Work Materials	Insert Grades	Cutting conditions	φ30	φ32	φ40	φ50
Carbon steel S50C, S55C (C50, C55) 150-280HB	JC5040	n (min^{-1})	1,490	1,400	1,120	900
		V_f (mm/min)	670	630	680	680
		a_p (mm)	~5	~5	~3	~5
Alloy steel SCM440 (1.7223) 150-280HB	JC5040	n (min^{-1})	1,490	1,400	1,120	900
		V_f (mm/min)	540	510	540	540
		a_p (mm)	~5	~5	~3	~3
Mold steel NAK, P20 (1.2311, P20) 280-400HB	JC5040 JC5015	n (min^{-1})	1,170	1,100	880	700
		V_f (mm/min)	430	400	430	420
		a_p (mm)	~3	~3	~2	~3
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) 150-255HB	JC5040	n (min^{-1})	1,170	1,100	880	700
		V_f (mm/min)	430	400	430	420
		a_p (mm)	~3	~3	~2	~3
Stainless steel SUS304, SUS316 150-250HB	JC5015 (JC5040)	n (min^{-1})	1,070	1,000	800	640
		V_f (mm/min)	390	360	390	390
		a_p (mm)	~3	~3	~2	~3
Cast iron FC250, FC300 (GG25, GG30) 160-260HB	JC5015 (JC5040)	n (min^{-1})	1,600	1,500	1,200	960
		V_f (mm/min)	820	770	820	820
		a_p (mm)	~5	~5	~3	~5
Nodular cast iron FCD600, FCD700 (GGG60, GGG70) 170-300HB	JC5015 (JC5040)	n (min^{-1})	1,490	1,400	1,120	900
		V_f (mm/min)	670	630	680	680
		a_p (mm)	~5	~5	~3	~5
Aluminium alloy 50-110HB	FZ15	n (min^{-1})	3,200	3,000	2,400	1,900
		V_f (mm/min)	1,440	1,350	1,440	1,430
		a_p (mm)	~5	~5	~5	~5

n: Spindle speed, V_f: Feed speed, a_p: Depth of cut, a_e: Width of cut

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case of using long type holder, reduce depth of cut by 60% to 40% or feed speed.

Side Chipper

SICTYPE

RECOMMENDED CUTTING CONDITIONS

● SICM2513 TYPE (END MILL TYPE)

Work Materials	Insert Grades	Cutting conditions	Shoulder Milling	Slotting
Carbon steel S50C, S55C (C50, C55) 150-280HB	JC5040	n (min^{-1})	1,910	1,790
		V_f (mm/min)	860	650
		a_p (mm)	4	~4
		a_e (mm)	8	—
Alloy steel SCM440 (1.7223) 150-280HB	JC5040	n (min^{-1})	1,910	1,790
		V_f (mm/min)	690	540
		a_p (mm)	4	~4
		a_e (mm)	8	—
Mold steel NAK, P20 (1.2311, P20) 280-400HB	JC5040 JC5015	n (min^{-1})	1,530	1,400
		V_f (mm/min)	560	420
		a_p (mm)	2.5	~2.5
		a_e (mm)	8	—
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) 150-255HB	JC5040	n (min^{-1})	1,530	1,400
		V_f (mm/min)	560	420
		a_p (mm)	2.5	~2.5
		a_e (mm)	8	—
Stainless steel SUS304, SUS316 150-250HB	JC5015 (JC5040)	n (min^{-1})	1,400	1,280
		V_f (mm/min)	510	390
		a_p (mm)	2.5	~2.5
		a_e (mm)	8	—
Cast iron FC250, FC300 (GG25, GG30) 160-260HB	JC5015 (JC5040)	n (min^{-1})	2,040	1,910
		V_f (mm/min)	1,040	580
		a_p (mm)	4	~4
		a_e (mm)	8	—
Nodular cast iron FCD600, FCD700 (GGG60, GGG70) 170-300HB	JC5015 (JC5040)	n (min^{-1})	1,910	1,790
		V_f (mm/min)	860	650
		a_p (mm)	4	~4
		a_e (mm)	8	—
Aluminium alloy 50-110HB	FZ15	n (min^{-1})	3,820	3,820
		V_f (mm/min)	2,000	1,380
		a_p (mm)	4	~4
		a_e (mm)	8	—

n: Spindle speed (min^{-1}), V_f: Feed speed (mm/min)

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case of using long type holder, reduce depth of cut by 60% to 40% or feed speed.

Side Chipper SICTYPE

■ RECOMMENDED CUTTING CONDITIONS

● FACE MILL TYPE

Work Materials	Insert Grades	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Depth of cut ap (mm)	Pick feed ae (mm)
Carbon steel S50C, S55C (C50, C55) 150-280HB	JC5040	150 (80~200)	0.20 (0.1~0.25)	5	0.6Dc
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) 150-255HB	JC5040	120 (80~150)	0.15 (0.1~0.2)	3	0.6Dc
Cast iron FC250, FC300 (GG25, GG30) 160-260HB	JC5040 JC5015	150 (80~200)	0.20 (0.1~0.25)	5	0.6Dc
Stainless steel SUS304, SUS316 150-250HB	JC5015 (JC5040)	110 (80~200)	0.10 (0.05~0.15)	3	0.6Dc
Aluminium alloy 50-110HB	FZ15	300 (200~500)	0.20 (0.1~0.25)	5	0.6Dc

■ RECOMMENDED CUTTING CONDITIONS FOR PCD INSERT (JDA10)

NOTE

1) Max. depth of cut: ap=Up to 4mm

2) Max. cutting speed: Vc=Up to 1,000m/min

① SICM○○10 TYPE (END MILL TYPE) / SHOULDER MILLING

Work Materials	Insert Grades	Cutting Conditions	Dimensions (mm)					
			φ16	φ20	φ25	φ32	φ40	φ50
Aluminium alloy 50-110HB	JDA10	n (min^{-1})	6,000	4,780	3,820	3,000	2,400	1,900
		Vf (mm/min)	1,800	2,150	2,300	2,250	2,000	1,900
		ap (mm)	3	3	3	3	3	3
		ae (mm)	5	6	8	10	12	15

② SICM○○10 TYPE (END MILL TYPE) / SLOTTING

Work Materials	Insert Grades	Cutting Conditions	Dimensions (mm)					
			φ16	φ20	φ25	φ32	φ40	φ50
Aluminium alloy 50-110HB	JDA10	n (min^{-1})	6,000	4,780	3,820	3,000	2,400	1,900
		Vf (mm/min)	1,200	1,430	1,530	1,500	1,440	1,330
		ap (mm)	~2	~2	~2	~2	~2	~2

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

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case of using long type holder, reduce depth of cut by 60% to 40% or feed speed.

Roughing Chipper RFCTYPE

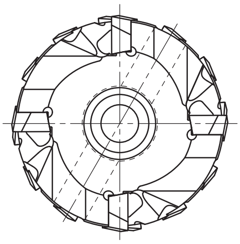
G-Body

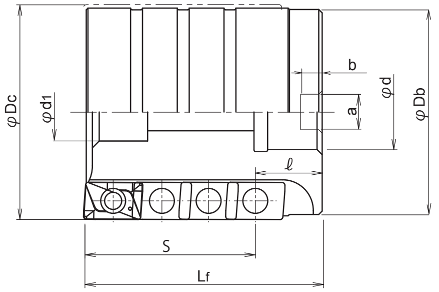
- 3D insert geometry gives low cutting forces and excellent chip ejection for high productivity at high feed rate
- Adopted ultra rigid G Body

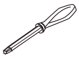
JCTMA 2008-005 ECO PRODUCT ★★★

Shoulder Milling

BODY





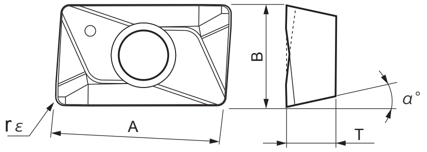
Cat. No.	Stock	No. of Inserts	No. of flutes	No. of Eff. Cutting edge	Dimensions (mm)									Weight (kg)	Set bolt	Parts	
					φDc	φDb	φd1	S	Lf	φd	a	b	ℓ			Clamp screw 	Wrench 
RFC5050R-22	●	12	3	3	**50**	45	17	50	90	22	10.4	6.3	20	0.9	★ M10x1.5x55	DSW-4510H	A-20SD
RFC6350R-22	●	16	4	4	**63**	60	17	50	70	22	10.4	6.3	20	1.1		DSW-4510H	A-20SD
RFC8060R-27	□	25	5	5	**80**	60	20	60	80	27	12.4	7	22	2.2		DSW-4510H	A-20SD

Note) 1. All cutters are supplied without inserts

2. ★mark shows: these cutter bodies are equipped with theset bolt because of the specified bolt size.

Clamp Screw	Recommended torque (N・m)
DSW-4510H	6.0

INSERTS



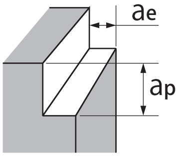
Cat. No.	PVD coated		Dimensions (mm)				
	JC5015	**JC5040**	A	B	T	α°	rε
ZPMT170508R	●	●	17	11	5.56	11	0.8

10 inserts per case

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

Roughing Chipper **RFCTYPE**

RECOMMENDED CUTTING CONDITIONS

Type of Machining	Shoulder Milling
	

Work Materials	Hard-ness	Insert Grades	Max. D.O.C. (mm)	Tool dia. (mm)								
				φ50			φ63			φ80		
				Vc (m/min)	n (min^{-1})	Vf (mm/min)	Vc (m/min)	n (min^{-1})	Vf (mm/min)	Vc (m/min)	n (min^{-1})	Vf (mm/min)
Cast iron (FC)	150HB	JC5015 (JC5040)	ae = 0.5Dc(max) ap=1.0Dc(max)	140	890	610	140	710	650	140	560	640
			ae = 0.1Dc ap = Below flute length	140	890	880	140	710	940	140	560	920
Nodular cast iron (FCD)	Below 220HB	JC5015 (JC5040)	ae = 0.5Dc(max) ap =1.0Dc(max)	120	760	520	120	610	560	120	480	550
			ae = 0.1Dc ap = Below flute length	120	760	750	120	610	810	120	480	790
Carbon steel Alloy steel (S-C, SCM)	Below 250HB	JC5040	ae = 0.5Dc(max) ap =1.0Dc(max)	110	700	420	110	560	450	110	440	440
			ae = 0.1Dc ap = Below flute length	110	700	690	110	560	670	110	440	660
Tool & Die steel SKD	Below 255HB	JC5040	ae = 0.5Dc(max) ap = 1.0Dc(max)	100	640	230	100	510	250	100	400	240
			ae = 0.1Dc ap = Below flute length	100	640	350	100	510	370	100	400	360

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

DIJET Mill 45/90 **SSE45 / SSD90TYPE**

Ultra rigid **Longer tool life** **Wide range of application from general steel to hardened steel**

SSE45/SSD90 Series

SSE45 type
- ● Entering angle: 45°
- ● For Face Milling (φ50 ~ φ125)

Face Milling

SSD90 type
- ● Entering angle: 90°
- ● For Shoulder Milling (φ50 ~ φ125)

Face Milling Shoulder Milling

- ○ Carbide shim gives longer tool life of cutter body
- ○ For SSE45 Ultra Fine Pitch type is available

SSE45 Type

- ●Entering angle: 45°
- ●For Face Milling

SSD90 Type

- ●Entering angle: 90°
- ●For Shoulder Milling

DIJET Mill 45 SSE45TYPE

JCTMA 2008-005 ECO PRODUCT ★★★

Face Milling

SSE45 gives wide application for cast iron, general steel and hardened steel.

JC5040 for general steel, JC605W for cast iron, JC8015 for nodular cast iron and hardened steel, FZ05 for Aluminium alloy and tough grade JC8050 for unfavorable conditions.

Ultra-rigid body gives longer tool life.

1. Adopted Carbide shim prevents body damage and improves security when insert is broken.
2. Secure insert location maintains high precision face run out and improves surface roughness and tool life.
3. SSE45 achieves 1.3 times longer tool life than competitor.

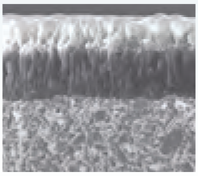
Excellent and smooth cutting is possible with 20 degree positive axial rake and high positive 3D geometry insert.

Wiper insert is available for excellent surface roughness.

NEWLY DEVELOPED COATING, “JC605W”

JC605W is new CVD coated grade for cast iron milling. JC605W is improved wear and thermal resistance by adopting new substrate having excellent wear and chipping resistance and thick α-A R 2O3 layer providing maximum thermal and chemical protection. By means of smooth surface treatment of coating layer prevents abnormal wear such as sudden weld chipping.

Structure of JC605W

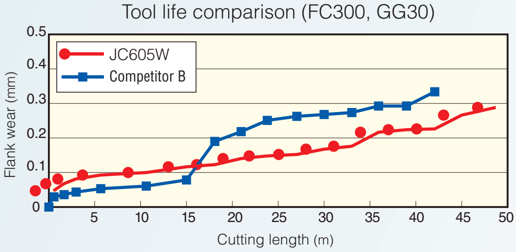


- α-AR2O3 layer with improved oxidation resistance and smooth surface treatment
- Ti (C, N) layer with improved chipping resistance
- Substrate gives excellent wear and chipping resistance

Applicable range of JC605W

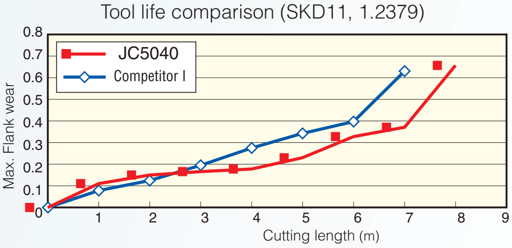
Type	Finishing or light cutting		Medium cutting	Heavy cutting
ISO code	K01	K10	K20	K30
Wear-resistance ↑↓ Chipping-resistance	JC605W			

CUTTING PERFORMANCE



Tool life comparison (FC300, GG30)

Material: FC300 (GG30),
Insert No.: SEMT13T3AGSN-KM (JC605W)
Cutting conditions: Vc=200m/min, fz=0.25mm/t,
ap=2.5mm, ae=68mm,Dry

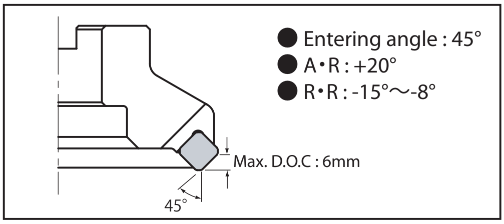


Tool life comparison (SKD11, 1.2379)

Material: SKD11 (1.2379),
Insert No.: SEMT13T3AGSN-PM (JC5040)
Tooldia.: φ100mm
Cutting conditions: Vc=120m/min, n=382min^{-1},
f=0.2mm/rev(1N), ap=2mm, ae=76mm,
Shoulder milling, Down cut, Airblow

DIJET Mill 45

SSE45TYPE



- Entering angle : 45°
- A•R : +20°
- R•R : -15°〜-8°

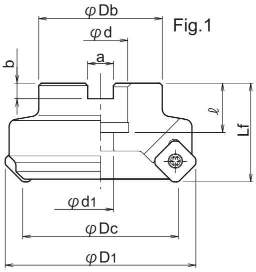


Fig.1

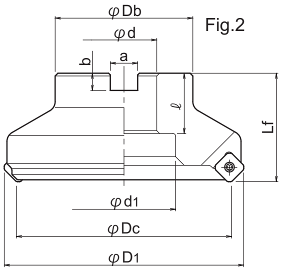


Fig.2

BODY

Bore	Cat. No.	Stock	No. of flutes	Dimensions (mm)									Weight kg	Fig.
				φDc	φD1	φDb	Lf	φd	φd1	a	b	ℓ		
Metric Bore	**SSE45-4050R-22**	●	4	50	63	45	40	22	10.4	10.4	6.3	20	0.4	1
	SSE45-5063R-22	●	5	63	76.1	50	40	22	10.4	10.4	6.3	20	0.6	1
	SSE45-6080R-27	●	6	80	93.1	56	50	27	13.5	12.4	7	22	1.1	1
	SSE45-7100R-32	●	7	100	113.3	70	50	32	17.5	14.4	8	25	1.6	1
	SSE45-8125R-40	●	8	125	138.3	80	63	40	60	16.4	9	32	2.6	2

Note)1. All cutters are supplied without inserts.
2. Please refer page C252 for recommended cutting conditions.

DIJET Mill 45 SSE45TYPE

INSERTS

Fig.1

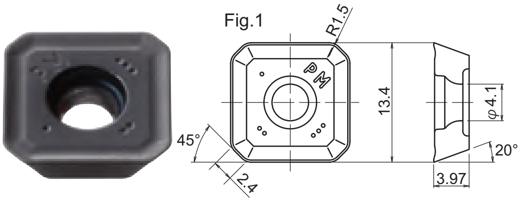


Fig.2

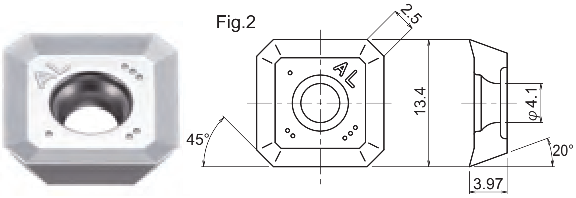
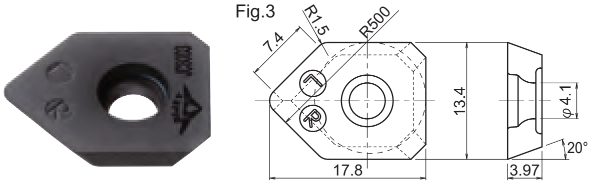


Fig.3

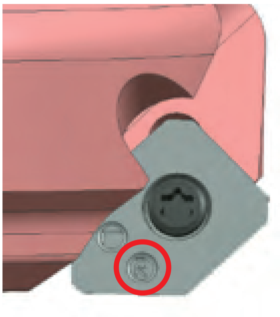


Cat. No.	Tole-rance	PVD coated				CVD coated	Uncoated	Fig.
		JC5040	**DH103**	**JC8015**	**JC8050**	**JC605W**	**FZ05**	
SEMT13T3AGSN-PM	M	●		●	●			1
SEMT13T3AGSN-KM	M					●		1
SEGT13T3AGFN-AL	G						●	2
XEHW13T3AGSN-W (Wiper insert)	H		●					3

10 inserts per case.

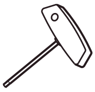
Clamp screw	Recommended torque (N•m)
TSW-3512H	2.1
SSW-535	6.5

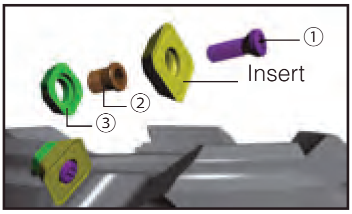
ATTENTION TO USING WIPER INSERT



- In case of feed per rev fz ≧ 2 mm/rev and surface roughness is required, were commend to use wiper insert.
- Wiper insert for SSE45 has single cutting edge.
- Please put insert as “R“ mark is shown to the front.

PARTS

Clamp screw	Shim screw	Shim	Wrench	Wrench for shim
① 	② 	③ 		
TSW-3512H	SSW-535	SM-SE13	A-15T	LW-035



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

DIJET Mill 45 SSE45TYPE

CASE STUDIES

Work	Part name	Block
	Material	FC250 GG25
	Hardness	–
Tool	Tool No.	SSE45-14250R-60(φ250 14N)
	Grade	SEMT13T3AGSN-KM (JC605W)
Cutting conditions	Vc, (n)	204 m/min, (260min^{-1})
	Vf, (fz)	728 mm/min, (0.2mm/t)
	a_p (mm)	2.5×2mm
	a_e (mm)	–
	Coolant	Dry
	Machine	Horizontal MC

Result

Combination of SSE45 and JC605W increased cutting speed 1.3 times and feed speed 3.25 times faster than competitor.

RECOMMENDED CUTTING CONDITIONS

ISO	Work Materials	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Insert Grades	Insert No.
P	Low carbon steel (SS400, S10C) Below 180HB	250 (200–300)	0.2 (0.1–0.3)	JC5040 (JC8050)	SEMT13T3AGSN-PM
	Carbon steel (S50C, S55C) Below 250HB	220 (170–250)	0.2 (0.1–0.3)	JC5040 (JC8050)	SEMT13T3AGSN-PM
	Tool & Die steel (SKD61, SKD11) Below 255HB	120 (100–150)	0.2 (0.1–0.3)	JC5040	SEMT13T3AGSN-PM
M	Stainless steel (SUS304) Below 250HB	220 (170–250)	0.2 (0.1–0.3)	JC8050 (JC8015)	SEMT13T3AGSN-PM
K	Grey cast iron (FC300) Below 300HB	200 (150–250)	0.2 (0.1–0.3)	JC605W (JC8015)	SEMT13T3AGSN-KM (SEMT13T3AGSN-PM)
	Nodular cast iron (FCD400) Below 300HB	150 (120–180)	0.2 (0.1–0.3)	JC8015	SEMT13T3AGSN-PM
H	Hardened steel 40-55HRC	80 (60–100)	0.15 (0.1–0.2)	JC8015	SEMT13T3AGSN-PM
N	Aluminium alloy (A5052) 50-110HB	300–	0.2 (0.1–0.3)	FZ05	SEGT13T3AGFN-AL

Note) In case of unfavourable conditions, insert grade JC8050 is recommended.

DIJET Mill 90 SSD90TYPE

Face Milling
Shoulder Milling

Economical shoulder milling cutter SSD90 uses four cutting edge insert.

1. Combination of M class insert with 3D geometry and high precision body achieves true 90 degree with no mismatch and excellent surface roughness.
2. Adopted carbide shim prevents body damage and improves security in case if insert is broken.

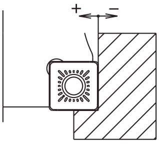
SSD90 gives wide application for cast iron, general steel and hardened steel.

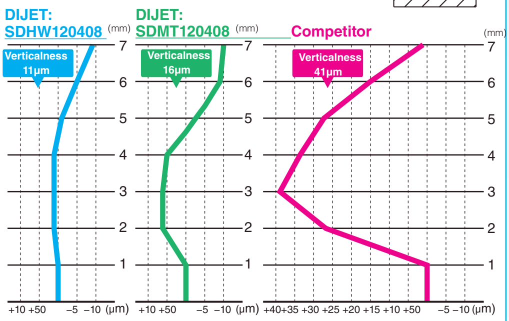
JC5040 is suitable for general steel, JC605W for cast iron, JC8015 for nodular cast iron and hardened steel and tough grade JC8050 for unfavourable conditions.

CUTTING PERFORMANCE

1. Verticalness comparison

Material: S50C (C50)
Cutting conditions:
ap=8mm, ae=2.5mm Vc=120m min,
fz=0.15mm/t, ap=8mm,ae=2,5mm

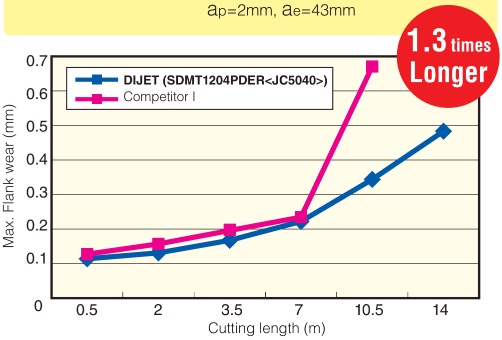




Theoretical verticalness of SSD90: 11μm (11mm width), 8μm (3mm width)

2. Tool life comparison (SKD61, Raw material)

Material: SKD61 (1.2344) Raw material
Cutting conditions: Vc=200m/min, fz=0.15mm/t,
ap=2mm, ae=43mm

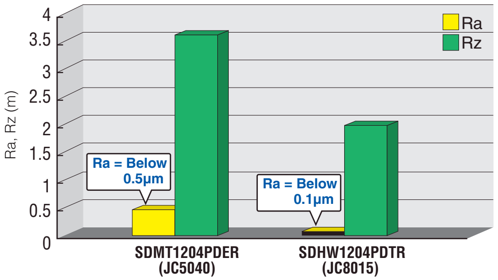


SSD90 tool achieved 1.3 times longer tool life.

3. Surface roughness comparison

Material: SKD61 (1.2344) Raw material
Cutting conditions: Vc=200m/min, fz=0.15mm/t,
ap=2mm, ae=43mm

SDMT insert (M class) achieved below Ra=0.5μm.
SDH Winsert (H class) achieved better surface roughness below Ra=0.1mm.



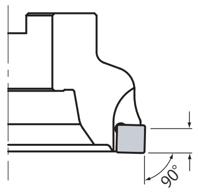
DIJET Mill 90

SSD90TYPE

JCTMA 2008-005 ECO PRODUCT ☆☆☆

Face Milling

Shoulder Milling



- Entering angle : 90°
- A•R : +10°
- R•R : -9°～-11°

Max. D.O.C : 11mm

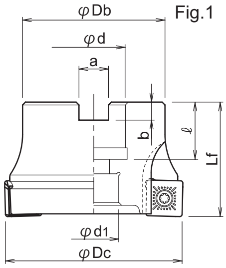


Fig.1

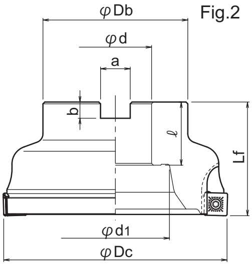


Fig.2

■ BODY

Bore	Cat. No.	Stock	No. of flutes	Dimensions (mm)								Weight kg	Fig.
				φDc	φDb	L_f	φd	φd_1	a	b	ℓ		
Metric Bore	**SSD90-4050R-22**	●	4	50	41	40	22	17	10.4	6.3	20	0.3	1
	SSD90-5063R-22	●	5	63	50	40	22	17	10.4	6.3	20	0.5	1
	SSD90-6080R-27	●	6	80	60	50	27	37	12.4	7	22	0.9	1
	SSD90-8100R-32	●	8	100	70	50	32	43	14.4	8	32	1.5	2
	SSD90-10125R-40	●	10	125	80	63	40	57	16.4	9	35	2.6	2

Note) All cutters are supplied without inserts.

● Standardstockitems ☐ StockinJapan ○ Soontobedeleted

DIJET Mill 90 SSD90TYPE

INSERTS

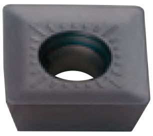
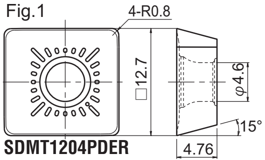
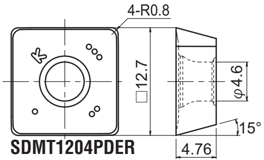


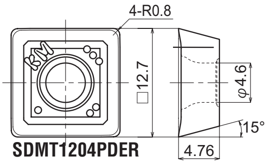
Fig.1



SDMT1204PDER
(With Chipbreaker)
(Grade：JC8050, JC5040)

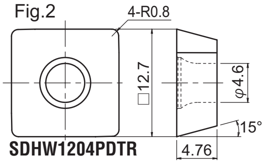


SDMT1204PDER
(With Chipbreaker)
(Grade：JC8015)



SDMT1204PDER
(With Chipbreaker)
(Grade： JC605W)

Fig.2



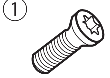
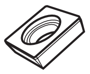
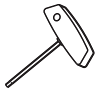
SDHW1204PDTR
(Without Chipbreaker)
(Grade：JC8015)

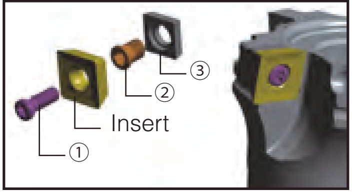
Clamp screw	Recommended torque (N•m)
TSW-3512H	2.1
SSW-535	6.5

Cat. No.	Tole-rance	PVD coated			CVD coated	Fig.
		JC8015	**JC8050**	**JC5040**	**JC605W**	
SDMT1204PDER	M	●	●	●	□	1
SDHW1204PDTR	H	●				2

10 inserts per case

PARTS

Clamp screw	Shim screw	Shim	Wrench	Wrench for shim
① 	② 	③ 		
TSW-3512H	SSW-535	SM-SD12	A-15T	LW-035



RECOMMENDED CUTTING CONDITIONS

ISO	Work Materials	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Insert Grades	Insert No.
P	Low carbon steel (SS400, S10C) Below 180HB	250 (200–300)	0.2 (0.1–0.3)	JC5040 (JC8050)	SDMT1204PDER
	Carbon steel (S50C, S55C) Below 250HB	220 (170–250)	0.2 (0.1–0.3)	JC5040 (JC8050)	SDMT1204PDER
	Tool & Die steel (SKD61, SKD11) Below 255HB	120 (100–150)	0.15 (0.1–0.25)	JC5040	SDMT1204PDER
M	Stainless steel (SUS304) Below 250HB	220 (170–250)	0.15 (0.1–0.25)	JC8050 (JC8015)	SDMT1204PDER (SDMT1204PDER) (SDHW1204PDTR)
K	Grey cast iron (FC300) Below 300HB	200 (150–250)	0.2 (0.1–0.3	JC605W (JC8015)	SDMT1204PDER (SDMT1204PDER) (SDHW1204PDTR)
	Nodular cast iron (FCD400) Below 300HB	150 (120–180)	0.2 (0.1–0.3)	JC8015	SDMT1204PDER SDHW1204PDTR
H	Hardened steel 40-55HRC	80 (60–100)	0.1 (0.05–0.15)	JC8015	SDMT1204PDER SDHW1204PDTR

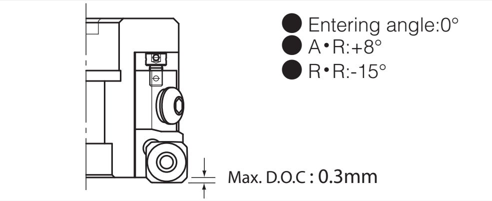
Note) In case of unfavourable conditions, insert grade JC8050 is recommended.

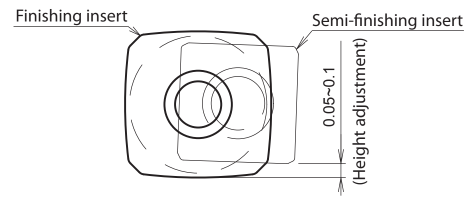
● : Standard stock items □ : Stock in Japan ○ : Soon to be deleted

Finish Jet Mill **FJM**TYPE

● Super Finishing Milling Application

1. The combination of 2 finishing cartridges and 2 semi-finishing cartridges gives stable finishing quality of unreliable removal stock on cast iron and cast steel.
2. Maximum ap=0.3mm (3 times larger than competitor's ap)
   Consolidate to one process of semi-finishing and super-finishing
3. Two semi-finishing inserts protect the finishing inserts and also achieve longer tool life with reducing cutting force.
4. Easy to adjust the face runout by adjusting the cartridges.
5. JC8003 for cast iron and stainless steel, Cermet grade CX75 for general steels.





■ BODY

Fig.1

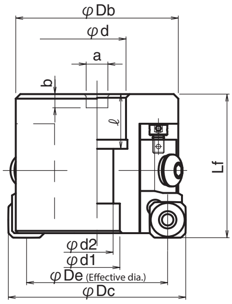


Fig.2

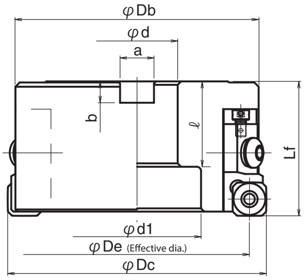
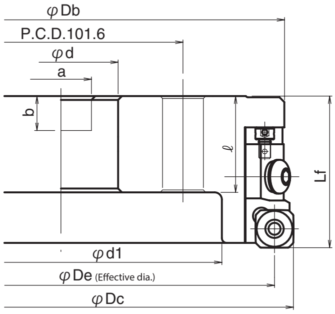


Fig.3



Cat. No.	Stock	No. of Inserts	Dimensions (mm)										Weight (kg)	Fig.
			φDc	φDe (Eff. dia)	Db	Lf	φd	φd1	φd2	a	b	ℓ		
FJM-4080R-27	●	2 Finishing & 2 Semi-finishing inserts	80	65	71	63	27	20	14.3	12.4	7	22	1.7	1
FJM-4100R-32	●		100	85	90	63	32	26	17	14.4	8	32	2.7	1
FJM-4125R-40	●		125	110	114	63	40	60	—	16.4	9	40	3.9	2
FJM-4160R-40	●		160	145	148	63	40	75	—	16.4	9	40	6.1	2
FJM-4200R-60	●		200	185	186	63	60	134	—	25.7	14	40	8.6	3
FJM-4250R-60	□		250	235	237	63	60	182	—	25.7	14	40	14.8	3

Note) 1. All cutter bodies are supplied without inserts.
2. Please refer page C258 for recommended cutting conditions.

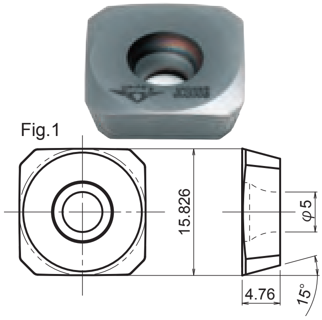
● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

Finish Jet Mill FJMTYPE

INSERTS

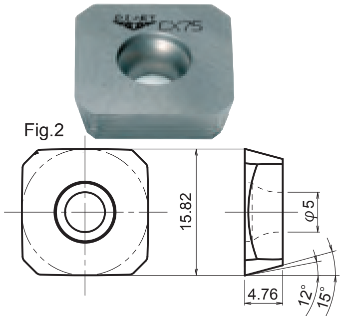
SDHW1504ADFN-W1

Fig.1



SDHW1 504ADE(F)N-W2

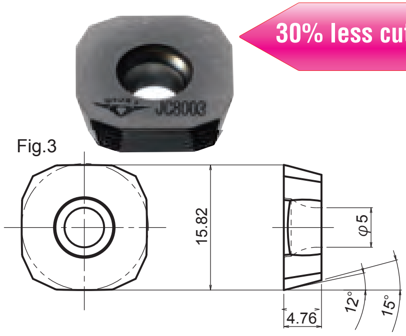
Fig.2



SDHW1504ADEN-F1

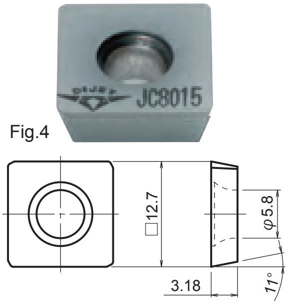
30% less cutting force

Fig.3



SPHW1203ZPTR

Fig.4



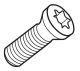
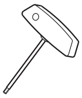
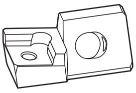
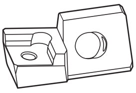
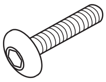
Cat. No.	PVD coated		Cermet	Tole-rance	Fig.	Application
	DH103	JC8015	CX75			
SDHW1504ADFN-W1 (finishing insert)	●			H	1	Cast iron・Cast steel
SDHW1504ADFN-W2 (finishing insert)			●	H	2	Carbon steel・Alloy steel
SDHW1504ADEN-W2 (finishing insert)	●			H	2	Mold steel・Die steel
SDHW1504ADEN-F1 (finishing insert for low rigid work)	●		●	H	3	DH103…(Cast iron・Cast steel) CX75…(Carbon steel・Alloy steel)
SPHW1203ZPTR (Semi-finishing insert)		●		H	4	

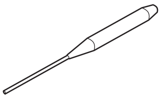
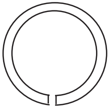
4 inserts per case, but in case of SPHW1203ZPTR: 10 piece per case.

● : Standard stock items ☐ : Stock in Japan ○ : Soon to be deleted ※ : Production after order received

Finish Jet Mill **FJM**TYPE

PARTS

Clamp screw	Wrench	Cartridge for finishing insert	Cartridge for semi-finishing insert	Set bolt for cartridge
 Recommendedtorque6.0N・m				
DSW-4510H	A-20 (φ80~φ200) A-20L (φ250)	SSFDR15-15F	SSFPR15-12R	BBH-825

Wrench for cartridge	Wrench for axial adjust screw	Axial adjust screw	Spring washer
			
LW-050	AD-2080	ADS-513	SBZ-8

RECOMMENDED CUTTING CONDITIONS

	Work Materials	Inserts	Insert Grades	Vc (m/min)	f (mm/rev)	ap (mm)	ae (mm)
P	Low carbon & Mild steel S20C, SS400 (C20) Below 255HB	SDHW1504ADFN-W2 (SDHW1504ADEN-F1)	CX75	250~300	4~5	up to 0.3mm	up to 0.8De
	Medium carbon steel S50C (C50) Below 255HB	SDHW1504ADFN-W2 (SDHW1504ADEN-F1)	CX75	200~250	4~5	up to 0.3mm	up to 0.8De
	Alloy & Die steel SCM440, SKD11 (1.7223, 1.2379) Below 255HB	SDHW1504ADFN-W2 (SDHW1504ADEN-F1)	CX75	100~150	4~5	up to 0.3mm	up to 0.8De
M	Stainless steel SUS304, 316 Below 250HB	SDHW1504ADFN-W2 (SDHW1504ADEN-F1)	JC8003	80~120	2~4	up to 0.2mm	up to 0.8De
K	Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	SDHW1504ADFN-W2 (SDHW1504ADEN-F1)	JC8003	130~200	4~6	up to 0.3mm	up to 0.8De
	Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	SDHW1504ADFN-W2 (SDHW1504ADEN-F1)	JC8003	110~180	4~6	up to 0.3mm	up to 0.8De
H	Mold steel HPM7, PX5, NAK80, P20 (1.2311,P20) Below 30-40HRC	SDHW1504ADFN-W2 (SDHW1504ADEN-F1)	JC8003	100~140	2~4	up to 0.2mm	up to 0.8De
	Hardened die steel SKD61, DAC, DHA (1.2311,P20) Below 40-55HRC	SDHW1504ADFN-W2 (SDHW1504ADEN-F1)	JC8003	40~60	0.3~0.7	up to 0.1mm	up to 0.7De

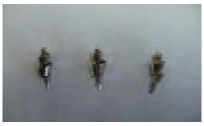
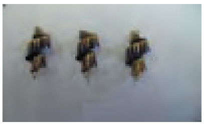
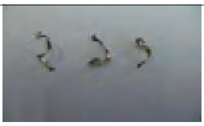
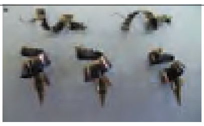
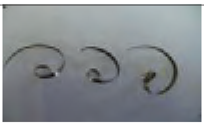
Vc: Cutting speed, f: Feedrate, ap: Depth of cut, ae: Width of cut

Note) 1. Incase of stainless steel, recommend wet cutting.
2. Recommend to use-F1 type insert for low rigid work.

Finish Jet Mill FJMTYPE

CHIP SHAPE COMPARISON

Work material: S15C, Tool dia.: φ200mm, Vc=300m/min, f=4mm/rev, ae=137mm

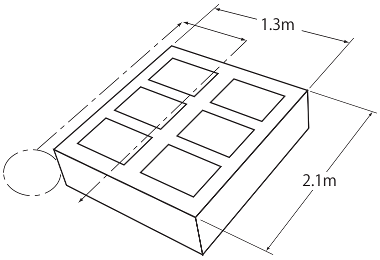
	DIJET		Competitor B
	Chips by finishing insert	Chips by semi-finishing insert	
ap=0.05mm			
ap=0.1mm			
ap=0.2mm			

- FJM obtains excellent surface roughness and longer tool life by stable cutting due to adopting the combination of 2 semi-finishing inserts and 2 finishing inserts. This combination divides the chips and cutting force. Competitor B got chipping problem by excessive cutting force due to increasing ap.
- There is no step on the surface which is machined by FJM.

Finish Jet Mill FJMTYPE

CASE STUDIES

Work size: 2.1m x 1.3m
Step between finishing insert and semi-finishing insert: 0.1mm

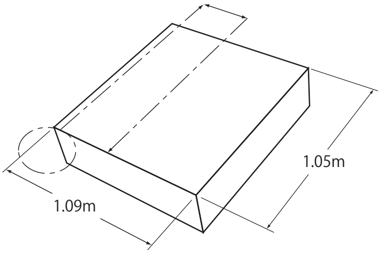


Competitor B: Vc=146m/min, Vf=800mm/min, ap=0.3mm
Step between finishing insert and semi-finishing insert: 0.1mm

Result FJM obtained same surface roughness with 80% faster feed speed than competitorB.

Work	Part name	Stamping die
	Material	FC250
	Hardness	–
Tool	Tool No.	FJM-4200R
	Grade	SDHW1504ADFN-W1 (JC8003) (1N) + SPHW1203ZPTR (JC8015) (1N)
Cutting conditions	Vc, (n)	183m/min (292min^{-1})
	Vf, (f z)	1,460mm/min(5mm/rev)
	ap (mm)	0.3 (mm)
	ae (mm)	180 (mm)
	Coolant	Dry
	Machine	Double column MC

Worksize:1050mm x 1090mm x 60mm

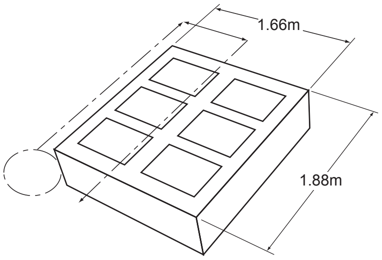


Competitor B: Vc=126m/min, Vf=400mm/min, ap=0.3mm

Result FJM improved machining efficiency by 2.6 times and surface roughness compared with competitor B

Work	Part name	Injection mold
	Material	S45C
	Hardness	Non heat treatment
Tool	Tool No.	FJM-4200R
	Grade	SDHW1504ADFN–W2 (CX75) (2N) + SPHW1203ZPTR (JC8015) (2N)
Cutting conditions	Vc, (n)	207m/min (330min^{-1})
	Vf, (f z)	1,050mm/min (3.2mm/rev)
	ap (mm)	0.2 (mm)
	ae (mm)	180 (mm)
	Coolant	Dry
	Machine	Double column MC

Work size: 1668mm x 1880mm x 300mm



Result F1 type insert for low rigid work achieved surface roughness Ra=0.8μm at feed speed 800mm/min under unstable clamping condition.

Work	Part name	-
	Material	SKT4
	Hardness	35 HRC
Tool	Tool No.	FJM-4160R
	Grade	SDHW1504ADEN–F1 (JC8003) (2N) + SPHW1203ZPTR (JC8015) (2N)
Cutting conditions	Vc, (n)	120m/min (240min^{-1})
	Vf, (f z)	800mm/min (1.67mm/rev)
	ap (mm)	0.2 (mm)
	ae (mm)	120 (mm)
	Coolant	Dry
	Machine	Double column MC

Back & Forth Cutter PFCTYPE

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

Up & Down Milling

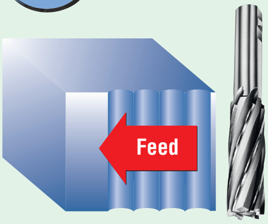
Reciprocating Milling

1 High speed & high accuracy can be achieved.

➡ Surface roughness and Parallelism/Perpendicularity: 0.01mm or less (feed & pick direction).

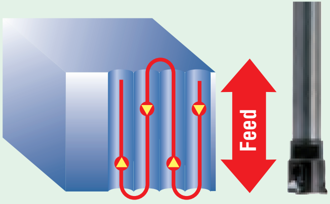
Improvement of machining method

Current method: by end mill



- Long machining time.
- Deflection and waviness problem occurs.

Improved method: by up and down cutting motion



- Short machining time.
- Exellent surface roughness
- Deflection and waviness problem occurs.

Excellent verticalness and surface roughness

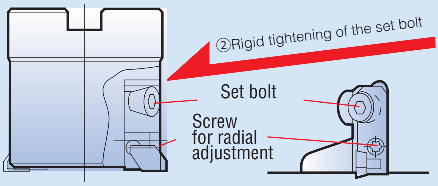
2 Suitable to use with extra overhung length

DSA arbor: total 43 items
Available maximum overhung length: 400mm

3 Easy to adjust the O.D.run out

Instructions for adjusting the O.D. run out

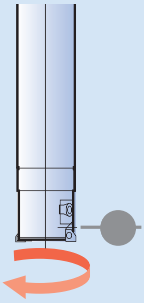
STEP1



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

STEP2 On the machine

④Measure the O.D. run out on the machine.
⑤Adjust 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



4 CBN insert and JC8003 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.

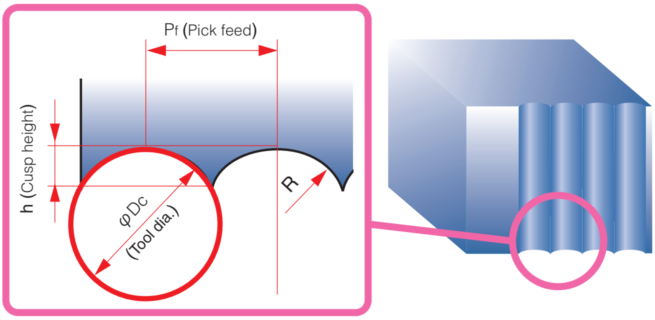
5 Consolidating of parts.

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

Back & Forth Cutter

PFC TYPE

SURFACE ROUGHNESS

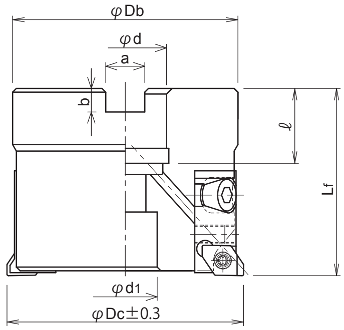


$$h \text{ (Cusp height) } \mu m = \frac{(Pf)^2}{8R} \times 1000$$

$$R: \frac{\varphi Dc \text{ (Tool dia.)}}{2}$$

It is efficient to use large diameter cutter to increase the pick feed. But large diameter cutter may cause interference problem in case of complex work, so to be considered.

BODY



Cat. No.	Stock	No. of flutes	Dimensions (mm)								Weight (kg)
			φDc	Lf	φDb	φd	φd1	a	b	ℓ	
PFC-4050R-22	●	4	**50**	50	47	22	17	10.4	6.3	20	0.6
PFC-4063R-22	☐	4	**63**	50	60	22	17	10.4	6.3	20	1.0
PFC-6063R-22	●	6		50	60	22	17	10.4	6.3	20	0.9
PFC-6063R-27	●	6		50	60	27	20	12.4	7	22	0.9
PFC-4080R-27	☐	4	**80**	50	76	27	20	12.4	7	22	1.8
PFC-8080R-27	●	8		50	76	27	20	12.4	7	22	1.8

Note)1. All cutters are supplied without inserts.
2. Please refer page C265 for recommended cutting conditions.

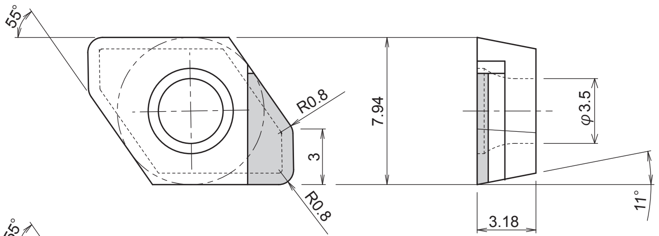
Modular Head Type Please refer Page B179

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

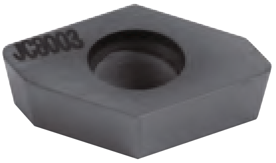
Back & Forth Cutter PFC TYPE

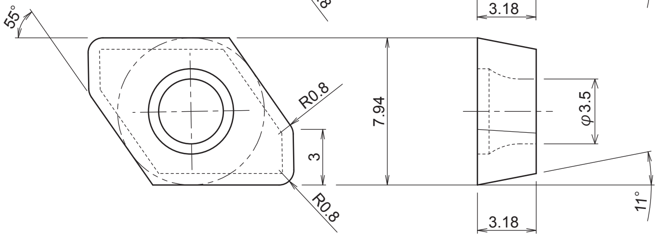
■INSERTS

DPGT0903-W3
JBN500



DPGT0903-W3
JC8003

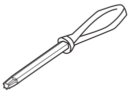
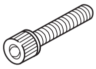


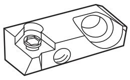
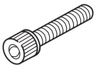


Cat. No.	Tole-rance	PVD coated	CBN
		JC8003 (Semi finishing・Finishing)	**JBN500** (Super finishing)
DPGT0903-W3	G	●	☐

10 inserts per case, but grade JBN500 insert is packed in1 piece per case.

■PARTS

Clamp screw	Wrench	Set bolt for arbor
 Recommended torque:1.8N•m		 ※ for φd=27mm cutter
DSW-307H	A-10SD	M12x1.75x30

Cartridge	Screw for radial adjustments	Set bolt for cartridge	Wrench for cartridge
			
SDGPR09CA-PFC	RSW-05008	HCS5-10	LW-040

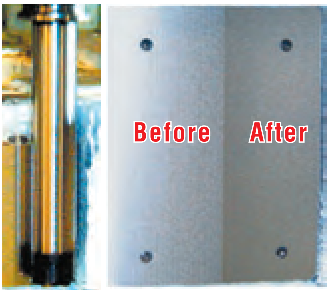
● : Standard stock items ☐ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted

Back & Forth Cutter

PFC TYPE

CASE STUDIES

Overhung length: 400mm



Result

After 3 hours machining, inserts did not show any chipping and wear. Excellent surface quality and tool life. Surface roughness and deflection was below 0.01mm

Work	Part name	Stamping die
	Material	FC250
	Hardness	–
Tool	Tool No.	PFC-6063R-22
	Grade	DPGT0903-W3 JBN500
Cutting conditions	Vc,(n)	6,000 (min^{-1}), 1,18 (m/min)
	Vf, (f z)	6,000 (mm/min)
	ae (mm)	0.05 (mm)
	ap (mm)	0.50 (mm)
	Coolant	Dry
	Machine	Double column MC

RECOMMENDED CUTTING CONDITIONS

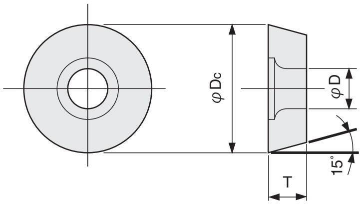
Work Materials	Insert Grades	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Depth of cut ap (mm)
Cast iron FC250 160-260HB	JBN500	1,200 (800~2,000)	0.1 (0.05~0.15)	0.05~0.1
	JC8003	400 (300~500)	0.1 (0.05~0.15)	0.05~0.5
Nodular cast iron FCD600 170-200HB	JBN500	1,000 (600~1,500)	0.1 (0.05~0.15)	0.05~0.1
	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 chatter occurrs and unsatisfactory surface quality due to machine and work rigidity, recommend to reduce spindle speed or feed per tooth.
2) In case of using as face mill, recommend to reduce feed per tooth up to 0.05mm.

Milling Inserts

INSERTS



Cat. No.	Tole-rance	PVD coated					Dimensions (mm)		
		DH103	JC8015	JC5040	JC5118	JC8118	φDc	T	φD
RDHX0501MOT	H	●	○				**5.0**	1.5	2.0
RDHX0701MOT	H	●		○		●	**7.0**	1.99	2.8
RDHX0702MOT	H	●		○	○		**7.0**	2.38	2.8
RDHX1003MOT	H	●		○		●	**10.0**	3.18	3.9
RDHX12T3MOT	H	●	○	○		●	**12.0**	3.97	3.9
RDMX12T3MOT	M			●					
RDHX1604MOT	H	●	○	○	○	●	**16.0**	4.76	5.0
RDMX1604MOT	M		●	●					

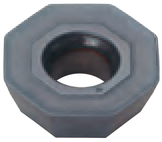
10 Inserts per case

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

Milling Inserts

INSERTS

ODMT TYPE



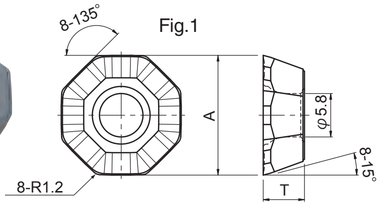
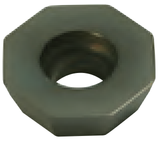


Fig.1

ODMW TYPE



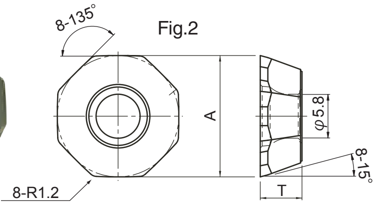
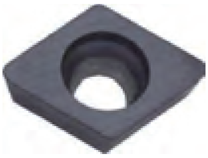


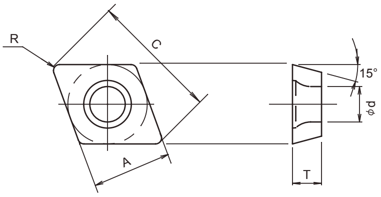
Fig.2

Cat. No.	PVD coated		Dimensions (mm)		Tole-rance	Fig.
	JC8015	JC5040	A	T		
ODMT0606AEN	●	●	16	5.5	M	1
ODMW0606AEN	●		16	5.5	M	2

10 Inserts per case

XDHW TYPE





SPECIFICATIONS

Cat. No.	PVD Coated			Dimensions (mm)				
	JC8015	JC5040	DH103	A	T	C	R	d
XDHW0206-05	●		●	6.5	2.38	10.589	0.5	2.8
XDHW0206-10	●	●	●	6.5	2.38	9.846	1.0	2.9
XDHW0310-10	●	●	●	10	3.97	15.948	1.0	4

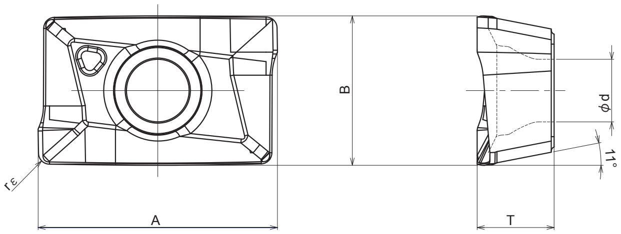
10 Inserts per case

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

Milling Inserts

■ INSERTS

APKT1003PDER-05

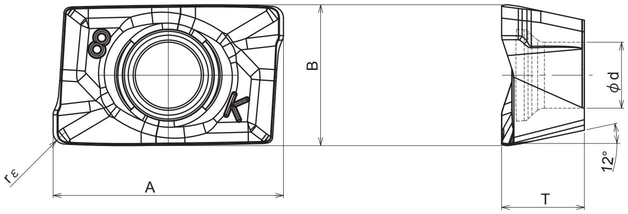


Cat. No.	PVD Coated		Dimensions (mm)				
	JC5118	JC8050	A	B	T	rε	d
APKT1003PDER-05	●	●	10.4	6.703	3.5	0.5	2.85
APKT1604PDR-08	●	●	16.7	9.55	5.7	0.8	4.5

10 Inserts per case

■ INSERTS

ADKT1505PDER-08



Cat. No.	PVD Coated		Dimensions (mm)				
	JC5118	JC8050	A	B	T	rε	d
ADKT1505PDER-08	●	●	15.837	9.605	5.64	0.8	4.5

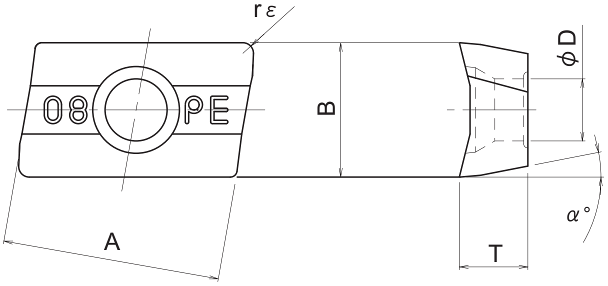
10 Inserts per case

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

Milling Inserts

INSERTS

APMT



Cat. No.	PVD Coated		Dimensions (mm)				
	JC5118	**JC8050**	A	B	T	rε	d
ADMT100308PDER	●	●	10.23	6.43	3.32	0.8	2.8
APMT160408PDER	●	●	15.645	9.525	4.85	0.8	5.4
APMT160416PDER	●	●	15.577	9.525	4.85	1.6	5.4

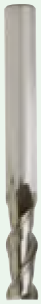
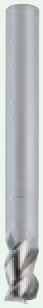
10 Inserts per case

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

Tooling by DIJET®

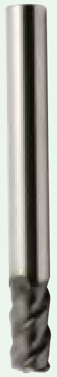
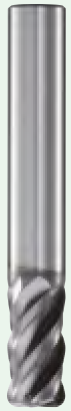
Solid Carbide End Mills

Solid Carbide End Mills - Square

Application	For heat resistant alloy	For hardened steel	For Aluminium			
						
Page	D006	D035	D011	D016	D018	D021
Cat. No.	DV-SCMS	DV-SEHS/H	AL-SEES2	AL-SEEL2	AL-SEEZ3	AL-SEES3-LS
No. of flutes	6~8 flutes	4~8 flutes	2 flutes	2 flutes	3 flutes	3 flutes
Helix angle	45°	50°	45°	45°	45°	45°
Flute length	Regular	Regular	Regular	Long	Regular	Regular
Dia.	φ6~φ16	φ1~φ32	φ0.4~φ30	φ1~φ25	φ3~φ25	φ3~φ22
Coated	DV Coating	DV Coating	Uncoated	Uncoated	Uncoated	Uncoated
Carbon steel Alloy steel	○					
Hardenead steel 45HRC	○	○				
Hardenead steel 50HRC		○				
Hardenead steel 65HRC		◎				
Stainless steel	◎					
Cast iron		○				
Aluminium alloy			◎	◎	◎	◎
Copper alloy			○	○	○	○
Graphite						
Heat resistant alloy Titanium alloy	◎					
Plastic			○			

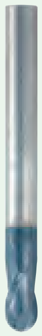
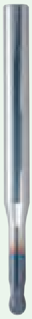
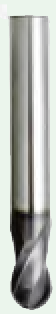
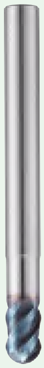
◎: First choice, Good condition ○: Moderate condition

Solid Carbide End Mills - Square

Application		For Aluminium		General use	For heat resistant alloy
					
Page		D023	D026	D031	D009
Cat. No.		AL-SEES3 -LS-R02	AL-SEES3 -XLS-R02	DV-OCSR	DV-OCSAR4
No. of flutes		3 flutes	3 flutes	3 flutes	4 flutes
Helix angle		45°	45°	50°	42°~45°
Flute length		Regular	Regular	Regular	Regular
Dia.		φ6~φ22	φ6~φ22	φ2~φ20	φ3~φ20
Coated		Uncoated	Uncoated	DV Coating	DV Coating
Carbon steel Alloy steel				○	○
Hardenead steel	45HRC			◎	○
	50HRC			◎	
	65HRC			◎	
Stainless steel					◎
Cast iron				○	
Aluminium alloy		◎	◎		
Copper alloy		○			
Graphite					
Heat resistant alloy Titanium alloy					◎
Plastic					

◎: First choice, Good condition ○: Moderate condition

Solid Carbide End Mills - Square

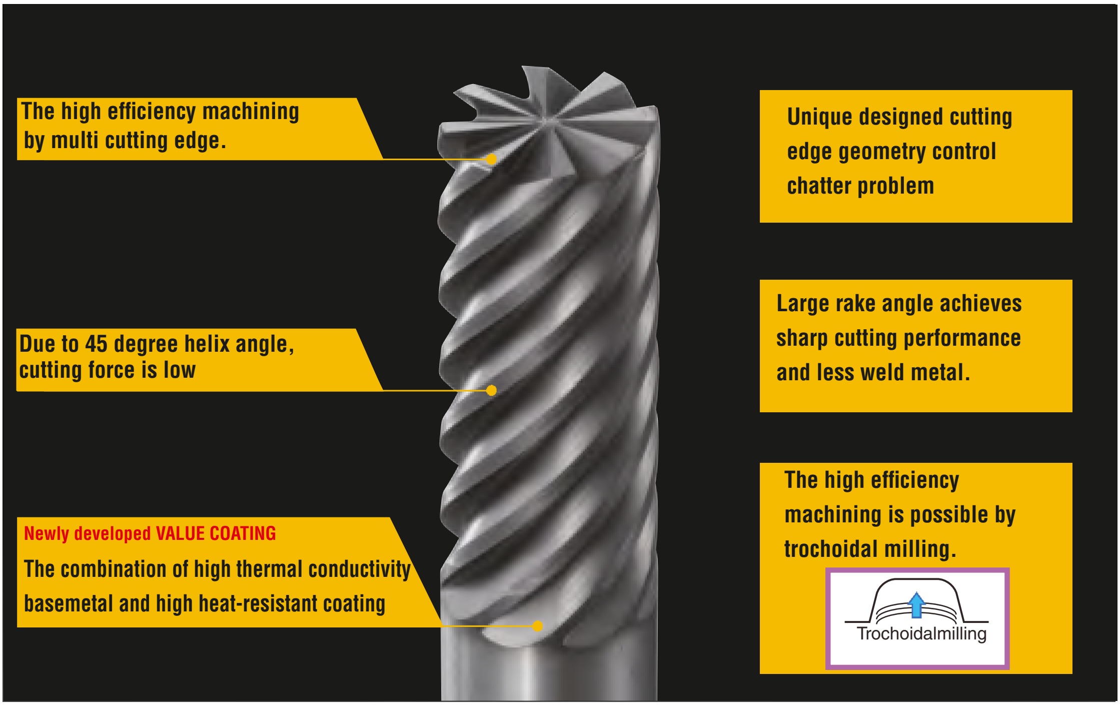
Application		**General use**		**For hardened steel**	
					
Page		**D046**	**D047**	**D044**	**D041**
Cat. No.		**DZ03-OCSB**	**DZ03-OCSB-LN**	**DV-OCSB**	**DH-OCHB**
No. of flutes		2 flutes	2 flutes	2 flutes	4 flutes
Helix angle		30°	30°	30°	45°
Flute length		Regular	Regular	Regular	Regular
Dia.		φ1~φ25	φ1~φ4	φ1~φ25	φ3~φ12
Coated		DZ Coating (TiAlN)	DZ Coating (TiAlN)	DV Coating	DH Coating
Carbon steel Alloy steel		◎	◎	◎	◎
Hardenead steel	45HRC	◎	◎	◎	◎
	50HRC	◎	◎	◎	◎
	65HRC	◎	◎	◎	◎
Stainless steel					
Cast iron		◎	◎	◎	
Aluminium alloy		○	○	○	
Copper alloy		○	○	○	
Graphite				○	
Heat resistant alloy Titanium alloy		○	○	○	
Plastic					

◎: First choice, Good condition ○: Moderate condition

DV-Coated End Mill for Heat Resistant Alloy DV-SCMSTYPE

Aerospace Tooling

Features of DV-SCMS type



The high efficiency machining by multi cutting edge.

Due to 45 degree helix angle, cutting force is low

Newly developed VALUE COATING

The combination of high thermal conductivity basemetal and high heat-resistant coating

Unique designed cutting edge geometry control chatter problem

Large rake angle achieves sharp cutting performance and less weld metal.

The high efficiency machining is possible by trochoidal milling.

■ CUTTING PERFORMANCE

Tool life comparison

Work	Part name	Test piece
	Material	Inco718 Aging
	Hardness	42HRC
Tool	ToolNo.	DV-SCMS8120
	Grade	Value coating
Cutting conditions	Vc,(n)	100 (m/min)
	Vf, (f z)	0.48 (mm/rev),0.06 (mm/t)
	ap (mm)	5 (mm)
	ae (mm)	0.8 (mm)
	Coolant	Wet
	Machine	VerticalMC

Result

DV-SCMS shows no chipping and less wear. Excellent result.

● **After machining 7.4 mm**

Relief face
Flank wear 0.09 mm

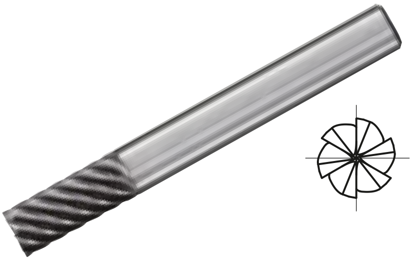
Rake face

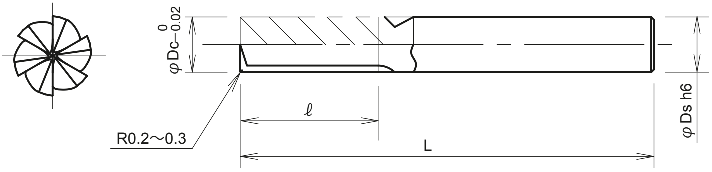
DV-Coated End Mill for Heat Resistant Alloy DV-SCMSTYPE

- For heat resistant alloy
- 6,8 flutes, Helix angle45°
- R0.2 Corner radius

DV Coating

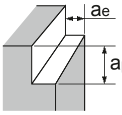
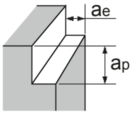
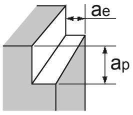
Shoulder Milling





Cat.No.	Stock	Dimensions (mm)				
		No.of flutes	φDc	ℓ	L	φDs
DV-SCMS6060	●	6	6	15	50	6
DV-SCMS6080	●	6	8	20	70	8
DV-SCMS6100	●	6	10	25	75	10
DV-SCMS8120	●	8	12	26	100	12
DV-SCMS8160	☐	8	16	32	100	16

RECOMMENDED CUTTING CONDITIONS

Work Materials	Stainless steel SUS304,1.4301		Titanium alloy Ti-6Al-4V		Heat-resistant alloy Inco718	
Type of Machining	 $ap \leqq 1.5Dc$ $ae \leqq 0.1Dc$		 $ap \leqq 1.5Dc$ $ae \leqq 0.1Dc$		 $ap \leqq 1.5Dc$ $ae \leqq 0.05Dc$	
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)
6	8,000	2,100	8,000	2,100	2,100	380
8	6,000	2,100	6,000	2,100	1,600	310
10	4,800	2,100	4,800	2,100	1,300	310
12	4,000	2,100	4,000	2,100	1,100	350
16	3,000	1,700	3,000	1,700	1,700	260

NOTE

1) Above cutting conditions are for general guidance.
2) The cutting parameters to be adjusted according to machining shape, purpose and rigidity of machine and work clamping.
3) Recommend to use down cutting.
4) Recommend to use wet cutting condition. It is effective to use cutting fluid for heat-resistant alloy.

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

“One-Cut Radius”End Mill for Heat Resistant Alloy **DV-OCSARTYPE**

Features of DV-OCSAR type

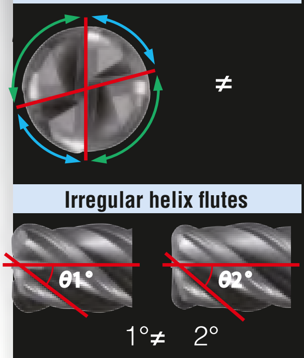
Adopted un-equal pitch and irregular helix flutes including corner radius solved vibration problems (possible to stable machining for very thin plate)

Adopted positive rake reduced cutting heat top revent welding.

The combination of 42° & 45° helix angle improve reliability and surface roughness

Newly developed VALUECOATING has excellent heat resistance and wear resistance

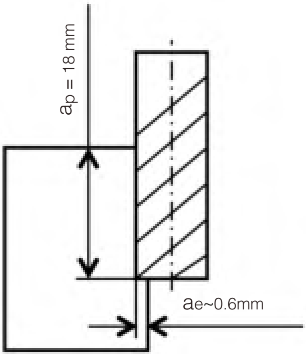
Un-equal pitch



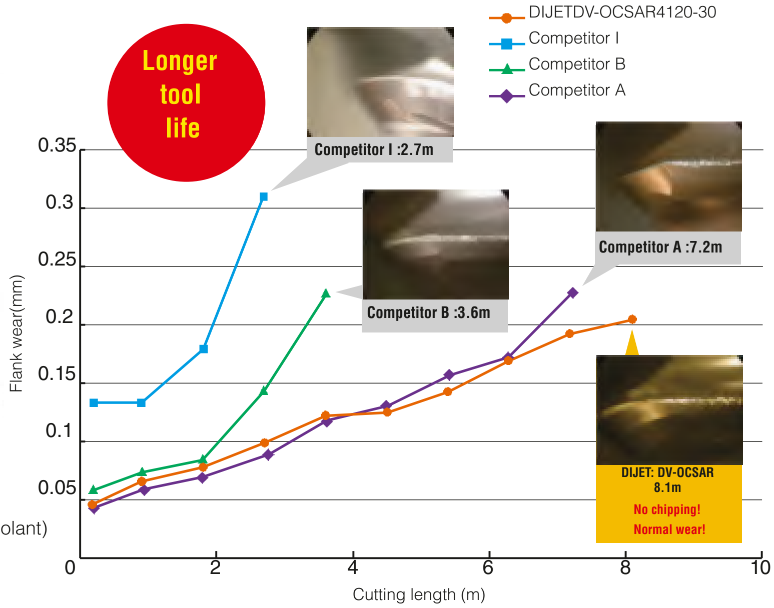
Adopted un-equal pitch & irregular helix flutes including corner radius solved vibration problem.

CUTTING PERFORMANCE

(1) INCO718

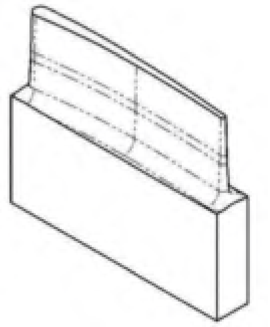


Material: INCO718 (Age hardened)
Tooldia: φ12mm
Vc=50m/min,f=0.20mm/rev,
ap=18mm,ae=0.6mm
Down cut,Water soluble (External coolant)



“One-Cut Radius” End Mill for Heat Resistant Alloy DV-OCSARTYPE

(2) Stainless steel (SUS304)



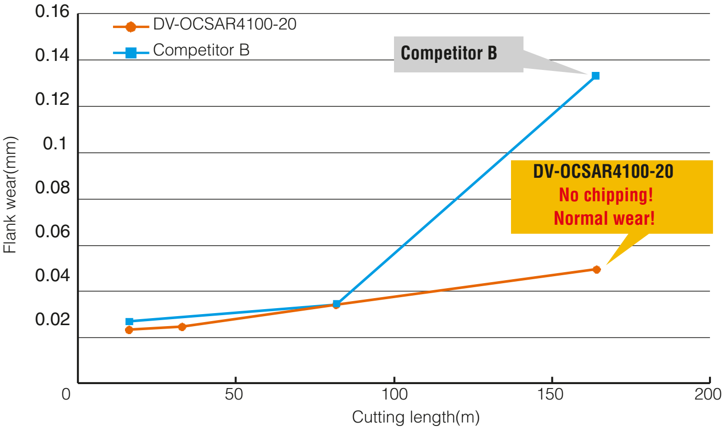
SUS304 very thin plate
to be easily chattered

Material: SUS304 (Very thin plate)
Tooldia: φ10mm, Corner radius R2
Vc=100m/min,f=0.28mm/rev
ap=18mm,ae=1.2mm
Down cut
By helical milling:Zdim.0.5mm/rev
⇒Total cutting length per work:16.4m
⇒Total cutting time per work:19min.
Water soluble (External coolant)

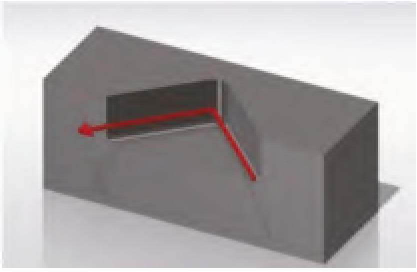
● Work surface

	DV-OCSAR4100-20	Competitor B
Inner R side surface	 No chatter, Stable	 Chattering

● Tool life comparison after machining 164 mm



(3) Titanium alloy (Ti-6Al-4V)



Material:Ti-6Al-4V,
Tool dia.: φ10mm,CornerRadiusR2
Vc=100m/min, f=0.24mm/rev
ap=15mm, ae=0.5mm
Water soluble (External coolant)

Result

DV-OCSAR improved surface roughness than conventional tool.

One cut radius(φ10-R2)
DV-OCSAR4100-20

No chatter

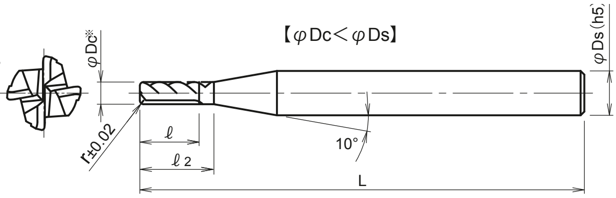
DIJET conventional tool(φ10-R2)
Regular helix flutes

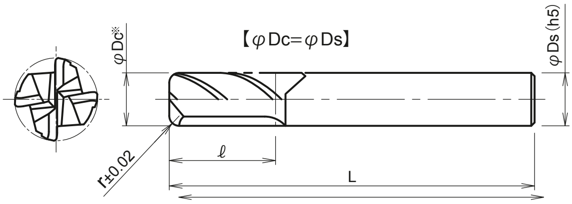
Chattering

"One-Cut Radius" End Mill for Heat Resistant Alloy DV-OCSARTYPE

- For heat resistant alloy
- 4 flutes, Helix angle 42°-45°

DV Coating Corner Radius Shoulder Milling Copy Milling Pocket Milling Helical Interpolation





Cat.No.	Stock	Dimensions (mm)					
		φDc	r	ℓ	ℓ2	L	φDs
DV-OCSAR4030-05	●	3	0.5	8	10	60	6
DV-OCSAR4040-05	●	4	0.5	11	13	60	6
DV-OCSAR4040-10	☐	4	1	11	13	60	6
DV-OCSAR4050-05	●	5	0.5	13	15	60	6
DV-OCSAR4050-10	☐	5	1	13	15	60	6
DV-OCSAR4060-05	●	6	0.5	13	–	60	6
DV-OCSAR4060-10	●	6	1	13	–	60	6
DV-OCSAR4080-05	●	8	0.5	19	–	75	8
DV-OCSAR4080-10	●	8	1	19	–	75	8
DV-OCSAR4080-20	●	8	2	19	–	75	8
DV-OCSAR4100-05	●	10	0.5	22	–	80	10
DV-OCSAR4100-10	●	10	1	22	–	80	10
DV-OCSAR4100-20	●	10	2	22	–	80	10
DV-OCSAR4120-05	●	12	0.5	26	–	100	12
DV-OCSAR4120-10	●	12	1	26	–	100	12
DV-OCSAR4120-20	●	12	2	26	–	100	12
DV-OCSAR4120-30	☐	12	3	26	–	100	12
DV-OCSAR4160-10	●	16	1	32	–	110	16
DV-OCSAR4160-20	●	16	2	32	–	110	16
DV-OCSAR4160-30	●	16	3	32	–	110	16
DV-OCSAR4200-10	●	20	1	38	–	125	20
DV-OCSAR4200-20	●	20	2	38	–	125	20
DV-OCSAR4200-30	●	20	3	38	–	125	20

TOLERANCE (mm)

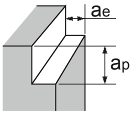
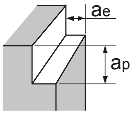
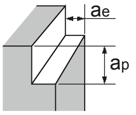
Tool dia. φDc	Tolerance (φDc)
Up to φ6mm	$^{0}_{-0.015}$
Over φ6mm	$^{0}_{-0.02}$

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

"One-Cut Radius" End Mill for Heat Resistant Alloy DV-OCSARTYPE

RECOMMENDED CUTTING CONDITIONS FOR DV-OCSAR TYPE

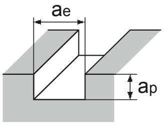
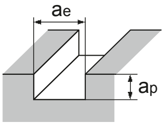
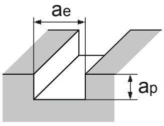
(1) Shoulder Milling

Work Materials	Stainless steel SUS304,1.4301		Titanium alloy Ti-6Al-4V		Heat-resistant alloy Inco718	
Type of Machining	 ap≦1.5Dc ae≦0.1Dc		 ap≦1.5Dc ae≦0.1Dc		 ap≦1.5Dc ae≦0.1Dc	
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)
3	11,000	1,200	11,000	1,200	4,200	320
4	8,000	1,200	8,000	1,200	3,200	320
5	6,400	1,200	6,400	1,200	2,500	320
6	5,400	1,200	5,400	1,200	2,100	320
8	4,000	1,200	4,000	1,200	1,600	320
10	3,200	1,300	3,200	1,300	1,300	320
12	2,700	1,300	2,700	1,300	1,100	280
16	2,000	960	2,000	960	800	200
20	1,600	770	1,600	770	640	160

NOTE

1) Above cutting conditions are for general guidance.
2) The cutting parameters to be adjusted according to machining shape, purpose and rigidity of machine and work clamping
3) Recommend to use down cutting.
4) Recommend to use wet cutting condition. It is effective to use cutting fluid for heat-resistant alloy.

(2) Slotting

Work Materials	Stainless steel SUS304,1.4301		Titanium alloy Ti-6Al-4V		Heat-resistant alloy Inco718	
Type of Machining	 ap≦Dc		 ap≦Dc		 ap≦0.3Dc	
Tooldia. 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)
3	11,000	670	11,000	670	3,200	160
4	8,000	750	8,000	750	2,400	180
5	6,400	800	6,400	800	1,900	175
6	5,300	740	5,300	740	1,600	180
8	4,000	800	4,000	800	1,200	190
10	3,200	900	3,200	900	950	210
12	2,700	900	2,700	900	800	200
16	2,000	640	2,000	640	600	150
20	1,600	510	1,600	510	480	120

NOTE

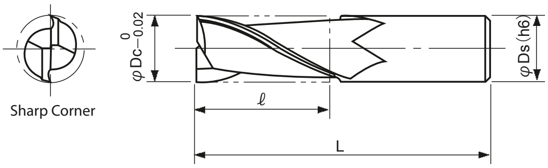
1) Above cutting conditions are for general guidance.
2) The cutting parameters to be adjusted according to machining shape, purpose and rigidity of machine and work clamping
3) Recommend to use wet cutting condition. It is effective to use cutting fluid for heat-resistant alloy.

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

Solid Carbide End Mill for Aluminium AL-SEES2TYPE

- ● 2 flutes, Helix angle 45°
- ● Regular flute length

Sharp Corner Shoulder Milling Slotting



Cat.No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
AL-SEES2010	●	**1**	2.8	40	3
AL-SEES2015	●	**1.5**	4.4	40	4
AL-SEES2020	●	**2**	7	40	4
AL-SEES2025	●	**2.5**	9	40	4
AL-SEES2030	●	**3**	11	50	6
AL-SEES2035	☐	**3.5**	12	50	6
AL-SEES2040	●	**4**	14	50	6
AL-SEES2045	●	**4.5**	16	50	6
AL-SEES2050	●	**5**	17	55	6
AL-SEES2060	●	**6**	17	55	6
AL-SEES2070	●	**7**	22	65	8
AL-SEES2080	●	**8**	22	65	8
AL-SEES2090	●	**9**	22	70	10
AL-SEES2100	●	**10**	28	75	10

Cat.No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
AL-SEES2120	●	**12**	28	80	12
AL-SEES2130	☐	**13**	35	85	12
AL-SEES2140	●	**14**	40	95	16
AL-SEES2150	●	**15**	40	95	16
AL-SEES2160	●	**16**	40	95	16
AL-SEES2180	●	**18**	45	115	20
AL-SEES2200	●	**20**	45	115	20
AL-SEES2250	●	**25**	55	130	25

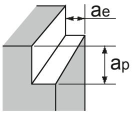
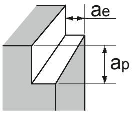
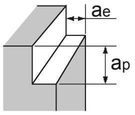
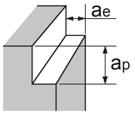
Note) Please refer page D015-D018 for recommended cutting conditions.

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

Solid Carbide End Mill for Aluminium AL-SEES2TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEES2 TYPE

(1) Shoulder Milling

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to 13% Si)		Copper alloy (C1100)	
Type of Machining	 ap=1.5Dc ae=0.5Dc		 ap=1.5Dc ae=0.5Dc		 ap=1.5Dc ae=0.5Dc		 ap=1.5Dc ae=0.5Dc	
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)
0.4	32,000	380	32,000	380	32,000	380	32,000	380
0.5	32,000	480	32,000	480	32,000	480	32,000	480
0.75	32,000	700	32,000	700	32,000	700	32,000	700
1	32,000	900	32,000	900	32,000	900	32,000	900
1.5	32,000	1,400	32,000	1,400	32,000	1,400	32,000	1,400
2	32,000	1,900	32,000	1,900	32,000	1,900	25,000	1,500
3	24,000	2,200	22,000	2,000	24,000	2,200	17,000	1,500
4	18,000	2,200	16,000	2,000	18,000	2,200	13,000	1,500
5	15,000	2,200	13,000	2,000	15,000	2,200	10,000	1,500
6	12,000	2,200	10,000	2,000	12,000	2,200	8,500	1,500
8	9,000	1,800	8,000	1,600	9,000	1,800	6,500	1,300
10	7,300	1,800	6,000	1,600	7,300	1,800	5,000	1,300
12	6,000	1,800	5,000	1,600	6,000	1,800	4,000	1,300
16	4,500	1,500	4,000	1,400	4,500	1,500	3,000	1,000
20	3,600	1,500	3,000	1,400	3,600	1,500	2,500	1,000
25	3,000	1,500	2,500	1,400	3,000	1,500	2,000	1,000
30	2,500	1,250	2,100	1,050	2,500	1,250	1,700	850

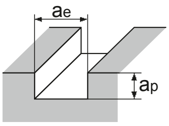
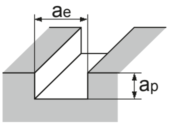
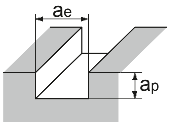
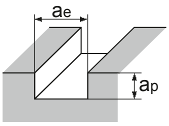
NOTE

1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30%-60% on above table.
4) If machine does not have enough spindle speed (RPM),it is recommended to reduce feed speed into same proportion.

Solid Carbide End Mill for Aluminium AL-SEES2TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEES2 TYPE

(2) Slotting

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to 13% Si)		Copper alloy (C1100)	
Type of Machining	 ap=Dc ae=Dc		 ap=Dc ae=Dc		 ap=Dc ae=Dc		 ap=Dc ae=Dc	
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)
0.4	32,000	230	32,000	230	32,000	230	32,000	230
0.5	32,000	290	32,000	290	32,000	290	32,000	290
0.75	32,000	430	32,000	430	32,000	430	32,000	430
1	32,000	570	32,000	570	32,000	570	32,000	570
1.5	32,000	860	32,000	860	32,000	860	29,000	780
2	32,000	1,100	27,000	1,000	32,000	1,100	22,000	800
3	21,000	1,100	18,000	1,000	21,000	1,100	14,000	800
4	16,000	1,100	13,000	1,000	16,000	1,100	11,000	800
5	12,000	1,100	10,000	1,000	12,000	1,100	8,900	800
6	10,000	1,100	9,000	1,000	10,000	1,100	7,400	800
8	8,000	1,100	7,000	1,000	8,000	1,100	5,500	800
10	6,000	1,100	5,500	1,000	6,000	1,100	4,500	800
12	5,000	1,100	4,500	1,000	5,000	1,100	3,700	800
16	4,000	1,000	3,300	800	4,000	1,000	2,700	700
20	3,000	900	2,700	800	3,000	900	2,200	650
25	2,500	900	2,000	700	2,500	900	1,800	650
30	2,000	800	1,800	700	2,000	800	1,500	600

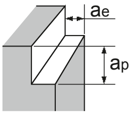
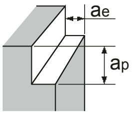
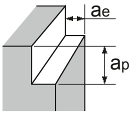
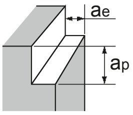
■ NOTE

1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30%-60% on above table.
4) If machine does not have enough spindle speed (RPM),it is recommended to reduce feed speed into same proportion.

Solid Carbide End Mill for Aluminium AL-SEES2TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEES2 TYPE

(1) Shoulder Milling / High Speed Machining

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to 13% Si)		Copper alloy (C1100)	
Type of Machining	 ap=1.5Dc ae=0.3Dc		 ap=1.5Dc ae=0.3Dc		 ap=1.5Dc ae=0.3Dc		 ap=1.5Dc ae=0.3Dc	
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)
0.4	50,000	600	50,000	600	50,000	600	50,000	600
0.5	50,000	750	50,000	750	50,000	750	50,000	750
0.75	50,000	1,100	50,000	1,100	50,000	1,100	50,000	1,100
1	50,000	1,500	50,000	1,500	50,000	1,500	50,000	1,500
1.5	50,000	2,200	50,000	2,200	50,000	2,200	50,000	2,200
2	50,000	3,000	50,000	3,000	50,000	3,000	50,000	3,000
3	50,000	4,500	45,000	4,000	50,000	4,500	37,000	3,300
4	40,000	4,500	34,000	4,000	40,000	4,500	27,000	3,300
5	32,000	4,500	27,000	4,000	32,000	4,500	22,000	3,300
6	27,000	4,500	22,000	4,000	27,000	4,500	18,000	3,300
8	20,000	4,000	17,000	3,400	20,000	4,000	14,000	2,800
10	16,000	4,000	13,000	3,200	16,000	4,000	11,000	2,800
12	13,000	3,200	11,000	2,800	13,000	3,200	9,000	2,200
16	10,000	3,000	8,500	2,500	10,000	3,000	7,000	2,100
20	8,000	2,400	7,000	2,100	8,000	2,400	5,500	1,700
25	6,500	2,200	5,500	2,000	6,500	2,200	4,500	1,600
30	5,000	1,800	4,500	1,600	5,000	1,800	3,700	1,300

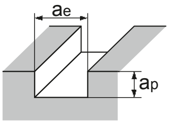
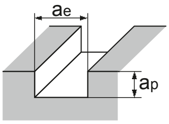
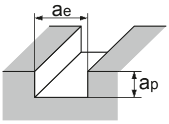
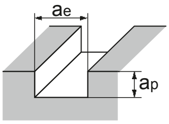
NOTE

1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30%-60% on above table.
4) If machine does not have enough spindle speed (RPM),it is recommended to reduce feed speed into same proportion.

Solid Carbide End Mill for Aluminium AL-SEES2TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEES2 TYPE

(2) Slotting/ High Speed Machining

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to 13% Si)		Copper alloy (C1100)	
Type of Machining	 a_p=0.5Dc a_e=Dc		 a_p=0.5Dc a_e=Dc		 a_p=0.5Dc a_e=Dc		 a_p=0.5Dc a_e=Dc	
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)
0.4	50,000	360	50,000	360	50,000	360	50,000	360
0.5	50,000	450	50,000	450	50,000	450	50,000	450
0.75	50,000	670	50,000	670	50,000	670	50,000	670
1	50,000	900	50,000	900	50,000	900	50,000	900
1.5	50,000	1,350	50,000	1,350	50,000	1,350	50,000	1,350
2	50,000	1,800	50,000	1,800	50,000	1,800	48,000	1,700
3	48,000	2,500	40,000	2,100	48,000	2,500	32,000	1,700
4	36,000	2,500	30,000	2,100	36,000	2,500	23,000	1,700
5	28,000	2,500	24,000	2,100	28,000	2,500	19,000	1,700
6	23,000	2,500	20,000	2,100	23,000	2,500	16,000	1,700
8	18,000	2,500	15,000	2,100	18,000	2,500	12,000	1,700
10	14,000	2,500	12,000	2,100	14,000	2,500	9,500	1,700
12	12,000	2,500	10,000	2,100	12,000	2,500	8,000	1,700
16	9,000	2,500	8,000	2,100	9,000	2,500	6,000	1,700
20	7,000	2,100	6,000	1,800	7,000	2,100	4,800	1,400
25	5,700	2,000	4,800	1,700	5,700	2,000	3,800	1,300
30	4,700	1,600	4,000	1,400	4,700	1,600	3,200	1,100

NOTE

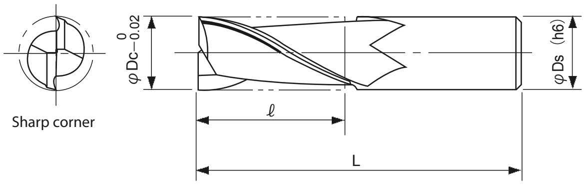
1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30%-60% on above table.
4) If machine does not have enough spindle speed (RPM), it is recommended to reduce feed speed into same proportion.

Solid Carbide End Mill for Aluminium AL-SEEL2TYPE

- 2 flutes, Helix angle 45°
- Long flute length

Sharp Corner

Shoulder Milling



Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
AL-SEEL2030	●	**3**	22	65	6
AL-SEEL2040	●	**4**	26	65	6
AL-SEEL2050	●	**5**	32	75	6
AL-SEEL2060	●	**6**	32	75	6
AL-SEEL2070	●	**7**	42	95	8
AL-SEEL2080	●	**8**	42	95	8
AL-SEEL2090	●	**9**	42	110	10
AL-SEEL2100	●	**10**	53	120	10
AL-SEEL2120	●	**12**	53	120	12
AL-SEEL2130	●	**13**	65	130	12
AL-SEEL2140	●	**14**	75	140	16
AL-SEEL2150	●	**15**	75	140	16
AL-SEEL2160	●	**16**	75	140	16
AL-SEEL2180	●	**18**	75	150	20
AL-SEEL2200	●	**20**	75	150	20
AL-SEEL2220	□	**22**	85	160	25
AL-SEEL2250	●	**25**	85	160	25

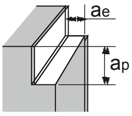
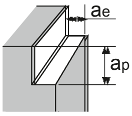
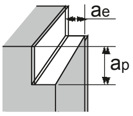
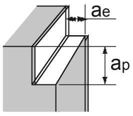
Note) Please refer page D020 for recommended cutting conditions

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

Solid Carbide End Mill for Aluminium AL-SEEL2TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEEL2 TYPE

(1) Shoulder Milling

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast Aluminium alloy (Up to 13%Si)		Copper alloy (C1100)	
Type of Machining	 ap=1.5Dc ae=0.2Dc		 ap=1.5Dc ae=0.2Dc		 ap=1.5Dc ae=0.2Dc		 ap=1.5Dc ae=0.2Dc	
Tooldia. 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)
1	32,000	700	32,000	700	32,000	700	30,000	660
1.5	32,000	1,000	32,000	1,000	32,000	1,000	20,000	660
2	28,000	1,200	23,000	1,000	28,000	1,200	16,000	660
3	19,000	1,200	16,000	1,000	19,000	1,200	10,000	660
4	14,000	1,200	12,000	1,000	14,000	1,200	8,000	660
5	11,000	1,200	9,500	1,000	11,000	1,200	6,000	660
6	9,500	1,200	8,000	1,000	9,500	1,200	5,000	660
8	7,000	1,200	6,000	1,000	7,000	1,200	4,000	660
10	5,700	1,200	4,800	1,000	5,700	1,200	3,200	660
12	4,700	1,200	4,000	1,000	4,700	1,200	2,600	660
16	3,500	1,000	3,000	900	3,500	1,000	2,000	600
20	2,800	800	2,400	700	2,800	800	1,600	500
25	2,300	800	1,900	650	2,300	800	1,300	500

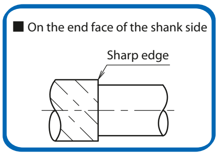
■ NOTE

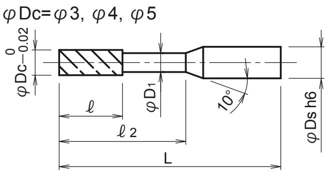
1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping,please reduce the cutting parameters by 30-60% on above table. (Not recommended to use)
4) If machine does not have enough spindle speed (RPM), it is recommended to reduce feed speed into same proportion.
5) In case of slotting, please use depth of cut below 0.2D and reduce feed speed by 30-60% on above cutting parameters. (Please try to avoid using this tool for full slotting)

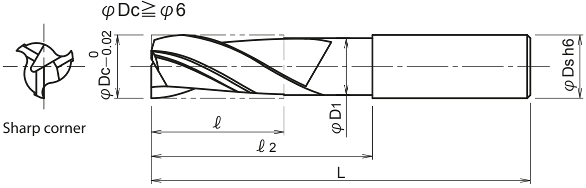
Solid Carbide End Mill for Aluminium AL-SEEZ3TYPE

- 3 flutes, Helix angle 45°
- Flute length 1.5Dc

Sharp Corner | Shoulder Milling | Slotting | Pocket Milling | Helical Interpolation | Counter boring







Cat. No.	Stock	Dimensions (mm)					
		φDc	ℓ	ℓ2	L	φD1	φDs
AL-SEEZ3030	●	**3**	5	9	55	2.8	6
AL-SEEZ3050	●	**4**	6	12	55	3.8	6
AL-SEEZ3040	●	**5**	8	15	55	4.8	6
AL-SEEZ3060	●	**6**	9	18	60	5.8	6
AL-SEEZ3080	●	**8**	12	24	70	7.8	8
AL-SEEZ3100	●	**10**	15	30	75	9.8	10
AL-SEEZ3120	●	**12**	18	36	80	11.7	12
AL-SEEZ3160	●	**16**	24	48	95	15.7	16
AL-SEEZ3200	●	**20**	30	60	115	19.7	20
AL-SEEZ3250	●	**25**	38	75	130	24.7	25

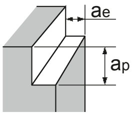
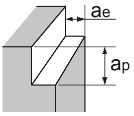
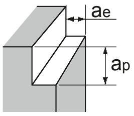
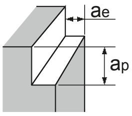
Note) Please refer page D023-D024 for recommended cutting conditions.

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

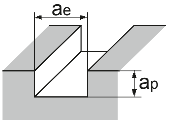
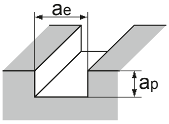
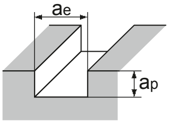
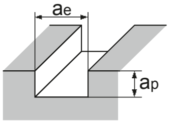
Solid Carbide End Mill for Aluminium AL-SEEZ3TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEEZ3 TYPE

(1) Shoulder Milling

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to13%Si)		Copper alloy (C1100)	
Type of Machining	 ap=1.5Dc ae=0.3Dc		 ap=1.5Dc ae=0.3Dc		 ap=1.5Dc ae=0.3Dc		 ap=1.5Dc ae=0.3Dc	
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)
3	24,000	4,800	22,800	4,400	24,000	4,800	17,000	3,400
4	18,000	4,500	16,000	4,000	18,000	4,500	13,000	3,200
5	15,000	4,500	13,000	4,000	15,000	4,500	10,000	3,200
6	12,000	4,200	10,000	3,500	12,000	4,200	8,500	3,000
8	9,000	3,600	8,000	3,200	9,000	3,600	6,500	2,600
10	7,300	3,200	6,000	2,700	7,300	3,200	5,000	2,200
12	6,000	3,000	5,000	2,500	6,000	3,000	4,000	2,000
16	4,500	2,500	4,000	2,200	4,500	2,500	3,000	1,600
20	3,600	2,100	3,000	1,800	3,600	2,100	2,500	1,500
25	3,000	1,800	2,500	1,500	3,000	1,800	2,000	1,200

(2)Slotting

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to13%Si)		Copper alloy (C1100)	
Type of Machining	 ap=Dc ae=Dc		 ap=Dc ae=Dc		 ap=Dc ae=Dc		 ap=Dc ae=Dc	
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)
3	21,000	3,100	18,000	2,700	21,000	3,100	14,000	2,100
4	16,000	2,500	13,000	2,000	16,000	2,500	11,000	1,700
5	12,000	2,100	10,000	1,800	12,000	2,100	8,900	1,600
6	10,000	2,000	9,000	1,800	10,000	2,000	7,400	1,500
8	8,000	2,000	7,000	1,750	8,000	2,000	5,500	1,400
10	6,000	1,800	5,500	1,650	6,000	1,800	4,500	1,350
12	5,000	1,800	4,500	1,600	5,000	1,800	3,700	1,300
16	4,000	1,600	3,300	1,300	4,000	1,600	2,700	1,000
20	3,000	1,350	2,700	1,200	3,000	1,350	2,200	1,000
25	2,500	1,100	2,000	900	2,500	1,100	1,800	800

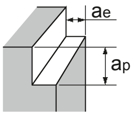
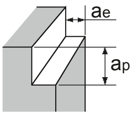
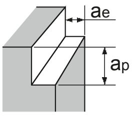
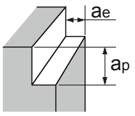
NOTE

1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30%-60% on above table.
4) If machine does not have enough spindle speed (RPM), it is recommended to reduce feed speed into same proportion.

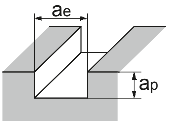
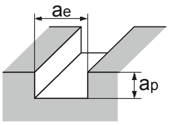
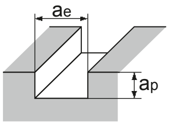
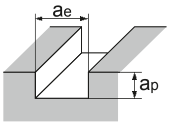
Solid Carbide End Mill for Aluminium AL-SEEZ3TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR AL-SEEZ3 TYPE

(1) Shoulder Milling / High Speed Machining

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to13%Si)		Copper alloy (C1100)	
Type of Machining	 ap=1.5Dc ae=0.2Dc		 ap=1.5Dc ae=0.2Dc		 ap=1.5Dc ae=0.2Dc		 ap=1.5Dc ae=0.2Dc	
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)
3	50,000	9,000	45,000	8,100	50,000	9,000	37,000	6,600
4	40,000	8,000	34,000	6,800	40,000	8,000	27,000	5,400
5	32,000	8,000	27,000	6,800	32,000	8,000	22,000	5,400
6	27,000	6,800	22,000	5,500	27,000	6,800	18,000	4,500
8	20,000	6,000	17,000	5,000	20,000	6,000	14,000	4,200
10	16,000	5,600	13,000	4,500	16,000	5,600	11,000	3,900
12	13,000	5,200	11,000	4,400	13,000	5,200	9,000	3,600
16	10,000	4,500	8,500	3,800	10,000	4,500	7,000	3,100
20	8,000	4,000	7,000	3,500	8,000	4,000	5,500	2,800
25	6,500	3,200	5,500	2,800	6,500	3,200	4,500	2,200

(2) Slotting / High Speed Machining

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminiumalloy (Up to 13%Si)		Copperalloy (C1100)	
Type of Machining	 ap=0.5Dc ae=Dc		 ap=0.5Dc ae=Dc		 ap=0.5Dc ae=Dc		 ap=0.5Dc ae=Dc	
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)
3	48,000	5,600	40,000	4,800	48,000	5,600	32,000	3,800
4	36,000	5,600	30,000	4,800	36,000	5,600	23,000	3,800
5	28,000	5,600	24,000	4,800	28,000	5,600	19,000	3,800
6	23,000	5,600	20,000	4,800	23,000	5,600	16,000	3,800
8	18,000	5,000	15,000	4,200	18,000	5,000	12,000	3,300
10	14,000	4,200	12,000	3,600	14,000	4,200	9,500	2,800
12	12,000	3,800	10,000	3,200	12,000	3,800	8,000	2,600
16	9,000	3,100	8,000	2,800	9,000	3,100	6,000	2,100
20	7,000	2,800	6,000	2,400	7,000	2,800	4,800	1,900
25	5,700	2,200	4,800	1,900	5,700	2,200	3,800	1,500

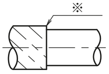
■ NOTE

1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30%-60% on above table.
4) If machine does not have enough spindle speed (RPM), it is recommended to reduce feed speed into same proportion.

Solid Carbide End Mill for Aluminium AL-SEES3-LSTYPE

- 3 flutes, Helix angle 45°
- Long shank type
- Under size neck

■ On the end face of the shank side



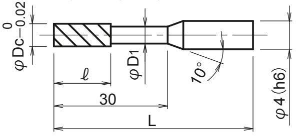
R chamfering	R
Sharp edge	S

Sharp Corner

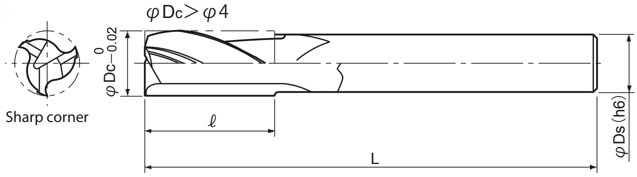
Shoulder Milling

Slotting

φDc=φ3, φ4



φDc>φ4



Cat. No.	Stock	Dimensions (mm)					※
		φDc	ℓ	L	φD1	φDs	
AL-SEES3030-LS	●	**3**	5	70	2.8	4	S
AL-SEES3040-LS	●	**4**	6	70	3.8	4	S
AL-SEES3050-LS	●	**5**	8	80	–	4	S
AL-SEES3060-LS	●	**6**	9	80	–	4	R
AL-SEES3060-LS-S5.8	●	**6**	9	80	–	5.8	S
AL-SEES3070-LS	●	**7**	10	100	–	6	R
AL-SEES3070-LS-S6.8	●	**7**	10	100	–	6.8	S
AL-SEES3080-LS	●	**8**	12	100	–	6	R
AL-SEES3080-LS-S7.8	●	**8**	12	100	–	7.8	S
AL-SEES3090-LS	☐	**9**	14	120	–	8	R
AL-SEES3090-LS-S8.8	☐	**9**	14	120	–	8.8	S
AL-SEES3100-LS	●	**10**	15	130	–	8	R
AL-SEES3100-LS-S9.8	●	**10**	15	130	–	9.8	S
AL-SEES3120-LS	●	**12**	18	150	–	10	R
AL-SEES3140-LS	●	**14**	21	160	–	12	R
AL-SEES3160-LS	●	**16**	24	180	–	14	R
AL-SEES3180-LS	●	**18**	27	180	–	16	R
AL-SEES3200-LS	●	**20**	30	200	–	18	R
AL-SEES3220-LS	●	**22**	33	200	–	20	R

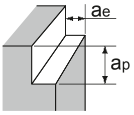
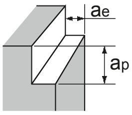
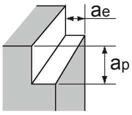
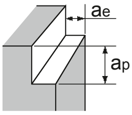
Note) Please refer page D026 for recommended cutting conditions.

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

Solid Carbide End Mill for Aluminium AL-SEES3-LS TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEES3-LS TYPE

(1) Shoulder Milling

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to 13% Si)		Copper alloy (C1100)	
Type of Machining	 ap=1.5Dc ae=0.05Dc		 ap=1.5Dc ae=0.05Dc		 ap=1.5Dc ae=0.05Dc		 ap=1.5Dc ae=0.05Dc	
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)
3	19,000	2,200	16,000	1,800	19,000	2,200	10,600	950
4	14,300	1,800	11,900	1,600	14,300	1,800	8,000	880
5	11,400	1,600	10,000	1,400	11,400	1,600	6,400	830
6	9,500	1,400	8,000	1,200	9,500	1,400	5,000	750
8	7,000	1,100	6,000	1,000	7,000	1,100	4,000	650
10	5,700	1,000	4,800	850	5,700	1,000	3,200	570
12	4,700	940	4,000	800	4,700	940	2,600	520
14	4,000	880	3,400	750	4,000	880	2,200	500
16	3,500	800	3,000	700	3,500	800	2,000	450
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

NOTE

1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30-60% on above table.(Not recommended to use)
4) If machine does not have enough spindle speed (RPM), it is recommended to reduce feed speed into same proportion.
5) In case of slotting, please use depth of cut below 0.2D and reduce feed speed by 30-60% on above cutting parameters. (Please try to avoid using this tool for full slotting)

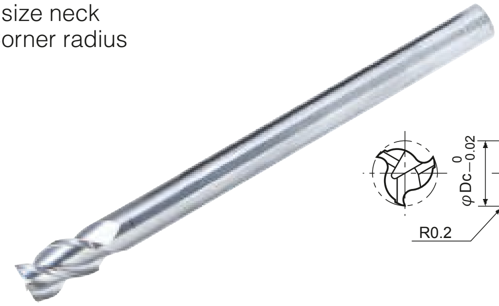
REDUCTION RATE FOR AL-SEES3-LS TYPE

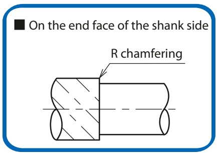
※ In case of lengthening overhung length, the cutting parameters to be adjusted according to the reductionrate.

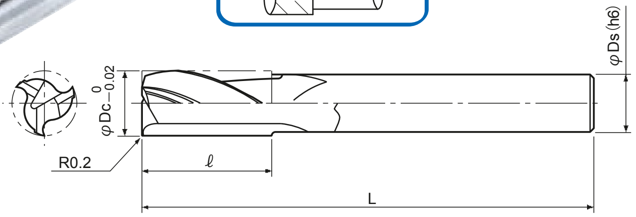
L / Dc	n (min^{-1})	Vf (mm/min)	ap	ae
Below 4 Dc	0%	0%	1.5 Dc	0.05 Dc
5~6 Dc	25%	30%	1.2 Dc	0.05 Dc
7~8 Dc	40%	50%	1.0 Dc	0.05 Dc

Solid Carbide End Mill for Aluminium AL-SEES3-LS-R02TYPE

- 3 flutes, Helix angle 45°
- Long shank type
- Under size neck
- R0.2 Corner radius







Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
AL-SEES3060-LS-R02	☐	**6**	9	80	4
AL-SEES3080-LS-R02	●	**8**	12	100	6
AL-SEES3100-LS-R02	●	**10**	15	130	8
AL-SEES3120-LS-R02	●	**12**	18	150	10
AL-SEES3140-LS-R02	●	**14**	21	160	12
AL-SEES3160-LS-R02	☐	**16**	24	180	14
AL-SEES3180-LS-R02	☐	**18**	27	180	16
AL-SEES3200-LS-R02	●	**20**	30	200	18
AL-SEES3220-LS-R02	☐	**22**	33	200	20

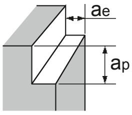
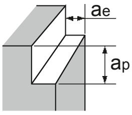
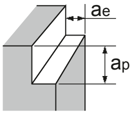
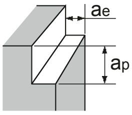
Note) Please refer page D028-D029 for recommended cutting conditions.

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

Solid Carbide End Mill for Aluminium AL-SEES3-LS-R02TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEES3-LS-R02 TYPE

(1) Shoulder Milling

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to 13% Si)		Copper alloy (C1100)	
Type of Machining	 ap=1.5Dc ae=0.05Dc		 ap=1.5Dc ae=0.05Dc		 ap=1.5Dc ae=0.05Dc		 ap=1.5Dc ae=0.05Dc	
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)
6	10,000	1,500	9,000	1,350	10,000	1,500	7,400	1,100
8	8,000	1,400	7,000	1,250	8,000	1,400	5,500	1,000
10	6,000	1,200	5,500	1,100	6,000	1,200	4,500	900
12	5,000	1,100	4,500	1,000	5,000	1,100	3,700	800
14	4,500	1,000	3,900	900	4,500	1,000	3,200	750
16	4,000	1,000	3,300	800	4,000	1,000	2,700	670
18	3,500	950	3,000	800	3,500	950	2,500	670
20	3,000	900	2,700	800	3,000	900	2,200	670
22	2,900	900	2,500	750	2,900	900	2,000	600

NOTE

1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30-60% on above table.(Not recommended to use)
4) If machine does not have enough spindle speed (RPM), it is recommended to reduce feed speed into same proportion.
5) In case of slotting, please use depth of cut below 0.2D and reduce feed speed by 30-60% on above cutting parameters. (Please try to avoid using this tool for full slotting)

REDUCTION RATE FOR AL-SEES3-LS TYPE

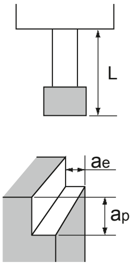
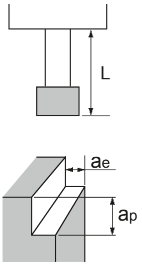
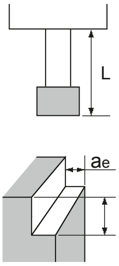
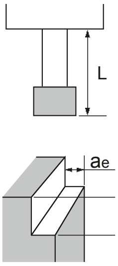
※ In case of lengthening overhung length, the cutting parameters to be adjusted according to the reductionrate.

L / Dc	n (min^{-1})	Vf (mm/min)	ap	ae
Below 4 Dc	0%	0%	1.5 Dc	0.05 Dc
5~6 Dc	25%	30%	1.2 Dc	0.05 Dc
7~8 Dc	40%	50%	1.0 Dc	0.05 Dc

Solid Carbide End Mill for Aluminium AL-SEES3-LS-R02TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEES3-LS-R02 TYPE

(1) Shoulder Milling / High Speed Machining

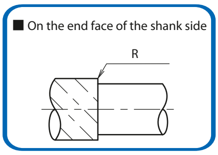
Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to 13% Si)		Copper alloy (C1100)	
Type of Machining	 ap=1.5Dc ae=0.04Dc L≦Dc x 4		 ap=1.5Dc ae=0.04Dc L≦Dc x 4		 ap=1.5Dc ae=0.04Dc L≦Dc x 4		 ap=1.5Dc ae=0.04Dc L≦Dc x 4	
Tool dia. φDc (mm)	Spindle speed n (min^{-1})	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)
6	20,000	2,600	17,000	2,200	20,000	2,600	12,000	1,600
8	15,000	2,100	13,000	1,800	15,000	2,100	9,000	1,300
10	12,000	2,000	10,000	1,800	12,000	2,000	7,300	1,200
12	10,000	2,000	9,000	1,800	10,000	2,000	6,000	1,200
14	8,500	1,850	7,500	1,600	8,500	1,850	5,000	1,100
16	7,500	1,650	6,500	1,400	7,500	1,650	4,500	1,000
18	6,500	1,500	6,000	1,400	6,500	1,500	4,000	1,000
20	6,000	1,500	5,000	1,250	6,000	1,500	3,600	900
22	5,500	1,400	4,800	1,200	5,500	1,400	3,300	800

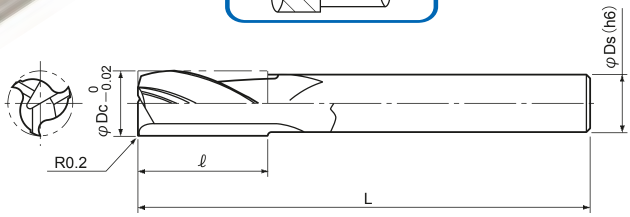
NOTE

1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30-60% on above table.(Not recommended to use)
4) If machine does not have enough spindle speed (RPM), it is recommended to reduce feed speed into same proportion.
5) In case of slotting, please use depth of cut below 0.2D and reduce feed speed by 30-60% on above cutting parameters. (Please try to avoid using this tool for full slotting)

Solid Carbide End Mill for Aluminium AL-SEES3-XLS-R02TYPE

- 3 flutes, Helix angle 45°
- Extra long shank type
- Under size neck
- R0.2 Corner radius





Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
AL-SEES3060-XLS-R02	●	**6**	9	100	5
AL-SEES3080-XLS-R02	●	**8**	12	140	7
AL-SEES3100-XLS-R02	●	**10**	15	160	9
AL-SEES3120-XLS-R02	●	**12**	18	180	11
AL-SEES3140-XLS-R02	●	**14**	21	200	13
AL-SEES3160-XLS-R02	●	**16**	24	220	15
AL-SEES3180-XLS-R02	☐	**18**	27	240	17
AL-SEES3200-XLS-R02	●	**20**	30	250	18
AL-SEES3220-XLS-R02	●	**22**	33	250	20

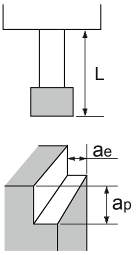
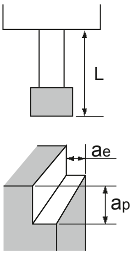
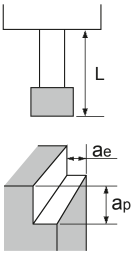
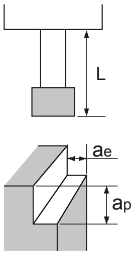
Note) Please refer page D031-D032 for recommended cutting conditions

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

Solid Carbide End Mill for Aluminium AL-SEES3-XLS-R02TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEES3-XLS-R02 TYPE

(1) Shoulder Milling

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to13% Si)		Copper alloy (C1100)	
Type of Machining	 L = Dc x 4 ae = Dc x 0.25 ap = Dc x 1.5		 L = Dc x 4 ae = Dc x 0.25 ap = Dc x 1.5		 L = Dc x 4 ae = Dc x 0.25 ap = Dc x 1.5		 L = Dc x 4 ae = Dc x 0.25 ap = Dc x 1.5	
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)
6	20,000	3,600	20,000	3,400	20,000	3,600	13,500	2,100
8	18,000	3,600	18,000	3,300	18,000	3,600	12,000	2,100
10	14,000	4,200	14,000	4,000	14,000	4,200	9,500	2,400
12	12,000	4,800	10,500	3,800	12,000	4,800	8,000	2,800
14	10,000	4,200	9,000	3,400	10,000	4,200	7,000	2,600
16	9,000	4,000	8,000	3,200	9,000	4,000	6,000	2,400
18	8,000	3,800	7,200	3,100	8,000	3,800	5,400	2,200
20	7,200	3,600	6,500	3,000	7,200	3,600	5,000	2,100
22	6,500	3,400	6,000	2,800	6,500	3,400	4,800	2,100

NOTE

1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30-60% on above table.(Not recommended to use)
4) If machine does not have enough spindle speed (RPM), it is recommended to reduce feed speed into same proportion.

REDUCTION RATE FOR AL-SEES3-XLS-R02 TYPE

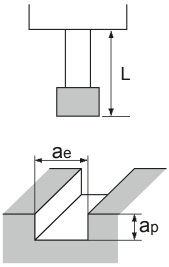
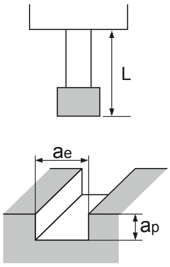
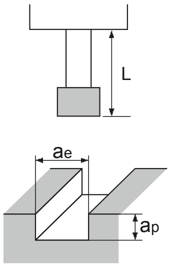
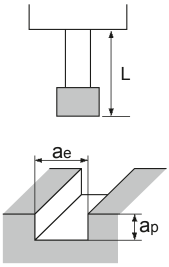
※ In case of lengthening overhung length, the cutting parameters to be adjusted according to the reduction rate.

L / Dc	n (min^{-1}) Vf (mm/min)	ae
4~5Dc	0%	0.2Dc
5~6Dc	10~20%	0.15Dc
6~7Dc	30~40%	0.1Dc
7~8Dc	40~50%	0.075Dc
8~9Dc	50~60%	0.05Dc
9~10Dc	60~70%	0.025Dc

Solid Carbide End Mill for Aluminium AL-SEES3-XLS-R02TYPE

RECOMMENDED CUTTING CONDITIONS FOR AL-SEES3-XLS-R02 TYPE

(2) Slotting

Work Materials	Aluminium alloy (A5052)		Aluminium alloy (A7075)		Cast aluminium alloy (Up to 13% Si)		Copper alloy (C1100)	
Type of Machining	 L = Dc x 4 ae = Dc ap = Dc x 0.25		 L = Dc x 4 ae = Dc ap = Dc x 0.25		 L = Dc x 4 ae = Dc ap = Dc x 0.25		 L = Dc x 4 ae = Dc ap = Dc x 0.25	
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)
6	15,000	5,250	14,000	4,600	15,000	5,250	11,000	3,500
8	12,500	4,150	12,000	3,800	12,500	4,150	9,000	2,700
10	11,000	3,500	10,500	3,500	11,000	3,500	8,000	2,300
12	9,600	3,100	9,000	2,800	9,600	3,100	7,000	2,000
14	8,600	2,750	8,200	2,500	8,600	2,750	6,200	1,800
16	7,800	2,650	7,400	2,400	7,800	2,650	5,600	1,700
18	7,000	2,520	6,700	2,300	7,000	2,520	5,000	1,600
20	6,400	2,560	6,000	2,300	6,400	2,560	4,600	1,600
22	6,000	2,520	5,800	2,300	6,000	2,520	4,400	1,700

NOTE

1) Use water soluble oil.
2) It is important to hold the tool shank at least up to 50-60 mm into any tool holder for rigid holding of the tool.
3) In case of ramping, please reduce the cutting parameters by 30-60% on above table.(Not recommended to use)
4) If machine does not have enough spindle speed (RPM), it is recommended to reduce feed speed into same proportion.

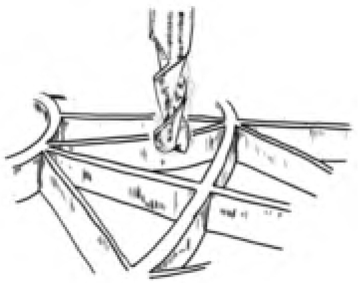
REDUCTION RATE FOR AL-SEES3-XLS-R02 TYPE

※ In case of lengthening overhung length, the cutting parameters to be adjusted according to the reduction rate.

L / Dc	n (min^{-1}) Vf (mm/min)		ap
	Below φ 10	Over φ 10	
4~5Dc	0%	0%	0.2Dc
5~6Dc	40~50%	10~20%	0.1Dc
6~7Dc	50~60%	20~30%	0.05Dc
7~8Dc	60~70%	30~50%	0.05Dc
8~9Dc	70~80%	40~60%	0.025Dc
9~10Dc	70~80%	50~70%	0.025Dc

Solid Carbide End Mill for Aluminium

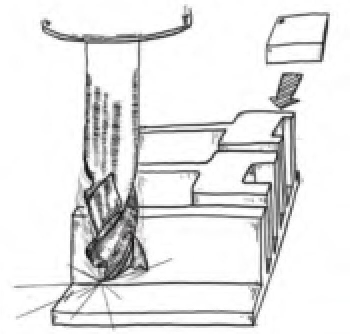
CASE STUDIES



Result

No chattering. Very smooth machining observed on low rigid work piece.

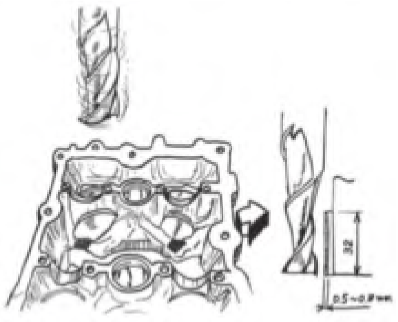
Work	Part name	Under plate
	Material	A6061 Aluminium alloy
	Hardness	–
Tool	Tool No.	AL-SEES2100
	Grade	KT9
Cutting conditions	Vc,(n)	25,000 (min^{-1})
	Vf, (f z)	8,000 (mm/min)
	a p(mm)	3 (mm)
	a e(mm)	10 (mm)
	Coolant	Wet cut
	Machine	H.S.C. Vertical MC



Result

Excellent surface roughness.
Less chattering than competitor's.

Work	Part name	Aircraft part
	Material	Aluminium alloy
	Hardness	–
Tool	Tool No.	AL-SEES3120-LS
	Grade	KT9
Cutting conditions	Vc,(n)	9,000 (min^{-1})
	Vf, (f z)	4,000 (mm/min)
	a p(mm)	0.5 (mm)
	a e(mm)	12 (mm)
	Coolant	Wet cut
	Machine	H.S.C. Vertical MC



Result

Could finish job by one process integrated roughing and finishing process.
Achieved 10 time longer tool life and better surface roughness than the exisiting.

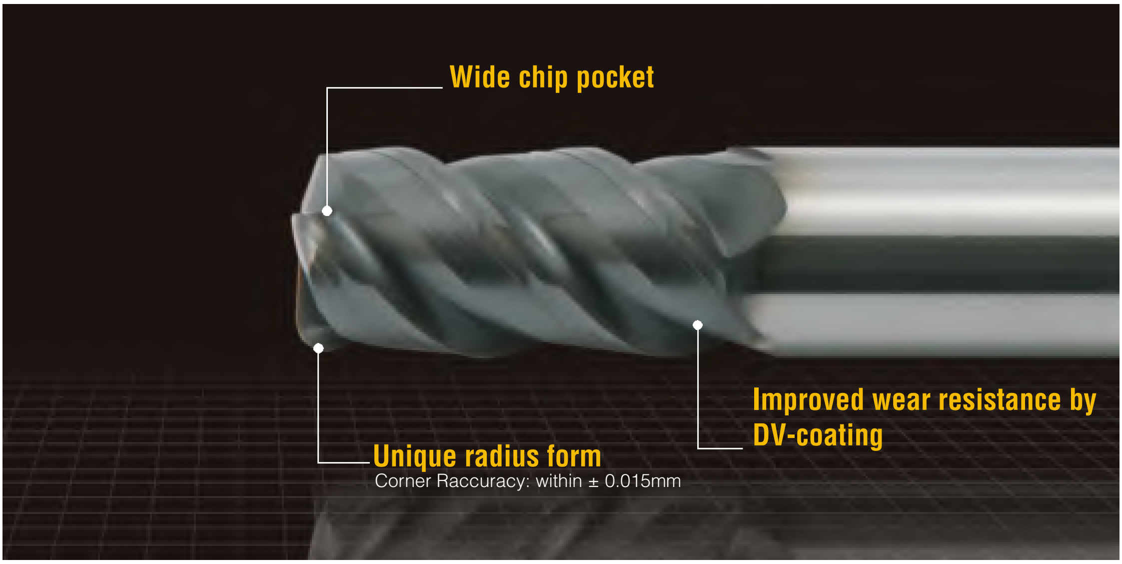
Work	Part name	Cylinder head
	Material	Aluminium alloy
	Hardness	–
Tool	Tool No.	AL-SEES2160
	Grade	KT9
Cutting conditions	Vc,(n)	7,500 (min^{-1})
	Vf, (f z)	3,500 (mm/min)
	a p(mm)	32 (mm)
	a e(mm)	0.5!0.8 (mm)
	Coolant	Wet cut
	Machine	H.S.C. Vertical MC

“One-Cut Super Radius” End Mill

DV-OCSRTYPE

DV Coating

From Roughing to Finishing on High Hardened Materials



Features

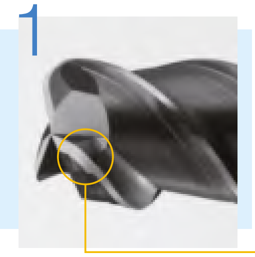
1 Suitable for various materials

2 High speed
High feed
High accuracy

3 Regular type
Long neck type
Taper neck type

Unique cutting edge geometry

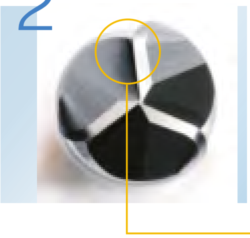
1



Adapted curve rake face with lead angle on corner edge

- ● Achieved high feed machining and longer tool life at roughing process of high hardened material by reducing heating due to smooth chip evacuation.

2



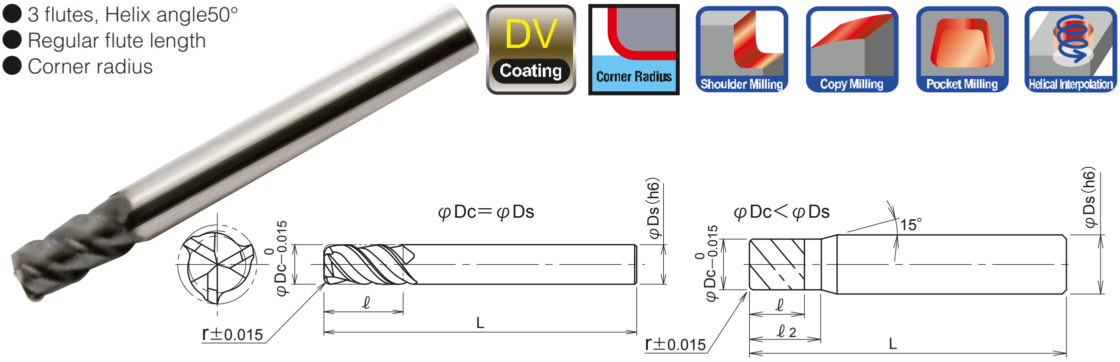
3 flutes with wide chip pocket

- ● Stable machining is possible at the corner of pocket milling
- ● High efficient slotting is possible.

"One-Cut Super Radius" End Mill DV-OCSRTYPE

- 3 flutes, Helix angle50°
- Regular flute length
- Corner radius

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



Cat. No.	Stock	Dimensions (mm)					
		φDc	r	ℓ	ℓ2	L	φDs
DV-OCSR3020-R05	●	**2**	0.5	4	6	70	6
DV-OCSR3030-R08	●	**3**	0.8	6	9	70	6
DV-OCSR3040-R10	●	**4**	1	8	12	70	6
DV-OCSR3050-R12	●	**5**	1.2	10	15	70	6
DV-OCSR3060-R15	●	**6**	1.5	12	–	90	6
DV-OCSR3080-R20	●	**8**	2	16	–	100	8
DV-OCSR3100-R10	□	**10**	1	20	–	110	10
DV-OCSR3100-R20	●	**10**	2	20	–	110	10
DV-OCSR3120-R20	●	**12**	2	24	–	120	12
DV-OCSR3160-R30	□	**16**	3	32	–	160	16
DV-OCSR3160-R30-L	□	**16**	3	32	–	185	16
DV-OCSR3200-R30	□	**20**	3	40	–	160	20

Note) Please refer page D051-D052 for recommended cutting conditions.

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

"One-Cut Super Radius" End Mill DV-OCSRTYPE

RECOMMENDED CUTTING CONDITIONS FOR DV-OCSR TYPE

Work Materials	L/Dc	Dimensions (mm)											
		φ2×R0.5			φ3×R0.8			φ4×R1			φ5×R1.2		
		ap (mm)	n (mm^{-1})	Vf (mm/min)	ap (mm)	n (mm^{-1})	Vf (mm/min)	ap (mm)	n (mm^{-1})	Vf (mm/min)	ap (mm)	n (mm^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	Below5 Dc	0.12	15,000	5,100	0.20	10,000	5,100	0.25	7,000	4,800	0.30	5,700	4,800
	6~8 Dc	0.08	7,000	1,900	0.13	5,300	2,700	0.17	3,500	2,300	0.20	2,800	2,300
	9~11Dc	0.06	5,000	1,000	0.10	3,000	1,500	0.12	2,300	1,500	0.14	1,900	1,600
Mold steel HPM7,NAK80,P20 (1.2311) 30-43HRC	Below5 Dc	0.12	12,000	4,000	0.20	8,500	4,300	0.25	6,000	4,000	0.30	5,000	4,200
	6~8 Dc	0.08	7,000	1,900	0.13	5,300	2,700	0.17	3,500	2,300	0.20	2,800	2,300
	9~11Dc	0.06	4,800	980	0.10	3,000	1,500	0.12	2,300	1,500	0.14	1,900	1,600
Die steel SKD61,SKD11 (1.2344,1.2379) Below 255HB	Below5 Dc	0.12	12,000	4,000	0.20	8,500	4,300	0.25	6,000	4,000	0.30	5,000	4,200
	6~8 Dc	0.08	7,000	1,900	0.13	5,300	2,700	0.17	3,500	2,300	0.20	2,800	2,300
	9~11Dc	0.06	4,800	980	0.10	3,000	1,500	0.12	2,300	1,500	0.14	1,900	1,600
Hardened die steel SKD61,DAC,DHA (1.2344,1.2379) 40-50HRC	Below5 Dc	0.10	9,600	2,900	0.18	6,300	2,800	0.22	4,700	2,800	0.27	2,200	1,600
	6~8 Dc	0.07	4,800	1,400	0.11	3,000	1,300	0.15	2,300	1,400	0.18	1,900	1,400
	9~11Dc	0.05	4,000	700	0.09	2,600	1,100	0.10	1,900	1,100	0.12	1,500	1,100
Hardened die steel SKD61,DAC,DHA (1.2344,1.2379) 55-60 HRC	Below5Dc	0.10	4,800	1,300	0.16	3,000	1,200	0.20	2,300	1,200	0.24	1,900	1,200
	6~8 Dc	0.06	4,000	980	0.10	2,600	1,000	0.13	1,900	1,000	0.16	1,500	1,000
	9~11Dc	0.05	3,000	550	0.08	2,000	800	0.10	1,500	800	0.11	1,200	800
Grey & Nodular cast iron FC,FCD(GG,GGG) Below 300HB	Below5 Dc	0.13	15,000	5,600	0.22	10,000	5,600	0.27	8,000	5,900	0.33	6,000	5,600
	6~8 Dc	0.09	8,700	1,900	0.14	5,800	3,200	0.16	4,300	3,200	0.22	3,500	3,200
	9~11Dc	0.07	5,600	1,200	0.11	3,700	2,000	0.13	2,700	2,000	0.15	2,200	2,000

L:Overhung length, Dc:Tool dia, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

Work Materials	L/Dc	Dimensions (mm)											
		φ6×R1.5			φ8×R2			φ10×R1			φ10×R2		
		ap (mm)	n (mm^{-1})	Vf (mm/min)	ap (mm)	n (mm^{-1})	Vf (mm/min)	ap (mm)	n (mm^{-1})	Vf (mm/min)	ap (mm)	n (mm^{-1})	Vf (mm/min)
Carbon steel S50C,S55C (C50,C55) Below 250HB	Below5 Dc	0.37	4,800	4,800	0.50	3,500	4,700	0.25	2,800	4,700	0.50	2,800	4,700
	6~8 Dc	0.25	2,300	2,300	0.34	1,700	2,300	0.17	1,400	2,300	0.34	1,400	2,300
	9~11Dc	0.18	1,500	1,500	0.24	1,100	1,400	0.12	900	1,500	0.24	900	1,500
Mold steel HPM7,NAK80,P20 (1.2311) 30-43 HRC	Below5 Dc	0.37	4,200	4,200	0.50	3,000	4,000	0.25	2,400	4,000	0.50	2,400	4,000
	6~8 Dc	0.25	2,300	2,300	0.34	1,700	2,300	0.17	1,400	2,300	0.34	1,400	2,300
	9~11Dc	0.18	1,500	1,500	0.24	1,100	1,400	0.12	900	1,500	0.24	900	1,500
Die steel SKD61,SKD11 (1.2344,1.2379) Below 255HB	Below5 Dc	0.37	4,200	4,200	0.50	3,000	4,000	0.25	2,400	4,000	0.50	2,400	4,000
	6~8 Dc	0.25	2,300	2,300	0.34	1,700	2,300	0.17	1,400	2,300	0.34	1,400	2,300
	9~11Dc	0.18	1,500	1,500	0.24	1,100	1,400	0.12	900	1,500	0.24	900	1,500
Hardened die steel SKD61,DAC,DHA (1.2344,1.2379) 40-50 HRC	Below5 Dc	0.33	1,800	1,600	0.45	1,300	1,500	0.20	1,900	2,900	0.45	1,900	2,900
	6~8 Dc	0.22	1,500	1,300	0.30	1,100	1,300	0.15	900	1,300	0.30	900	1,300
	9~11Dc	0.16	1,300	1,100	0.20	900	1,100	0.10	700	1,000	0.20	700	1,000
Hardened die steel SKD61,DAC,DHA (1.2344,1.2379) 55-60 HRC	Below5 Dc	0.30	1,500	1,200	0.40	1,100	1,100	0.20	900	1,200	0.40	900	1,200
	6~8 Dc	0.20	1,300	1,000	0.27	900	900	0.13	700	900	0.27	700	900
	9~11Dc	0.14	1,000	800	0.19	700	700	0.10	600	800	0.19	600	800
Grey & Nodular cast iron FC,FCD(GG,GGG) Below 300HB	Below5 Dc	0.40	5,300	5,900	0.55	3,800	5,600	0.27	3,000	5,600	0.55	3,000	5,600
	6~8 Dc	0.27	2,900	3,200	0.37	2,100	3,100	0.16	1,700	3,100	0.37	1,700	3,100
	9~11Dc	0.20	1,800	2,000	0.26	1,300	1,900	0.13	1,000	1,800	0.26	1,000	1,800

L:Overhung length, Dc:Tool dia, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

“One-Cut Super Radius” End Mill DV-OCSRTYPE

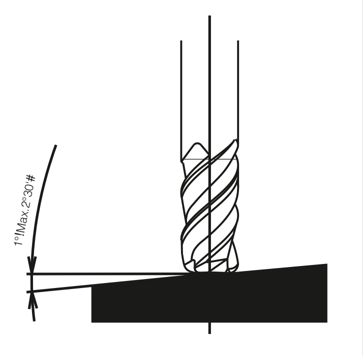
RECOMMENDED CUTTING CONDITIONS FOR DV-OCSR TYPE

Work Materials	L/Dc	Dimensions (mm)											
		φ12×R2			φ12×R3			φ16×R3			φ20×R3		
		ap (mm)	n (mm⁻¹)	Vf (mm/min)	ap (mm)	n (mm⁻¹)	Vf (mm/min)	ap (mm)	n (mm⁻¹)	Vf (mm/min)	ap (mm)	n (mm⁻¹)	Vf (mm/min)
Carbon steel S50C,S55C (C50,C55) Below 250HB	Below5 Dc	0.50	2,300	4,600	0.75	2,300	4,600	0.75	1,800	4,500	0.80	1,400	3,500
	6~8 Dc	0.34	1,100	2,200	0.50	1,100	2,200	0.50	900	2,200	0.50	700	1,700
	9~11Dc	0.24	700	1,400	0.36	700	1,400	0.36	600	1,500	0.36	400	1,000
Mold steel HPM7,NAK80,P20 (1.2311) 30-43 HRC	Below5 Dc	0.50	2,000	4,000	0.75	2,000	4,000	0.75	1,600	4,000	0.80	1,200	3,000
	6~8 Dc	0.34	1,100	2,200	0.50	1,100	2,200	0.50	900	2,200	0.50	700	1,700
	9~11Dc	0.24	700	1,400	0.36	700	1,400	0.36	600	1,500	0.36	400	1,000
Die steel SKD61,SKD11 (1.2344,1.2379) Below 255HB	Below5Dc	0.50	2,000	4,000	0.75	2,000	4,000	0.75	1,600	4,000	0.80	1,200	3,000
	6~8 Dc	0.34	1,100	2,200	0.50	1,100	2,200	0.50	900	2,200	0.50	700	1,700
	9~11Dc	0.24	700	1,400	0.36	700	1,400	0.36	600	1,500	0.36	400	1,000
Hardened die steel SKD61,DAC,DHA (1.2344,1.2379) 40-50HRC	Below5 Dc	0.45	1,500	2,700	0.70	1,500	2,700	0.70	1,200	2,700	0.70	900	2,000
	6~8 Dc	0.30	700	1,200	0.45	700	1,200	0.45	600	1,300	0.45	450	1,000
	9~11Dc	0.20	600	1,100	0.30	600	1,100	0.30	500	1,100	0.30	380	800
Hardened die steel SKD61,DAC,DHA (1.2344,1.2379) 55-60 HRC	Below5Dc	0.40	700	1,100	0.60	700	1,100	0.60	600	1,200	0.60	450	900
	6~8 Dc	0.27	600	900	0.40	600	900	0.40	500	1,000	0.40	380	700
	9~11Dc	0.19	500	800	0.30	500	800	0.30	400	800	0.30	300	600
Grey & Nodular cast iron FC,FCD(GG,GGG) Below 300HB	Below5 Dc	0.55	2,500	5,600	0.80	2,500	5,600	0.80	2,000	5,600	0.90	1,500	4,200
	6~8 Dc	0.37	1,400	3,100	0.55	1,400	3,100	0.55	1,100	3,000	0.55	800	2,200
	9~11Dc	0.26	800	1,700	0.40	800	1,700	0.40	700	1,900	0.40	500	1,400

L:Overhung length, Dc:Tool dia, ap: Depth of cut, n: Spindle speed, Vf: Feed speed

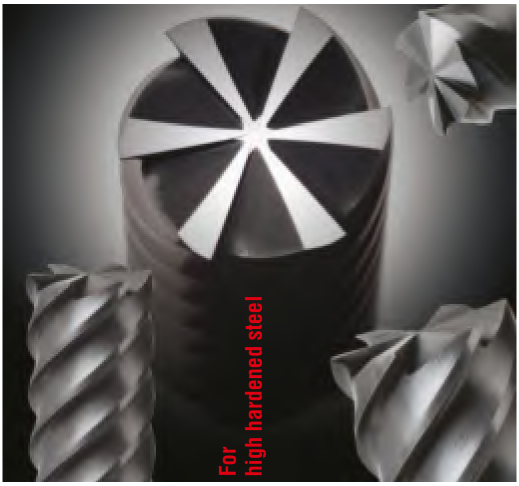
NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurs, reduce depth of cut or spindle speed with keeping feed per tooth.
3) Use air blow to flush the chips out.
4) In case of requring surface roughness, recommend to reduce feed speed.
5) Ramping angle 1°(Max2°30’) is recommended.



“One-Cut70” End Mill

DV-SEHTYPE



One-Cut70
Up to 70HRC

- Adopting high rigid design and special geometry give outstanding high precision and high performance on high hardened materials.
- Achieves to cut smoothly on high hardened materials from semi-finishing to finishing.
- The combination of new developed super micro-graincarbide and “VALUECOATING” achieves longer tool life in high speed machining.

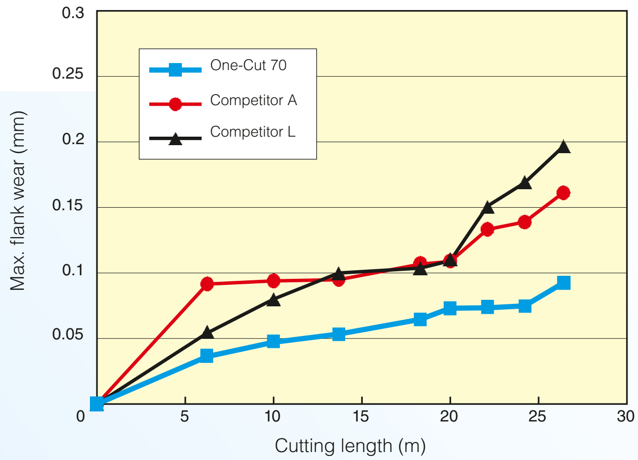
CUTTING PERFORMANCES

PERFORMANCE (Tool life comparison)

Work	Part name	Test piece
	Material	SKD11
	Hardness	60HRC
Tool	Tool No.	DV-SEHH6080
	Grade	Value coating
Cutting conditions	Cutting speed	150 m/min
	Feed rate	0.18 mm/rev
	Depth of cut	10 mm
	Width of cut	0.4 mm
	Coolant	Dry
	Machine	Vertical MC

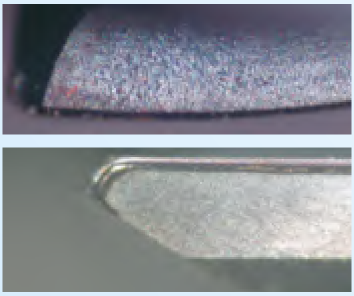
RESULT ($V_B$wear)

Wearing test *“One-Cut 70 VS Competitors“*



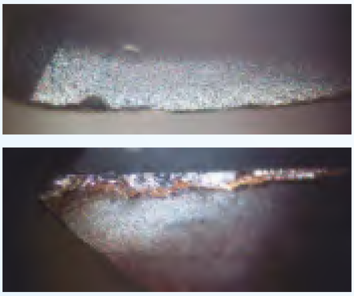
CONDITION OF CUTTING EDGE AFTER MACHINING 26m

One-Cut 70



Competitor A

Competitor L



RESULT: **After machining 26m, One-Cut 70 shows no chipping & less wear than competitor. Excellent result.**

"One-Cut70" End Mill

DV-SEHS DV-SEHH TYPE

- For high hardened materials up to70HRC
- 4,6,8 flutes, Helix angle 50°
- Short & Regular flute length

DV Coating

Shoulder Milling

Sharp Corner

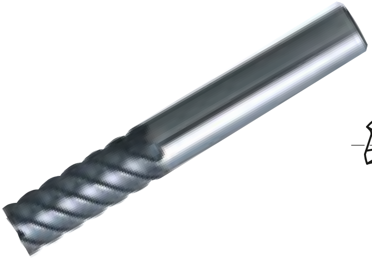
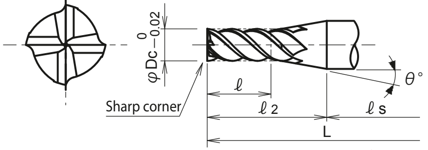
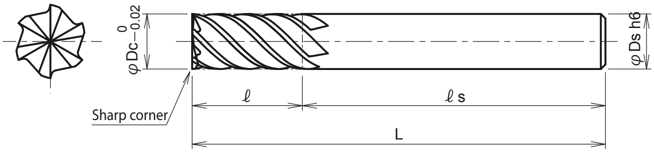


Fig.1 φDc<φD



Note) φDc<3 θ=15°, φDc≧3 θ=10°

Fig.2 φDc≧φD



	Cat. No.	Stock	No. of flutes	Dimensions (mm)						Fig.
				φDc	ℓ	ℓ2	ℓs	L	φDs	
Short	**DV-SEHS4010**	●	4	**1**	2	12	48	60	6	1
	DV-SEHS4015	●	4	**1.5**	3	12	48	60	6	1
	DV-SEHS4020	●	4	**2**	4	12	48	60	6	1
	DV-SEHS4025	●	4	**2.5**	5	12	48	60	6	1
	DV-SEHS4030	●	4	**3**	7	17	43	60	6	1
	DV-SEHS4040	●	4	**4**	9	16	44	60	6	1
	DV-SEHS4050	●	4	**5**	12	16	44	60	6	1
	DV-SEHS6060	●	6	**6**	13	–	47	60	6	2
Regular	**DV-SEHH4010**	●	4	**1**	3.5	13	47	60	6	1
	DV-SEHH4015	●	4	**1.5**	5	14	46	60	6	1
	DV-SEHH4020	●	4	**2**	7	15	45	60	6	1
	DV-SEHH4025	☐	4	**2.5**	8	15	45	60	6	1
	DV-SEHH4030	●	4	**3**	10	20	40	60	6	1
	DV-SEHH4035	●	4	**3.5**	12	20	40	60	6	1
	DV-SEHH4040	●	4	**4**	12	19	41	60	6	1
	DV-SEHH4045	●	4	**4.5**	15	20	40	60	6	1
	DV-SEHH4050	●	4	**5**	15	19	41	60	6	1
	DV-SEHH4055	☐	4	**5.5**	15	18	42	60	6	1
	DV-SEHH6060	●	6	**6**	15	–	45	60	6	2
	DV-SEHH6065	☐	6	**6.5**	20	25	50	75	8	1
	DV-SEHH6070	☐	6	**7**	20	24	51	75	8	1
	DV-SEHH6075	☐	6	**7.5**	20	22	53	75	8	1
	DV-SEHH6080	●	6	**8**	20	–	55	75	8	2
	DV-SEHH6085	☐	6	**8.5**	25	30	50	80	10	1
	DV-SEHH6090	☐	6	**9**	25	29	51	80	10	1
	DV-SEHH6095	☐	6	**9.5**	25	27	53	80	10	1
	DV-SEHH6100	●	6	**10**	25	–	55	80	10	2
	DV-SEHH6105	☐	6	**10.5**	30	35	65	100	12	1
	DV-SEHH6110	☐	6	**11**	30	34	66	100	12	1
	DV-SEHH6115	☐	6	**11.5**	30	32	68	100	12	1
	DV-SEHH6120	●	6	**12**	30	–	70	100	12	2
	DV-SEHH6130	☐	6	**13**	35	45	60	105	16	1
	DV-SEHH6140	●	6	**14**	35	42	63	105	16	1
	DV-SEHH6150	●	6	**15**	40	44	66	110	16	1
	DV-SEHH6160	●	6	**16**	40	–	70	110	16	2
	DV-SEHH6170	☐	6	**17**	40	50	70	120	20	1

Note) Please refer page D057 for recommended cutting conditions.

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

"One-Cut70" End Mill

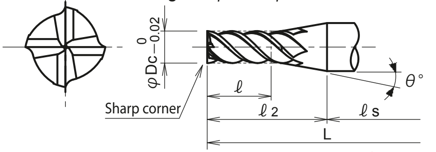
DV-SEHS TYPE
DV-SEHH

Sharp Corner

DV Coating

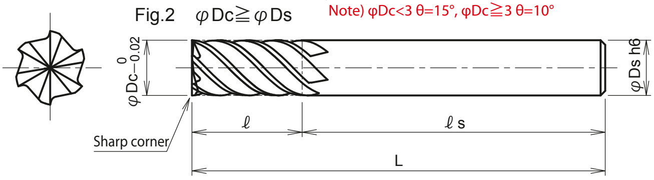
Shoulder Milling

Fig.1 φDc<φD



Note) φDc<3 θ=15°, φDc≧3 θ=10°

Fig.2 φDc≧φDs



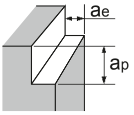
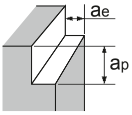
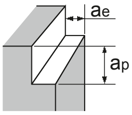
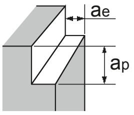
	Cat. No.	Stock	No. of flutes	Dimensions (mm)						Fig.
				φDc	ℓ	ℓ2	ℓs	L	φDs	
Regular	**DV-SEHH6180**	●	6	**18**	40	47	73	120	20	1
	DV-SEHH6190	□	6	**19**	45	49	76	125	20	1
	DV-SEHH6200	●	6	**20**	45	–	80	125	20	2
	DV-SEHH6220	□	6	**22**	45	55	80	135	25	1
	DV-SEHH6240	□	6	**24**	50	54	86	140	25	1
	DV-SEHH8250	□	8	**25**	50	–	90	140	25	2
	DV-SEHH8260	□	8	**26**	50	–	90	140	25	2
	DV-SEHH8280	□	8	**28**	55	–	90	145	25	2
	DV-SEHH8300	□	8	**30**	60	67	98	165	32	1
	DV-SEHH8320	□	8	**32**	70	–	105	175	32	2

Note) Please refer page D057 for recommended cutting conditions.

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

“One-Cut 70” End Mill DV-SEHS/DV-SEHH TYPE

RECOMMENDED CUTTING CONDITIONS FOR DV-SEHS/H

Work Materials	Tool & Die steel・Mold steel SKD, SKH, NAK (1.2344,1.2379,1.2311,P20) Below 45HRC		Hardened die steel SKD, SKT (1.2344,1.2379) 45-55HRC		Hardened die steel SKD, SKH (1.2344,1.2379) 55-65HRC		Hardened die steel SKD, SKH (1.2344,1.2379) 65-70HRC	
Type of Machining	 ap≦1.5Dc ae≦0.05Dc		 ap≦1.5Dc ae≦0.04Dc		 ap≦1.5Dc ae≦0.04Dc (MAX. 0.6mm)		 ap≦1.5Dc ae≦0.02Dc (MAX. 0.4mm)	
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)
1	40,000	700	25,000	410	20,000	320	10,000	130
2	24,000	950	15,000	560	12,000	430	6,400	220
3	24,000	1,300	15,000	800	12,000	600	6,000	250
4	18,000	1,800	12,000	1,100	9,500	800	5,100	300
6	12,000	2,200	8,000	1,400	6,500	1,100	3,500	420
8	10,000	2,200	6,000	1,400	5,000	1,100	2,500	420
10	8,000	2,200	5,000	1,400	4,000	1,100	2,000	420
12	6,500	1,900	4,000	1,200	3,300	900	1,700	350
16	5,000	1,480	3,000	930	2,500	700	1,300	260
20	3,800	1,150	2,300	730	2,000	550	1,000	200
25	3,000	920	1,800	580	1,600	450	800	160
30	2,500	680	1,500	430	1,300	330	700	140
32	2,300	550	1,400	350	1,200	300	650	120

NOTE

1) Above cutting conditions are for general guidance.
2) The cutting parameters to be adjusted according to machining shape, purpose and rigidity of machine and work clamping.
3) Recommend to use down cutting with air blow or mist coolant

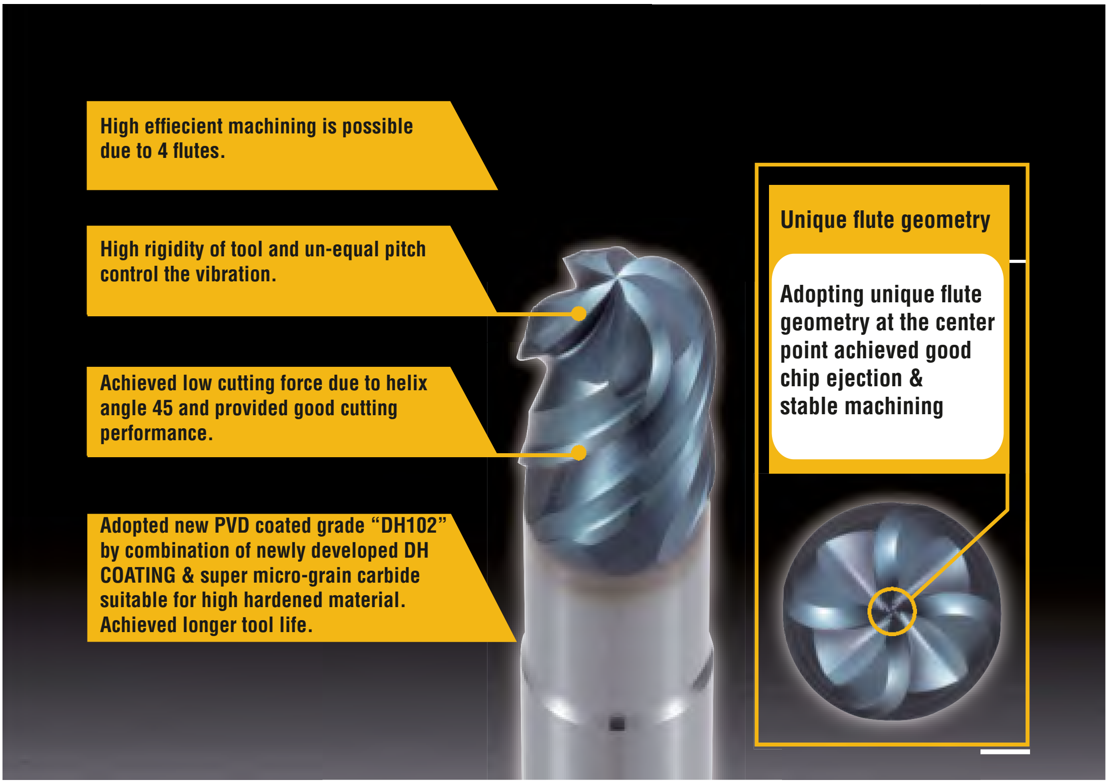
"One-Cut Ball 70" Ball Nose End Mill DH-OCHB TYPE

- 4 flutes solid carbide ball nose
- end mill for high hardened material up to 70HRC.
- From roughing to finishing.

DH Coating | Copy Milling | Slotting | Pocket Milling

One-Cut Ball 70
70HRC

"DH COATING" Solid Carbide Ball Nose End Mill for high hardened material up to 70HRC



High effiecient machining is possible due to 4 flutes.

High rigidity of tool and un-equal pitch control the vibration.

Achieved low cutting force due to helix angle 45 and provided good cutting performance.

Adopted new PVD coated grade "DH102" by combination of newly developed DH COATING & super micro-grain carbide suitable for high hardened material. Achieved longer tool life.

Unique flute geometry

Adopting unique flute geometry at the center point achieved good chip ejection & stable machining

NEWLY DEVELOPED "DH COATING"

DH COATING gives stable and high-performance machining on high hardened materials even with high speed dry condition, due to higher hardness and higher oxidation resistance than existing PVD coating.

Characteristic value of various PVD coatings

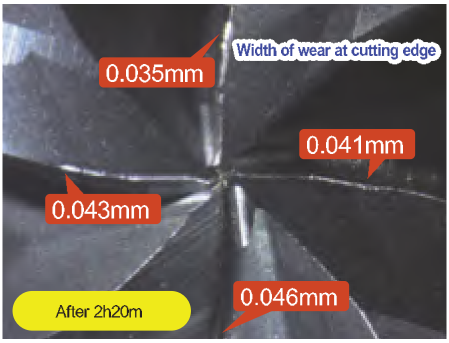
	DH Coat	DV Coat	DZ Coat	DX Coat	JC Coat
Hardness (Hv)	3,500~3,700	3,300~3,500	2,800~2,900	2,500~2,600	2,100~2,200
Oxidation temperature (°C)	1,100~1,200	1,000~1,100	700~800	300~400	400~500
Coefficient of friction	0.5	0.65	0.6	0.45	0.45

"One-Cut Ball 70" Ball Nose End Mill DH-OCHBTYPE

CUTTING PERFORMANCES

1. Tool life test for face milling on 70 HRC

Work: HSS (70HRC)
Tool: DH-OCHB4100(R5)
Spindle speed: n=3,800min^{-1}
Cutting speed: Vc=120m/min
Feed speed: Vf=1,050mm/min
feed per tooth:fz=0.07mm/t
Depth of cut: ap=0.2mm
Pick feed: ae=0.3mm
Coolant: Dry
Machine: Vertival MC

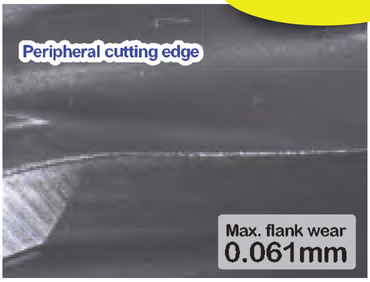


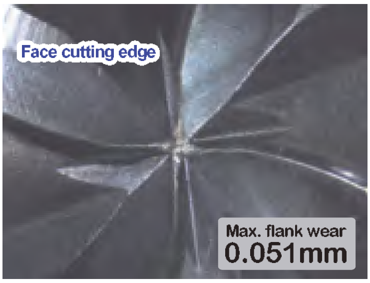
2. High efficient helical milling on high hardened steel

Work: 1.2379 (60HRC)
Tool: DH-OCHB4100(R5)
Spindle speed: n=3,800min^{-1}
Cutting speed: Vc=120m/min
Feed speed: Vf=1,834mm/min
feed: f=0.48mm/rev
Hertical pitch: 0.3mm
Hole size: φ12.6mm
Drilling depth: 6mm(thru.)
Coolant: Air blow
Overhung length: 50mm
Machine: Vertival MC

Compared with current drill for high hardened steel, One-Cut Ball 70 achieved good result:
Reduced machining time (60sec. to 15sec./hole).
No cutting fluid necessary.
Intensive tool management can be possibe because of wide applicable hole range by 1 pc.
Longer tool life (tens to over 180 holes).
No workpiece edge chipping, achieved goog hole accuracy.

Still able to continue!





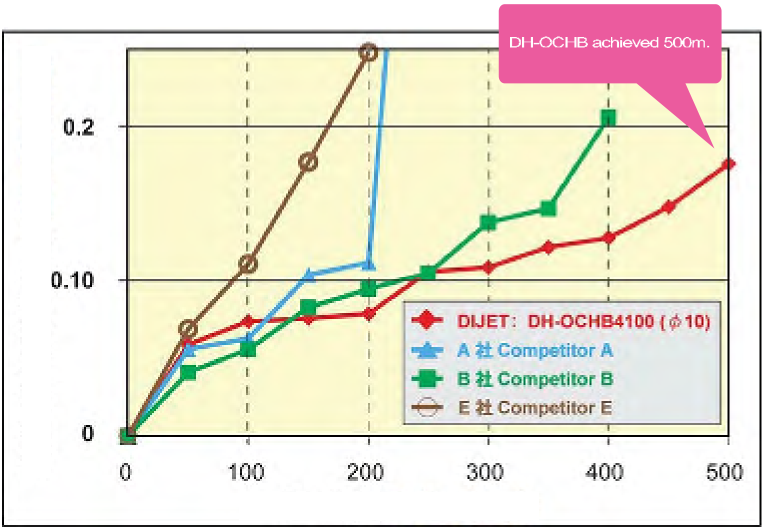
After 180 holes (cutting length: 1.08m)

“One-Cut Ball 70” Ball Nose End Mill DH-OCHBTYPE

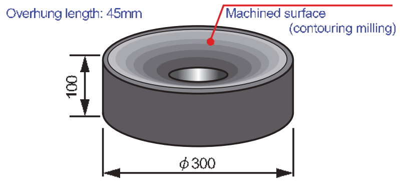
CUTTING PERFORMANCES

3. Toollife comparison on 60 HRC

Spindle speed: n=5,100min^{-1}
Cutting speed: Vc=160m/min
Feed speed: Vf=2,040mm/min
feed:f=0.4mm/rev
Pick feed: ae=0.3mm
Overhung length: 50mm
Coolant: Air blow
Machine: Vertival MC



CUTTING DATA

<table>
<tr><td colspan="2" rowspan="8"> </td><td rowspan="3">Work</td><td>Part name</td><td>Forging die</td></tr>
<tr><td>Material</td><td>1.2379, heat-treated</td></tr>
<tr><td>Hardness</td><td>60HRC</td></tr>
<tr><td rowspan="2">Tool</td><td>Tool No.</td><td>DH-OCHB4080</td></tr>
<tr><td>Grade</td><td>DH-Coated</td></tr>
<tr><td rowspan="6">Cutting conditions</td><td>Vc,(n)</td><td>n=7,000 (min^{-1}), Vc=175 (m/min)</td></tr>
<tr><td>Vf</td><td>5,000 (mm/min)</td></tr>
<tr><td>ap (mm)</td><td>0.1 (mm)</td></tr>
<tr><td rowspan="3">Result</td><td rowspan="3">Improved the efficiency by 1.2 times and tool life by 2 times (9 hours) compared with competitor`s 2 flutes solid carbide ball nose end mill. And DH-OCHB is still able to continue</td><td>ae (mm)</td><td>0.3 (mm)</td></tr>
<tr><td>Coolant</td><td>Wet cut</td></tr>
<tr><td>Machine</td><td>Vertical MC</td></tr>
</table>

“One-Cut Ball 70” Ball Nose End Mill DH-OCHBTYPE

- For high hardened steel up to 70 HRC
- 4 flutes, Helix angle 45°
- DH Coating

DH Coating | Copy Milling | Slotting | Pocket Milling

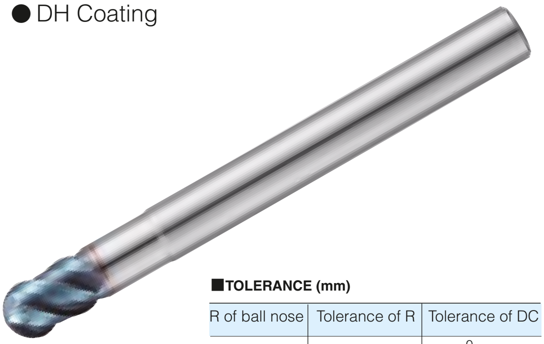


Fig.1 φDc<φDs

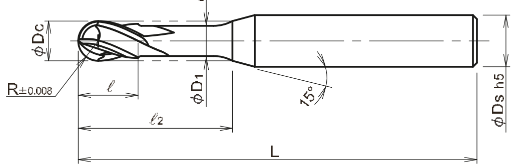
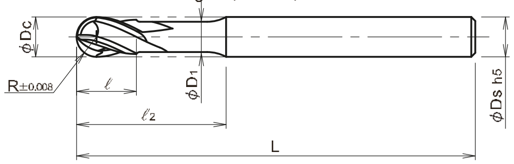


Fig.2 φDc=φDs



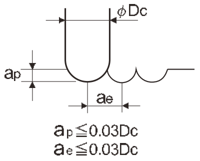
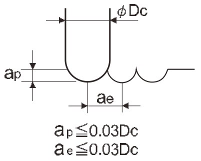
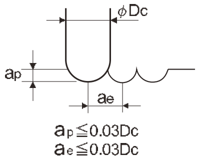
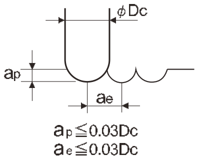
■TOLERANCE (mm)

R of ball nose	Tolerance of R	Tolerance of DC
R1.5~R2	± 0.008	$^{\,0}_{-0.010}$
R2.5~R6	± 0.008	$^{\,0}_{-0.015}$

Cat. No.	Stock	Dimensions (mm)							
		R	φDc	ℓ	ℓ2	L	φD1	φDs	Fig.
DH-OCHB4030	●	**1.5**	**3**	4.5	9	70	2.9	6	1
DH-OCHB4040	●	**2**	**4**	6	12	70	3.8	6	1
DH-OCHB4050	●	**2.5**	**5**	7.5	15	80	4.8	6	1
DH-OCHB4060	●	**3**	**6**	9	18	90	5.7	6	2
DH-OCHB4080	●	**4**	**8**	12	24	100	7.6	8	2
DH-OCHB4100	●	**5**	**10**	15	30	100	9.5	10	2
DH-OCHB4120	●	**6**	**12**	18	36	110	11.4	12	2

■ RECOMMENDED CUTTING CONDITIONS FOR “ONE-CUT BALL 70”

1. For finishing

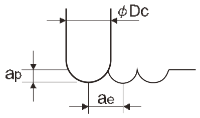
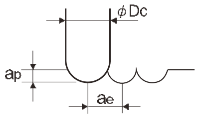
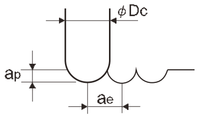
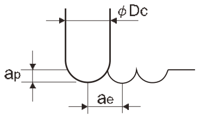
Work Materials		Tool & die steel Mold steel (1.2344, 1.2379, 1.2311, P20,P21) ~45HRC		Hardened steel (1.2344, 1.2379) 45~55HRC		Hardened steel (1.2344, 1.2379) 55~62HRC		Hardened steel (1.2379, HSS) 62~72HRC	
Type of Machining		 $a_p \leqq 0.03Dc$ $a_e \leqq 0.03Dc$		 $a_p \leqq 0.03Dc$ $a_e \leqq 0.03Dc$		 $a_p \leqq 0.03Dc$ $a_e \leqq 0.03Dc$		 $a_p \leqq 0.03Dc$ $a_e \leqq 0.03Dc$	
Tool dia.		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)
R(mm)	φDc(mm)								
1.5	**3**	25,500	4,000	21,200	3,000	17,000	2,000	12,700	1,000
2	**4**	19,100	4,000	15,900	3,000	12,700	2,000	9,500	1,000
2.5	**5**	15,300	4,000	12,700	3,000	10,200	2,000	7,600	1,000
3	**6**	12,700	4,000	10,600	3,000	8,500	2,000	6,400	1,000
4	**8**	9,500	4,000	8,000	3,000	6,400	2,000	4,800	1,000
5	**10**	7,600	4,000	6,400	3,000	5,100	2,000	3,800	1,000
6	**12**	6,400	4,000	5,300	3,000	4,200	2,000	3,200	1,000

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

"One-Cut Ball 70" Ball Nose End Mill DH-OCHB TYPE

RECOMMENDED CUTTING CONDITIONS FOR "ONE-CUT BALL 70"

1. For roughing & semi-finishing

Work Materials		Tool & die steel Mold steel (1.2344, 1.2379, 1.2311, P20,P21) ~45HRC			Hardened steel (1.2344, 1.2379) 45~55HRC			Hardened steel (1.2344, 1.2379) 55~62HRC			Hardened steel (1.2379, HSS) 62~72HRC		
Type of Machining		 $a_p \leqq 1.2Dc$ $a_e \leqq 0.2Dc$ example φDc=3 $a_p=2.2$, $a_e=0.1$ $(a_p \times a_e \leqq 0.22)$			 $a_p \leqq 1.2Dc$ $a_e \leqq 0.2Dc$ example φDc=3 $a_p=2.2$, $a_e=0.1$ $(a_p \times a_e \leqq 0.22)$			 $a_p \leqq 1.2Dc$ $a_e \leqq 0.2Dc$ example φDc=3 $a_p=1.8$, $a_e=0.1$ $(a_p \times a_e \leqq 0.18)$			 $a_p \leqq 1.0Dc$ $a_e \leqq 0.1Dc$ example φDc=3 $a_p=1$, $a_e=0.05$ $(a_p \times a_e \leqq 0.05)$		
Tool dia.		Spindle speed	Feed speed	ap x ae	Spindle speed	Feed speed	ap x ae	Spindle speed	Feed speed	ap x ae	Spindle speed	Feed speed	ap x ae
R(mm)	φDc(mm)	n (min-1)	Vf (mm/min)		n (min-1)	Vf (mm/min)		n (min-1)	Vf (mm/min)		n (min-1)	Vf (mm/min)	
1.5	**3**	19,100	3,000	0.22	15,900	2,250	0.22	12,700	1,500	0.18	9,500	750	0.05
2	**4**	14,300	3,000	0.38	11,900	2,250	0.38	9,500	1,500	0.32	7,200	750	0.10
2.5	**5**	11,500	3,000	0.60	9,500	2,250	0.60	7,600	1,500	0.50	5,700	750	0.15
3	**6**	9,500	3,000	0.86	8,000	2,250	0.86	6,400	1,500	0.72	4,800	750	0.22
4	**8**	7,200	3,000	1.54	6,000	2,250	1.54	4,800	1,500	1.28	3,600	750	0.38
5	**10**	5,700	3,000	2.40	4,800	2,250	2.40	3,800	1,500	2.00	2,900	750	0.60
6	**12**	4,800	3,000	3.46	4,000	2,250	3.46	3,200	1,500	2.88	2,400	750	0.86

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

● Attention for helical milling

1) Recommended ramping angle is under 1°(up to 3°).
2) In case of ramping angle under 1°, apply the above table. But, in case of ramping angle over 1°, recommend to reduce Feed speed according to actual machining condition.

“One-Cut Hard” Ball Nose End Mill DV-OCSB-TYPE

DV Coating

One-Cut Ball Hard

- Adopting high rigid design and unique chip pocket gives outstanding high precision and high performance on high hardened materials for die and mold making.
- Achieves to cut smoothly on high hardened materials from semi-roughing to super-finishing.
- The combination of new developed super micro-grain carbide and “VALUE COATING” achieves longer tool life in high speed machining.

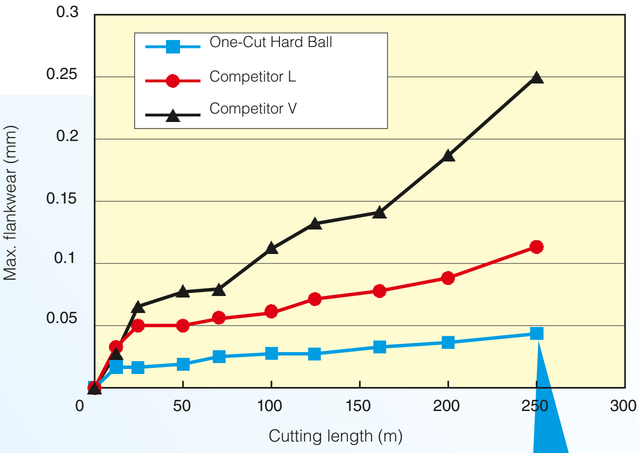
CUTTING PERFORMANCES

PERFORMANCE (Tool life comparison)

Work Material	Wave shaped test piece (SKD11,1.2379,D2)
Hardness	60HRC
Tool	DV-OCSB2100 Value coating
Cutting conditions	Cutting speed : 200m min Feedrate : 0.24mm/ rev Depth of cut : 0.1mm Pick feed : 0.2mm Coolant : Dry Machine : Vertical MC

RESULT (VB wear)

Wearing test “One-Cut Ball Hard VS Competitors“



RESULT: **Exellent surface roughness. After machining 250m, maximum flank wear was below 0.05mm. Still able to continue.**

"One-Cut Hard" Ball Nose End Mill

DV-OCSB TYPE

- 2flutes, Helix angle 30°
- Flute length 1.5Dc

DV Coating

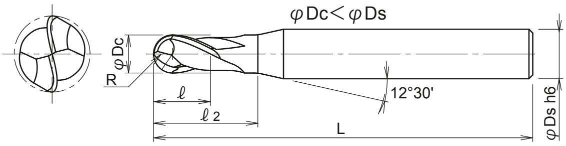
Copy Milling

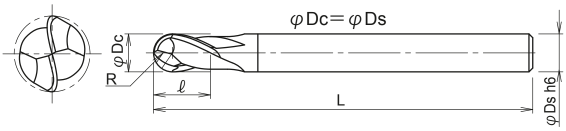
Slotting

Pocket Milling

■TOLERANCE (mm)

Radius of ball nose R	Tolerance of R	Tolerance of φDc
0.5~1.25	±0.005	0 −0.01
1.5~6	±0.005	0 −0.02
8~12.5	±0.01	0 −0.02





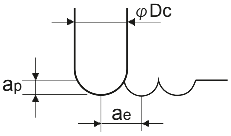
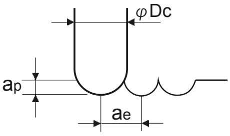
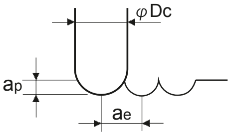
Cat. No.	Stock	Dimensions (mm)					
		R	φDc	ℓ	ℓ2	L	φDs
DV-OCSB2010	●	0.5	**1**	1.5	3	50	4
DV-OCSB2010-2.5T	□	0.5	**1**	2.5	4.5	50	4
DV-OCSB2012	□	0.6	**1.2**	1.8	3.5	50	4
DV-OCSB2014	□	0.7	**1.4**	2.1	4	50	4
DV-OCSB2015	●	0.75	**1.5**	2.25	4.5	50	4
DV-OCSB2016	□	0.8	**1.6**	2.4	4.5	50	4
DV-OCSB2018	□	0.9	**1.8**	2.7	5	50	4
DV-OCSB2020	●	1	**2**	3	5.5	50	6
DV-OCSB2020-5T	●	1	**2**	5	7	50	6
DV-OCSB2025	●	1.25	**2.5**	3.75	6.5	50	6
DV-OCSB2030	●	1.5	**3**	4.5	8	60	6
DV-OCSB2030-8T	●	1.5	**3**	8	10	60	6
DV-OCSB2035	□	1.75	**3.5**	5.25	9.5	60	6
DV-OCSB2040S4	●	2	**4**	6	–	70	4
DV-OCSB2040	●	2	**4**	6	10.5	70	6
DV-OCSB2040-8T	●	2	**4**	8	10.5	70	6
DV-OCSB2050	●	2.5	**5**	7.5	12.5	80	6
DV-OCSB2050-10T	●	2.5	**5**	10	12.5	80	6
DV-OCSB2060	●	3	**6**	9	–	90	6
DV-OCSB2060-12T	●	3	**6**	12	–	90	6
DV-OCSB2060-L120	●	3	**6**	9	–	120	6
DV-OCSB2080	●	4	**8**	12	–	100	8
DV-OCSB2080-14T	●	4	**8**	14	–	100	8
DV-OCSB2080-L120	●	4	**8**	12	–	120	8
DV-OCSB2100	●	5	**10**	15	–	100	10
DV-OCSB2100-18T	●	5	**10**	18	–	100	10
DV-OCSB2100-L140	●	5	**10**	15	–	140	10
DV-OCSB2120	●	6	**12**	18	–	110	12
DV-OCSB2120-22T	●	6	**12**	22	–	110	12
DV-OCSB2120-L140	●	6	**12**	18	–	140	12
DV-OCSB2160-30T-L140	●	8	**16**	30	–	140	16
DV-OCSB2160-L140	□	8	**16**	24	–	140	16
DV-OCSB2160	●	8	**16**	24	–	160	16
DV-OCSB2160-L180	□	8	**16**	24	–	180	16
DV-OCSB2200-L140	□	10	**20**	30	–	140	20
DV-OCSB2200-L160	□	10	**20**	30	–	160	20
DV-OCSB2200	□	10	**20**	30	–	180	20
DV-OCSB2250	□	12.5	**25**	38	–	180	25

Note) Please refer page D065 for recommended cutting conditions.

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

“One-Cut Hard” Ball Nose End Mill DV-OCSB TYPE

RECOMMENDED CUTTING CONDITIONS FOR DV-OCSB TYPE

Work Materials		Tool & Die steel・Mold steel SKD, SKH, NAK Below 45HRC		Tool & Die steel・Mold steel SKD, SKT 45~50HRC		Tool & Die steel・Mold steel SKD, SKT 45~65HRC	
Type of Machining		 $a_p \leqq 0.1Dc$ $a_e \leqq 0.3Dc$		 $a_p \leqq 0.05Dc$ (MAX 0.5mm) $a_e \leqq 0.1Dc$		 $a_p \leqq 0.03Dc$ (MAX 0.3mm) $a_e \leqq 0.05Dc$	
Tool dia.		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)
R (mm)	φDc (mm)						
0.5	**1**	32,000	1,600	25,000	1,300	22,000	1,100
1	**2**	28,000	1,700	22,000	1,400	20,000	1,200
1.5	**3**	24,000	1,800	21,000	1,500	18,000	1,300
2	**4**	20,000	2,000	18,000	1,600	14,000	1,400
3	**6**	16,000	2,200	13,000	1,800	10,000	1,500
4	**8**	12,000	2,300	10,000	2,000	8,000	1,500
5	**10**	10,000	2,200	8,000	1,800	6,000	1,400
6	**12**	8,000	2,000	6,500	1,700	5,000	1,200
8	**16**	6,000	1,800	5,000	1,500	4,000	1,000
10	**20**	5,000	1,500	4,000	1,200	3,000	800
12.5	**25**	4,000	1,200	4,000	1,000	2,000	600

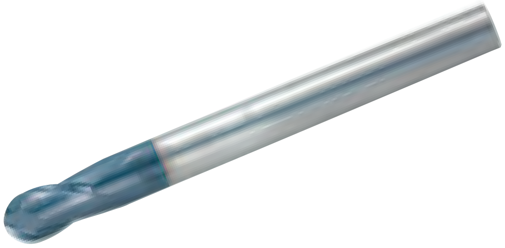
NOTE

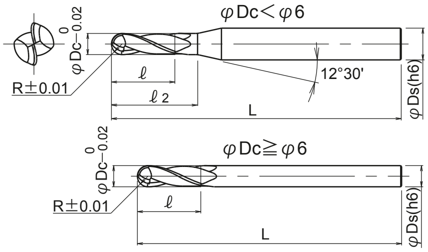
1) The above cutting conditions are for general guidance.
2) The cutting parameters to be adjusted according to machining shape, purpose and rigidity of machine and work clamping.

“One-Cut 03” Ball Nose End Mill DZ03-OCSB TYPE

- 2 flutes, Helix angle 30°
- Flute length 1.5Dc

DZ TiAlN | Copy Milling | Slotting | Pocket Milling





Cat. No.	Stock	Dimensions (mm)					
		R	φDc	ℓ	ℓ2	L	φDs
DZ03-OCSB2010	●	0.5	**1**	1.5	3	50	4
DZ03-OCSB2012	☐	0.6	**1.2**	1.8	3.5	50	4
DZ03-OCSB2014	☐	0.7	**1.4**	2.1	4	50	4
DZ03-OCSB2015	●	0.75	**1.5**	2.25	4.5	50	4
DZ03-OCSB2016	☐	0.8	**1.6**	2.4	4.5	50	4
DZ03-OCSB2018	☐	0.9	**1.8**	2.7	5	50	4
DZ03-OCSB2020	●	1	**2**	3	5.5	50	6
DZ03-OCSB2025	●	1.25	**2.5**	3.75	6.5	50	6
DZ03-OCSB2030	●	1.5	**3**	4.5	8	60	6
DZ03-OCSB2035	☐	1.75	**3.5**	5.25	9.5	60	6
DZ03-OCSB2040S4	●	2	**4**	6	–	70	4
DZ03-OCSB2040	●	2	**4**	6	10.5	70	6
DZ03-OCSB2050	●	2.5	**5**	7.5	12.5	80	6
DZ03-OCSB2060	●	3	**6**	9	–	90	6
DZ03-OCSB2060-L120	●	3	**6**	9	–	120	6
DZ03-OCSB2080	●	4	**8**	12	–	100	8
DZ03-OCSB2080-L120	●	4	**8**	12	–	120	8
DZ03-OCSB2100	●	5	**10**	15	–	100	10
DZ03-OCSB2100-L140	●	5	**10**	15	–	140	10
DZ03-OCSB2120	●	6	**12**	18	–	110	12
DZ03-OCSB2120-L140	☐	6	**12**	18	–	140	12
DZ03-OCSB2160-L140	☐	8	**16**	24	–	140	16
DZ03-OCSB2160	●	8	**16**	24	–	160	16
DZ03-OCSB2160-L180	☐	8	**16**	24	–	180	16
DZ03-OCSB2200-L140	☐	10	**20**	30	–	140	20
DZ03-OCSB2200-L160	☐	10	**20**	30	–	160	20
DZ03-OCSB2200	☐	10	**20**	30	–	180	20
DZ03-OCSB2250	☐	12.5	**25**	38	–	180	25

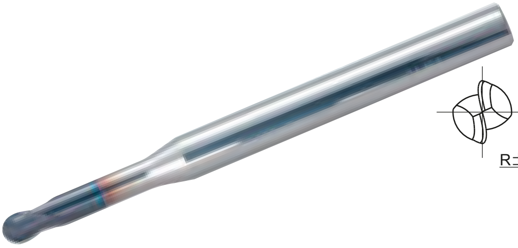
Note) Please refer page D068 for recommended cutting conditions.

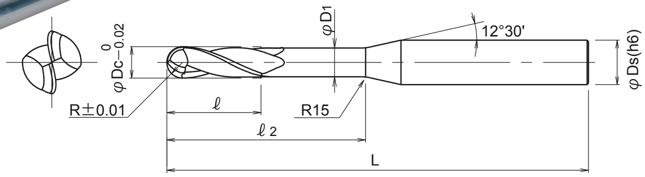
●: Standard stock items ☐: Stock in Japan ○: Soon to be deleted

“One-Cut 03” Ball Nose End Mill DZ03-OCSB-LNTYPE

- 2 flutes, Helix angle 30°
- Flute length 1Dc
- Long neck type

DZ
TiAlN
Copy Milling
Slotting
Pocket Milling





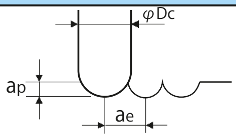
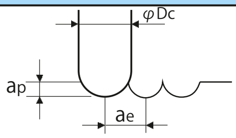
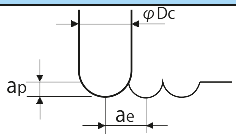
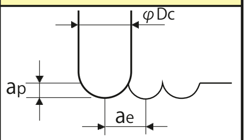
Cat. No.	Stock	Dimensions (mm)						
		R	φDc	ℓ	ℓ2	L	φD1	φDs
DZ03-OCSB2010-6LN	●	0.5	**1**	1	6	60	0.95	4
DZ03-OCSB2010-11LN	●	0.5	**1**	1	11	60	0.95	4
DZ03-OCSB2010-17LN	●	0.5	**1**	1	17	60	0.95	4
DZ03-OCSB2010-21LN	●	0.5	**1**	1	21	60	0.95	4
DZ03-OCSB2015-6LN	☐	0.75	**1.5**	1.5	6	60	1.45	4
DZ03-OCSB2015-11LN	☐	0.75	**1.5**	1.5	11	60	1.45	4
DZ03-OCSB2015-17LN	☐	0.75	**1.5**	1.5	17	60	1.45	4
DZ03-OCSB2015-21LN	☐	0.75	**1.5**	1.5	21	60	1.45	4
DZ03-OCSB2020S4-6LN	☐	1	**2**	2	6	60	1.95	4
DZ03-OCSB2020S4-9LN	●	1	**2**	2	9	60	1.95	4
DZ03-OCSB2020-9LN	●	1	**2**	2	9	60	1.95	6
DZ03-OCSB2020S4-11LN	●	1	**2**	2	11	60	1.95	4
DZ03-OCSB2020-11LN	●	1	**2**	2	11	60	1.95	6
DZ03-OCSB2020S4-17LN	●	1	**2**	2	17	60	1.95	4
DZ03-OCSB2020-17LN	●	1	**2**	2	17	60	1.95	6
DZ03-OCSB2020S4-21LN	●	1	**2**	2	21	60	1.95	4
DZ03-OCSB2020-21LN	●	1	**2**	2	21	60	1.95	6
DZ03-OCSB2025S4-11LN	☐	1.25	**2.5**	2.5	11	60	2.45	4
DZ03-OCSB2025S4-17LN	●	1.25	**2.5**	2.5	17	60	2.45	4
DZ03-OCSB2025S4-21LN	●	1.25	**2.5**	2.5	21	60	2.45	4
DZ03-OCSB2030-9LN	●	1.5	**3**	3	9	60	2.95	6
DZ03-OCSB2030-17LN	●	1.5	**3**	3	17	60	2.95	6
DZ03-OCSB2030-21LN	●	1.5	**3**	3	21	60	2.95	6
DZ03-OCSB2040-13LN	●	2	**4**	4	13	70	3.95	6
DZ03-OCSB2040-17LN	●	2	**4**	4	17	70	3.95	6
DZ03-OCSB2040-21LN	●	2	**4**	4	21	70	3.95	6

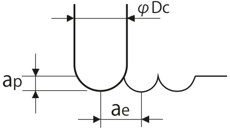
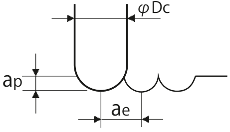
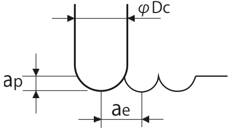
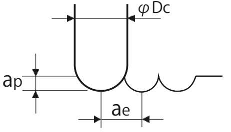
Note) Please refer page D068 for recommended cutting conditions.

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

“One-Cut 03” Ball Nose End Mill DZ03-OCSB/ DZ03-OCSB-LN TYPE

RECOMMENDED CUTTING CONDITIONS FOR DZ03-OCSB/DZ03-OCSB-LN/ TYPE

Work Materials		Carbon steel S55C 180~280HB		Tool & Die steel SKD, SNCM Below 300HB		Mold steel NAK55, NAK80 35~45HRC		Stainless steel SUS420J2 Below 270HB	
Type of Machining		 ap≦0.3Dc ae≦0.5Dc		 ap≦0.3Dc ae≦0.5Dc		 ap≦0.3Dc ae≦0.5Dc		 ap≦0.3Dc ae≦0.5Dc	
Tool dia.		Spindle speed	Feed speed	Spindle speed	Feed speed	Spindle speed	Feed speed	Spindl speed	Feed speed
R (mm)	φDc (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
0.5	**1**	50,000	2,500	45,000	2,200	38,000	1,900	38,000	1,900
1	**2**	25,000	2,000	22,000	1,700	19,000	1,500	19,000	1,500
1.5	**3**	17,000	1,700	15,000	1,500	12,700	1,270	12,700	1,270
2	**4**	12,700	1,600	11,000	1,100	9,500	950	9,500	950
3	**6**	8,500	1,600	7,400	900	6,400	800	6,400	800
4	**8**	6,400	1,600	5,600	900	4,800	670	4,800	800
5	**10**	5,000	1,500	4,500	900	3,800	650	3,800	750
6	**12**	4,200	1,400	3,700	850	3,200	640	3,200	750
8	**16**	3,200	1,300	2,800	840	2,400	620	2,400	700
10	**20**	2,500	1,250	2,200	800	1,900	600	1,900	700
12.5	**25**	2,000	1,200	1,800	800	1,500	600	1,500	650

Work Materials		Hardened die steel SKD, SKT 45~52HRC		Hardened die steel SKD, SKT 55~60HRC		Grey cast iron FC250 Tensile strength 350 N/mm^2		Nodular cast iron FCD450, FCD550 Tensile strength below 550N/mm^2	
Type of Machining		 ap≦0.3Dc ae≦0.5Dc		 ap≦0.3Dc ae≦0.5Dc		 ap≦0.3Dc ae≦0.5Dc		 ap≦0.3Dc ae≦0.5Dc	
Tool dia.		Spindle speed	Feed speed	Spindle speed	Feed speed	Spindle speed	Feed speed	Spindl speed	Feed speed
R (mm)	φDc (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
0.5	**1**	31,000	1,200	25,000	750	60,000	4,800	54,000	4,300
1	**2**	16,000	950	12,000	600	40,000	4,800	27,000	3,200
1.5	**3**	10,000	600	8,500	430	26,000	4,100	18,000	2,700
2	**4**	8,000	500	6,300	320	20,000	3,400	13,000	2,000
3	**6**	5,300	370	4,200	250	13,000	2,500	9,000	1,700
4	**8**	4,000	320	3,200	250	9,900	2,500	6,700	1,700
5	**10**	3,200	320	2,500	220	8,000	2,400	5,400	1,600
6	**12**	2,700	300	2,100	210	6,600	2,200	4,500	1,500
8	**16**	2,000	260	1,600	200	5,000	2,100	3,400	1,400
10	**20**	1,600	260	1,200	200	4,000	2,000	2,700	1,300
12.5	**25**	1,300	270	1,000	200	3,200	1,900	2,100	1,300

NOTE

The cutting parameters to be adjusted according to machine rigidity or work rigidity.

Tooling by DIJET®

Drills

TA-EZ Drill TEZD-MS/ML TYPE

Easy assembly and high cutting performances

Coolant Hole | DV Coating | Drilling

G-Body

Ecology EZ cutting edge geometry reduce power consumption by 30%.

Economy High rigid G-Body achiees longer tool life of holder and insert.

High performance Unique cooling system achieve surely coolant supply to cutting edge.

CUTTING PERFORMCANCES

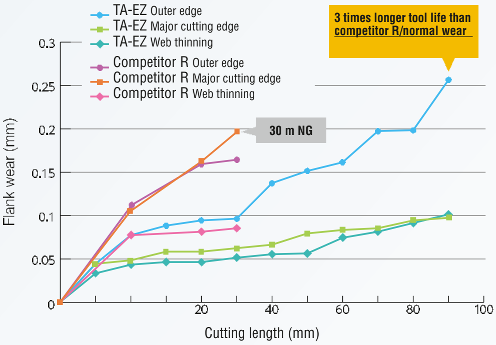
Tool life comparison

Toolno.: TEZD1900S25-ML (5XDc), TEZ 1930 (φ19.3 mm)
Competitor R: φ19 mm
Material: S25C (C25)
Machine: Vertical MC (BT50)
Coolant: Water soluble (Internal)
Cuttingcondition: Vc=75 m/min, f=0.35 mm/rev, H=95 mm (Through hole)

Competitor R

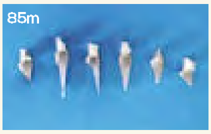
● Shape o fchips

Uncontrolled long chips came out at machining 25 m and impossible to continue at machining 30m because chips tangle in holder.



TEZD type

● Shape of chips



Compelely breaking chips

● Quality of holes

Good surface finish

● Power consumption

TA-EZ Drill

TEZD TYPE

Instructions for mounting insert

1. Clean

Clean the insert pocket (Slit part) by air blow or brush.

2. Mounting insert

Tighten two clamp screws temporary with pressing the top ofinsert (refer below photo). After conform-ing there is no gap between insert and insert pocket, thighten the clamp screws completely. (refer page E019-E022 for the recommended torque for the clamp screw).Recommend to apply "MOLY" to the clamp screw in advance.

Anti-seizure paste
"MOLY"

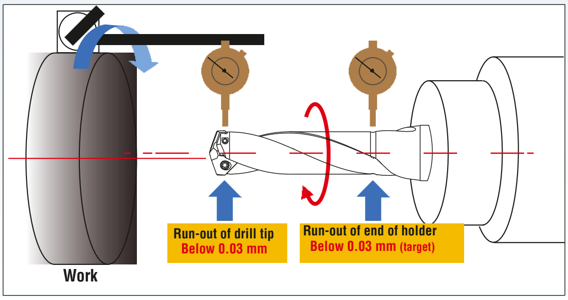
⚠ Attention

Clamp screw is expendable, so please change the clamp screw when ever you change the insert 10 times.But in case, there is the deformation of clamp screw, change it immediately.

Clamp screw

Instructions for using at NC lathe

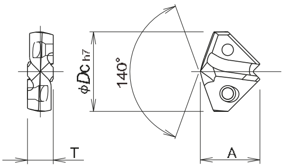
1. Adjust run-out of drill tip below 0.03 mm (off set of center below 0.015 mm) and run-out of end of holder below 0.03 mm (target)
2. Due to large thrust cutting force,set a backup plate at bottom end of holder.
3. Reduce spindle speed and feed speed by 20% on recommended cutting conditions. (PageE024). In case of long chips come out, recommend to increase feed rate only.



TA-EZ Drill TEZD-MS/MLTYPE

G-Body **Through Coolant Hole**

- Drilling depth: 3 x Dc/5 x Dc



- MS type: 3 x Dc

- ML type: 5 x Dc

Insert

Body

Drill dia. (mm)	Insert				Body								
	Insert No.	PVD coated	Dimensions (mm)		Applicable dia.		MS type (3D)						
							Tool no.	Stock	Dimensions (mm)				
φDc		JC8050	A	T	Over	Under			ℓ	ℓ2	ℓs	L	φDs
14	TEZ1400	●	11.4	4.5	13.5	14.5	TEZD1400S16-MS	●	51	65	48	113	16
14.1	TEZ1410	●											
14.2	TEZ1420	●											
14.3	TEZ1430	☐											
14.4	TEZ1440	☐											
14.5	TEZ1450	●											
14.6	TEZ1460	☐	11.5	4.8	14.5	15.5	TEZD1500S20-MS	●	54	69	50	119	20
14.7	TEZ1470	☐											
14.8	TEZ1480	☐											
14.9	TEZ1490	☐											
15	TEZ1500	●											
15.1	TEZ1510	●											
15.2	TEZ1520	●											
15.3	TEZ1530	☐											
15.4	TEZ1540	☐											
15.5	TEZ1550	●											
15.6	TEZ1560	☐	12.4	5.0	15.5	16.5	TEZD1600S20-MS	●	58	74	50	124	20
15.7	TEZ1570	☐											
15.8	TEZ1580	●											
15.9	TEZ1590	☐											
16	TEZ1600	●											
16.1	TEZ1610	☐											
16.2	TEZ1620	●											
16.3	TEZ1630	●											
16.4	TEZ1640	☐											
16.5	TEZ1650	●											
16.6	TEZ1660	☐	13.2	5.5	16.5	17.5	TEZD1700S20-MS	●	61	78	50	128	20
16.7	TEZ1670	☐											
16.8	TEZ1680	☐											
16.9	TEZ1690	☐											
17	TEZ1700	●											
17.1	TEZ1710	☐											
17.2	TEZ1720	☐											
17.3	TEZ1730	☐											
17.4	TEZ1740	☐											
17.5	TEZ1750	●											
17.6	TEZ1760	☐	13.5	5.8	17.5	18.5	TEZD1800S20-MS	●	65	83	50	133	20
17.7	TEZ1770	☐											
17.8	TEZ1780	●											
17.9	TEZ1790	☐											
18	TEZ1800	●											
18.1	TEZ1810	●											
18.2	TEZ1820	☐											
18.3	TEZ1830	☐											
18.4	TEZ1840	☐											
18.5	TEZ1850	●											

1 insert per case

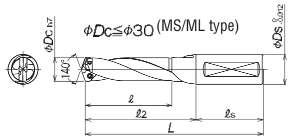
NOTE

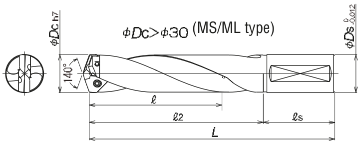
1) All bodies are supplied without insert.
2) Please contact with our salesdepartment for make to order items.
3) Please refer page E008 for recommended cutting conditions.
4) Please refer page E003 for “Instructions for mounting insert”.

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

TA-EZ Drill

TEZD-MS/ML TYPE





ECO PRODUCT ★★★

Drilling

Clamp screw	Recommended torque (Nm)
DSW-2045H	0.9
TSW-2556H	1.2
TSW-2567H	1.2
DSW-307H	2.0
DSW-309H	2.0
TSW-3510H	3.0
TSW-3512H	3.0

Insert

Parts

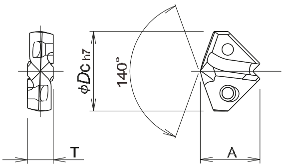
Body							Parts	
ML type (5D)							Clamp screw	Wrench
Toolno.	Stock	Dimensions (mm)						
		ℓ	ℓ2	ℓs	L	φDs		
TEZD1400S16-ML	●	80	97	48	145	16	DSW-2045H	A-07
TEZD1500S20-ML	●	85	103	50	153	20	DSW-2045H	A-07
TEZD1600S20-ML	●	91	110	50	160	20	TSW-2556H	A-08
TEZD1700S20-ML	●	96	117	50	167	20	TSW-2556H	A-08
TEZD1800S20-ML	●	102	123	50	173	20	TSW-2556H	A-08

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

TA-EZ Drill TEZD-MS/MLTYPE

G-Body **Through Coolant Hole**

- Drilling depth: 3 x Dc/5 x Dc



- MS type: 3 x Dc

- ML type: 5 x Dc

■ Insert

■ Body

Drill dia. (mm)	Insert	Insert	Insert	Insert		Body	Body	Body	Body	Body	Body	Body	Body
	Insert No.	PVD coated	Dimensions (mm)		Applicable dia.		MS type (3D)						
							Toolno.	Stock	Dimensions (mm)				
φDc		JC8050	A	T	Over	Under			ℓ	ℓ2	ℓs	L	φDs
18.6	TEZ1860	☐	14.2	6.0	18.5	19.5	TEZD1900S25-MS	●	68	87	56	143	25
18.7	TEZ1870	☐											
18.8	TEZ1880	☐											
18.9	TEZ1890	☐											
19	TEZ1900	●											
19.1	TEZ1910	☐											
19.2	TEZ1920	☐											
19.3	TEZ1930	●											
19.	TEZ1940	☐											
19.5	TEZ1950	●											
19.6	TEZ1960	☐	15.1	6.5	19.5	20.5	TEZD2000S25-MS	●	72	92	56	148	25
19.7	TEZ1970	☐											
19.8	TEZ1980	●											
19.9	TEZ1990	☐											
20	TEZ2000	●											
20.5	TEZ2050	●											
21	TEZ2100	●	15.7	6.7	20.5	21.5	TEZD2100S25-MS	●	75	96	56	152	25
21.5	TEZ2150	●											
22	TEZ2200	●	16.6	7.5	21.5	22.5	TEZD2200S25-MS	●	79	101	6 5	157	25
22.5	TEZ2250	●											
23	TEZ2300	●	17.4	7.5	22.5	23.5	TEZD2300S25-MS	●	82	105	56	161	25
23.5	TEZ2350	●											
24	TEZ2400	●	18.2	8.0	23.5	24.5	TEZD2400S32-MS	●	86	110	60	170	32
24.5	TEZ2450	●											
25	TEZ2500	●	19.1	8.0	24.5	25.5	TEZD2500S32-MS	●	89	114	60	174	32
25.5	TEZ2550	●											
26	TEZ2600	●	19.7	8.5	25.5	26.5	TEZD2600S32-MS	●	93	119	60	179	32
26.5	TEZ2650	●											
27	TEZ2700	●	20.4	8.5	26.5	27.5	TEZD2700S32-MS	●	96	123	60	183	32
27.5	TEZ2750	●											
28	TEZ2800	●	21.2	9.0	27.5	28.5	TEZD2800S32-MS	●	100	128	60	188	32
28.5	TEZ2850	●											
29	TEZ2900	●	22.1	9.0	28.5	29.5	TEZD2900S32-MS	●	103	132	60	192	32
29.5	TEZ2950	●											
30	TEZ3000	●	22.5	9.5	29.5	30.5	TEZD3000S32-MS	●	107	137	60	197	32
30.5	TEZ3050	●											
31	TEZ3100	●	23.4	10.0	30.5	31.5	TEZD3100S32-MS	●	110	141	60	201	32
31.5	TEZ3150	●											
32	TEZ3200	●	24.3	10.0	31.5	32.5	TEZD3200S32-MS	●	114	146	60	206	32

1 insert per case

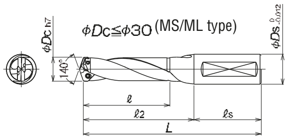
■ NOTE

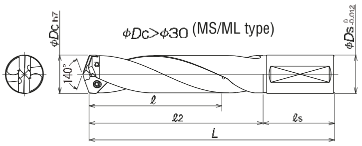
1) All bodies are supplied without insert.
2) Please contact with our salesdepartment for make to order items.
3) Please refer page E008 for recommended cutting conditions.
4) Please refer page E003 “Instructions for mounting insert”.

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

TA-EZ Drill

TEZD-MS/ML TYPE





Clamp screw	Recommended torque (Nm)
DSW-2045H	0.9
TSW-2556H	1.2
TSW-2567H	1.2
DSW-307H	2.0
DSW-309H	2.0
TSW-3510H	3.0
TSW-3512H	3.0

Insert

Parts

Body							Parts	
ML type (5D)							Clamp screw	Wrench
Toolno.	Stock	Dimensions (mm)						
		ℓ	ℓ2	ℓs	L	ϕDs		
TEZD1900S25-ML	●	107	130	56	186	25	TSW-2567H	A-08
TEZD2000S25-ML	●	113	137	56	193	25	TSW-2567H	A-08
TEZD2100S25-ML	●	118	143	56	199	25	TSW-2567H	A-08
TEZD2200S25-ML	●	124	150	56	206	25	DSW-307H	A-10
TEZD2300S25-ML	●	129	157	56	213	25	DSW-307H	A-10
TEZD2400S32-ML	●	135	164	60	224	32	DSW-307H	A-10
TEZD2500S32-ML	●	140	170	60	230	32	DSW-309H	A-10
TEZD2600S32-ML	●	146	177	60	237	32	DSW-309H	A-10
TEZD2700S32-ML	●	151	184	60	244	32	DSW-309H	A-10
TEZD2800S32-ML	●	157	190	60	250	32	TSW-3510H	A-15
TEZD2900S32-ML	●	162	197	60	257	32	TSW-3510H	A-15
TEZD3000S32-ML	●	168	204	60	264	32	TSW-3510H	A-15
TEZD3100S32-ML	●	173	210	60	270	32	TSW-3512H	A-15
TEZD3200S32-ML	●	179	217	60	277	32	TSW-3512H	A-15

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

TA-EZ Drill

TEZD TYPE

RECOMMENDED CUTTING CONDITIONS

● TEZD-MS/ML type

Work Materials	Structural steel Carbon steel SS400, S50C (C50) Below 280HB		Alloy steel SCM440 (1.7223) 280 350HB		Stainless steel SUS304 Below 280HB		Grey cast iron FC250 (GG25) Tensile strength Below 350MPa		Nodular cast iron FCD400 (GGG40) Tensile strength Below 450MPa	
Drill dia.	Spindle speed	Feed speed	Spindle speed	Feed speed	Spindle speed	Feed speed	Spindle speed	Feed speed	Spindle speed	Feed speed
φDc (mm)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)	n (min^{-1})	V_f (mm/min)
14	1,700	510	1,600	350	1,000	250	1,900	570	1,500	450
15	1,600	480	1,500	350	950	240	1,900	570	1,400	420
16	1,500	450	1,400	340	890	220	1,900	570	1,350	400
17	1,400	450	1,300	330	840	210	1,800	570	1,250	400
18	1,300	450	1,250	310	790	200	1,700	570	1,000	350
19	1,250	440	1,200	300	750	190	1,600	560	1,000	350
20	1,200	420	1,100	280	710	180	1,600	560	1,000	350
21	1,200	420	1,100	280	680	170	1,550	540	1,000	350
22	1,200	420	1,050	260	650	160	1,500	530	1,000	350
23	1,200	420	1,050	260	620	155	1,450	510	1,000	350
24	1,200	420	1,050	260	600	150	1,400	490	1,000	350
25	1,150	400	1,050	260	570	140	1,350	470	1,000	350
26	1,110	390	1,050	260	550	140	1,300	460	1,000	330
27	1,070	370	1,000	250	530	135	1,250	460	950	330
28	1,030	360	1,000	250	510	130	1,200	460	950	330
29	990	350	950	240	495	125	1,150	460	950	330
30	960	340	950	240	480	120	1,150	460	950	330
31	930	330	900	225	460	115	1,100	440	850	300
32	900	315	900	225	445	110	1,100	440	850	300

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.

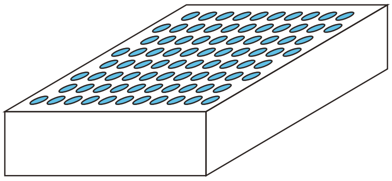
2) Recommend to make 0.5 x Dc depth pilot hole by same dia.TEZD-MS (3 x Dc) type.

TA-EZ Drill TEZDTYPE

CASE STUDIES

1.Drilling of tube plate for air conditioner.

Long tool life



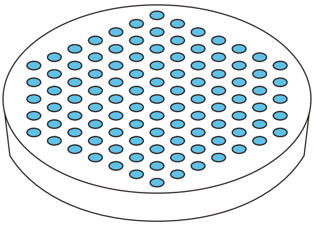
Result

Double spindle machine:
No. 1: 4,040 holes (113 m)
No. 2: 3,922 holes (110 m)

Work	Part name	Tube plate for air conditioner
	Material	Structural steel (Low carbon steel)
	Hardness	–
Tool	Tool no.	TEZD1600S20-MS
	Grade	TEZ1630(JC8050)
Cutting conditions	Spindle speed Cutting speed	n=1,450min^{-1}, Vc=73.76m/min
	Feed speed Feed rate	Vf=362.5mm/min, f=0.25mm/rev
	Drilling depth	28mm (Through hole)
	Clamp	Good
	Coolant	Water soluble
	Machine	Vertical MC

2.Drilling of heat exchanger.

High efficiency



Result

TEZD increased feed speed by 2 times and chip removal rate compared with competitors.

Work	Part name	Heat exchanger
	Material	Stainless steel
	Hardness	250HB
Tool	Tool no.	TEZD1900S25-MS
	Grade	TEZ1930 (JC8050)
Cutting conditions	Spindle speed Cutting speed	n = 1,000min^{-1}, Vc = 60.3m/min
	Feed speed Feed rate	Vf = 300mm/min, f = 0.3mm/rev
	Drilling depth	45mm (Through hole) Good
	Clamp	Water soluble
	Coolant	Double column MC
	Machine	

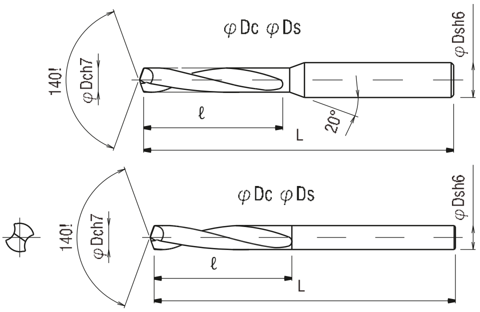
Sigma Drill Hard DZ-DHS TYPE

- Drilling depth: 5 x Dc
- For high hardened material up to 70HRC

DZ TiAlN

φDc φ12

Drilling



Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
DZ-DHS0200-12	●	**2.0**	12	55	3
DZ-DHS0200	●	**2.0**	16	55	3
DZ-DHS0200-21	●	**2.0**	21	55	3
DZ-DHS0210	●	**2.1**	16	55	3
DZ-DHS0220	●	**2.2**	16	55	3
DZ-DHS0230	●	**2.3**	16	55	3
DZ-DHS0240	●	**2.4**	16	55	3
DZ-DHS0250	●	**2.5**	16	55	3
DZ-DHS0250-21	●	**2.5**	21	55	3
DZ-DHS0260	●	**2.6**	16	55	3
DZ-DHS0270	●	**2.7**	16	55	3
DZ-DHS0280	●	**2.8**	16	55	3
DZ-DHS0290	●	**2.9**	16	55	3
DZ-DHS0300	●	**3**	21	55	4
DZ-DHS0330	●	**3.3**	24	60	4
DZ-DHS0340	●	**3.4**	24	60	4
DZ-DHS0350	●	**3.5**	24	60	4
DZ-DHS0380	●	**3.8**	27	60	4
DZ-DHS0390	●	**3.9**	27	60	4
DZ-DHS0400	●	**4**	27	60	4
DZ-DHS0420	●	**4.2**	29	63	6
DZ-DHS0430	●	**4.3**	29	63	6
DZ-DHS0440	●	**4.4**	29	63	6
DZ-DHS0450	●	**4.5**	29	63	6
DZ-DHS0490	●	**4.9**	32	68	6
DZ-DHS0500	●	**5**	32	68	6

Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
DZ-DHS0510	●	**5.1**	34	72	6
DZ-DHS0520	●	**5.2**	34	72	6
DZ-DHS0550	●	**5.5**	34	72	6
DZ-DHS0590	●	**5.9**	36	74	6
DZ-DHS0600	●	**6**	41	81	6
DZ-DHS0680	●	**6.8**	43	83	8
DZ-DHS0690	●	**6.9**	43	83	8
DZ-DHS0700	●	**7**	43	83	8
DZ-DHS0790	●	**7.9**	48	90	8
DZ-DHS0800	●	**8**	48	90	8
DZ-DHS0840	●	**8.4**	53	96	10
DZ-DHS0850	●	**8.5**	53	96	10
DZ-DHS0860	●	**8.6**	55	98	10
DZ-DHS0900	●	**9**	55	98	10
DZ-DHS0990	●	**9.9**	60	105	10
DZ-DHS1000	●	**10**	60	105	10
DZ-DHS1030	●	**10.3**	66	112	12
DZ-DHS1040	●	**10.4**	66	112	12
DZ-DHS1060	●	**10.6**	68	114	12
DZ-DHS1100	●	**11**	68	114	12
DZ-DHS1180	●	**11.8**	73	121	12
DZ-DHS1190	☐	**11.9**	73	121	12
DZ-DHS1200	●	**12**	73	121	12

Note) Please refer page E012 – E013 for recommended cutting conditions.

6145

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

Sigma Drill Hard DZ-DHSTYPE

■ CASE STUDIES

1. SKD11 (62HRC)

Machined hole dia.: 9.98 -10.00 mm

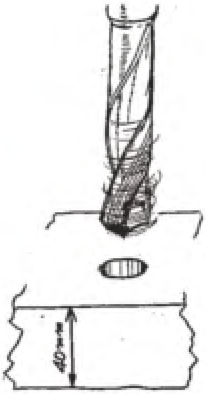
Result

After machining 84 holes, Sigma drill hard showed normal wear.
Tool life of competitor’s was only 11 holes.

Work	Part name	Plate
	Material	SKD11
	Hardness	62HRC
Tool	Tool No.	DZ-DHS1000
	Grade	DZ coating
Cutting conditions	Cutting speed	12.6 (m/min)
	Spindle speed	400 (min^{-1})
	Feed speed	20 (mm/min)
	Feed rate	0.05 (mm/rev)
	Drilling depth	26 mm (Through hole)
	Clamp	Good
	Coolant	Water soluble (External)
	Machine	Vertical MC

2. SKD11 (60HRC)

- ● Drilling depth: L/D = 6.7
- ● Step feed every 5 mm



Result

Existing tool was damaged every 5 mm machining and max. drilling depth was 20 mm. Sigma drill hard could machine 40 mm and still able to continue.

Work	Part name	Mould
	Material	SKD11
	Hardness	60HRC
Tool	Tool No.	DZ-DHS0600
	Grade	DZ coating 18.3
Cutting conditions	Cutting speed	(m/min) 970
	Spindle speed	(min^{-1})
	Feed speed	97 (mm/min) 0.1
	Feed rate	(mm/rev)
	Drilling depth	40 mm (Throughhole)
	Clamp	Good
	Coolant	Water soluble (External)
	Machine	Vertical MC

Sigma Drill Hard

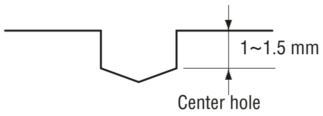
DZ-DHS TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	SKT, SKD61 (48~56HRC)		SKD11, SKH (57~62HRC)		SKD11, SKH (63~70HRC)	
Drill dia. (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)
	Cutting speed Vc (m/min)	Feed rate f (mm/rev)	Cutting speed Vc (m/min)	Feed rate f (mm/rev)	Cutting speed Vc (m/min)	Feed rate f (mm/rev)
2	2,860	115	2,070	83	1,270	38
	15~20	0.03~0.05	10~15	0.03~0.05	5~10	0.02~0.04
2.5	2,550	102	1,660	66	1,270	38
	15~25	0.03~0.05	10~15	0.03~0.05	7~12	0.02~0.04
3	2,100	84	1,380	55	1,060	31
	15~25	0.03~0.05	10~15	0.03~0.05	7~12	0.02~0.04
4	1,590	63	1,035	41	795	23
	15~25	0.03~0.05	10~15	0.03~0.05	7~12	0.02~0.04
5	1,270	62	830	41	635	25
	15~25	0.04~0.06	10~15	0.04~0.06	7~12	0.03~0.05
6	1,060	74	690	41	530	26
	15~25	0.06~0.08	10~15	0.05~0.07	7~12	0.04~0.06
7	910	63	590	35	455	22
	15~25	0.06~0.08	10~15	0.05~0.07	7~12	0.04~0.06
8	795	60	520	34	400	20
	15~25	0.06~0.09	10~15	0.05~0.08	7~12	0.04~0.06

NOTE

1) Use water soluble coolant.
2) Not recommended todrilling for general steel.
3) Recommend to use under the conditions of high accurate and rigid machine and rigid work.
4) The cutting parameters is for drilling depth 3 x Dc. Incase of drilling dept hover 3 x Dc, step feed is recommended.
5) To prevent breakage of drill, not recommend to making through hole. Please se tplanking.
6) Recommend to making center hole.



Sigma Drill Hard DZ-DHS TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	SKT, SKD61 (48~56HRC)		SKD11, SKH (57~62HRC)		SKD11, SKH (63~70HRC)	
Drill dia. (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)
	Cutting speed Vc (m/min)	Feed rate f (mm/rev)	Cutting speed Vc (m/min)	Feed rate f (mm/rev)	Cutting speed Vc (m/min)	Feed rate f (mm/rev)
9	710	53	460	30	355	18
	15~25	0.06~0.09	10~15	0.05~0.08	7~12	0.04~0.06
10	640	51	415	29	320	17
	15~25	0.06~0.1	10~15	0.05~0.09	7~12	0.04~0.07
11	580	46	375	26	290	15
	15~25	0.06~0.1	10~15	0.05~0.09	7~12	0.04~0.07
12	530	47	345	25	265	15
	15~25	0.06~0.12	10~15	0.05~0.1	7~12	0.04~0.08

NOTE

1) Use water soluble coolant.
2) Not recommended todrilling for general steel.
3) Recommend to use under the conditions of high accurate and rigid machine and rigid work.
4) The cutting parameters is for drilling depth 3 x Dc. Incase of drilling dept hover 3 x Dc, step feed is recommended.
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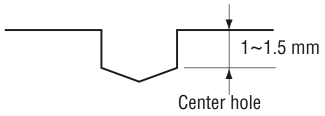
6) Recommend to making center hole.

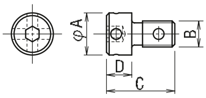
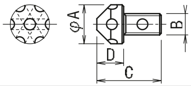


Tooling by DIJET®

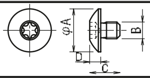
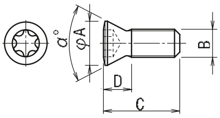
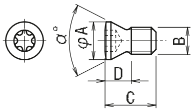
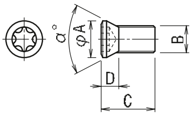
Technical Information

Parts

Adjustable screw

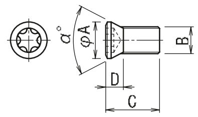
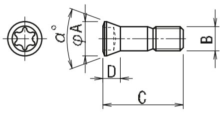
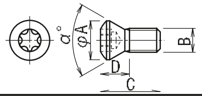
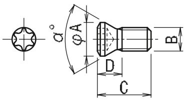
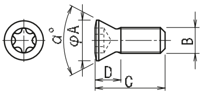
Drawings	Cat. No.	Dimensions (mm)						Wrench
		A	B	C	D	E	α°	
	**ASW-113**	4.8	No.10-32UNF	12.7	4.8	—	—	AD-1845
	ADS-513	7.8	M5×0.5	13.0	5.0	—	—	AD-2080
	ADS-514	5.6	M5×0.5	14.5	6.5	—	—	AD-2080
	**ASW-513**	9.0	M5×0.5	13.0	5.0	—	—	AD-1845

Clamp screw

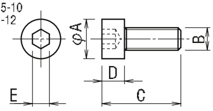
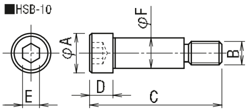
Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N•m)
		A	B	C	D	E	α°		
	**CB3540**	9.0	M3.5×0.6	6.3	2.3	—	—	T-15	2.1
	**CSW-1838**	2.7	M1.8×0.35	3.7	1.8	—	55	T-6	0.25
	CSW-206	3.5	M2.5×0.45	5.0	2.4	—	55	T-8	0.9
	CSW-2542	3.0	M2.5×0.45	4.2	2.5	—	43	T-7	0.9
	CSW-2547	3.4	M2.5×0.45	4.7	2.5	—	43	T-7	0.9
	CSW-3570	5.5	M3.5×0.6	7.0	3.5	—	55	T-15	2.1
	CSW-3575	5.5	M3.5×0.6	7.5	3.5	—	55	T-15	2.1
	CSW-3595	5.5	M3.5×0.6	9.5	3.5	—	55	T-15	2.1
	CSW-406H	5.0	M4×0.7	6.0	3.6	—	43	T-15	3.6
	CSW-407	5.0	M4×0.7	7.0	3.6	—	43	T-15	3.6
	CSW-408H	5.0	M4×0.7	8.0	3.6	—	43	T-15	3.6
	CSW-4510	6.6	M4.5×0.75	10.0	4.0	—	57	T-20	5.0
	CSW-510	6.4	M5×0.8	11.0	4.5	—	43	T-20	5.5
	CSW-513H	7.0	M5×0.8	13.0	4.4	—	63	T-20	5.5
	CSW-515	7.0	M5×0.8	15.0	5.0	—	63	T-20	5.5
	**DSW-1838H**	2.5	M1.8×0.35	3.8	2.0	—	55	T-6	0.4
	DSW-2045H	3.0	M2×0.4	4.5	2.3	—	60	T-7	0.5
	DSW-2563H	3.45	M2.5×0.45	6.3	2.6	—	55	T-8	0.9
	DSW-306H	4.3	M3×0.5	6.5	3.2	—	55	T-10	1.8
	DSW-307	4.3	M3×0.5	7.5	2.8	—	55	T-10	1.4
	DSW-307H	4.3	M3×0.5	7.6	3.2	—	55	T-10	1.8
	DSW-309H	4.3	M3×0.5	9.0	3.2	—	55	T-10	1.8
	DSW-4075	5.2	M4×0.7	7.5	3.5	—	55	T-15	3.6
	DSW-408	6.0	M4×0.7	8.5	3.6	—	55	T-15	3.6
	DSW-4085	5.3	M4×0.7	8.5	3.5	—	55	T-15	3.6
	DSW-410H	5.3	M4×0.7	10.0	3.7	—	55	T-15	3.6
	DSW-4510H	6.8	M4.5×0.75	10.0	4.7	—	55	T-20	6.0
	DSW-4512H	6.8	M4.5×0.75	12.5	5.2	—	55	T-20	6.0
	DSW-4515H	6.8	M4.5×0.75	15.5	5.2	—	55	T-20	6.0
	DSW-509	7.0	M5×0.8	9.5	4.9	—	55	T-20	6.1
	DSW-511H	7.0	M5×0.8	11.5	4.9	—	55	T-20	6.1
	**ESW-205**	3.6	M2.5×0.45	5.5	2.0	—	60	T-8	0.9
	ESW-206	3.6	M2.5×0.45	6.0	2.0	—	60	T-8	0.9
	ESW-304	4.0	M3×0.5	4.5	2.0	—	55	T-8	1.4
	ESW-306	4.0	M3×0.5	6.0	2.0	—	55	T-8	1.4
	ESW-307	4.0	M3×0.5	7.5	2.0	—	55	T-8	1.4
	ESW-405	5.3	M4×0.7	5.9	2.7	—	55	T-15	3.1
	ESW-406	5.3	M4×0.7	6.6	2.7	—	55	T-15	3.1
	ESW-408	5.3	M4×0.7	8.0	2.7	—	55	T-15	3.1

Parts

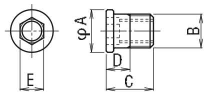
Clamp screw

Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N•m)
		A	B	C	D	E	α°		
	**ESW-410**	5.3	M4×0.7	10.0	2.7	—	55	T-15	3.1
	ESW-412	5.3	M4×0.7	12.0	2.7	—	55	T-15	3.1
	ESW-507	6.8	M5×0.8	7.5	3.4	—	55	T-25	5.5
	ESW-508	6.8	M5×0.8	8.2	3.4	—	55	T-25	5.5
	ESW-510	6.8	M5×0.8	10.0	3.4	—	55	T-25	5.5
	**FSW-2005H**	2.5	M2×0.25	5.0	1.3	—	40	T-6	0.5
	FSW-2506H	3.0	M2.5×0.35	6.6	1.5	—	40	T-7	0.9
	FSW-3007H	3.8	M3×0.35	8.1	2.0	—	40	T-8	1.2
	FSW-3509H	4.7	M3.5×0.6	9.6	2.3	—	40	T-10	2.0
	FSW-4013H	5.8	M4×0.7	13.5	3.3	—	40	T-15	3.0
	FSW-5016H	6.8	M5×0.8	16.4	3.2	—	40	T-20	4.0
	FSW-6020	8.5	M6×1.0	20.0	4.3	—	40	T-30	5.0
	FSW-8025	11.0	M8×1.25	25.0	5.5	—	40	T-40	6.0
	**HSW-614H**	10.0	M6×1.0	15.0	7.3	—	60	T-30	7.5
	**TSW-2250**	3.1	M2.2×0.45	5.0	2.3	—	60	T-7	0.6
	TSW-2556H	3.6	M2.5×0.45	5.6	2.7	—	60	T-8	0.9
	TSW-2567H	3.6	M2.5×0.45	6.7	2.7	—	60	T-8	0.9
	TSW-3510H	5.3	M3.5×0.6	10.0	4.5	—	60	T-15	2.1
	TSW-3512H	5.3	M3.5×0.6	11.5	4.5	—	60	T-15	2.1
	TSW-408	5.5	M4×0.7	8.0	3.3	—	60	T-15	3.1
	TSW-511	7.0	M5×0.8	11.0	5.0	—	60	T-20	5.5
	TSW-612	8.5	M6×1.0	12.0	4.8	—	60	T-25	7.5
	TSW-614H	8.5	M6×1.0	14.0	6.2	—	60	T-25	7.5
	**S4513P**	6.7	M4.5×0.75	13.0	3.5	—	55	20IP	5.0

Set bolt

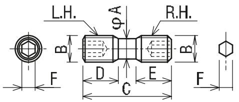
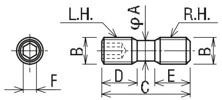
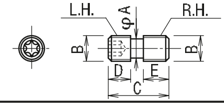
Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N•m)
		A	B	C	D	E	F		
■HCS4-10 HCS5-10 HSB-12 	**HCS4-10**	7.0	M4×0.7	14.0	4.0	3.0	—	—	—
	HCS5-10	8.5	M5×0.8	15.0	5.0	4.0	—	—	—
■HSB-10 	**HSB-10**	17.0	M10×1.5	56.0	10.0	8.0	13	—	—
	HSB-12	18.0	M12×1.75	62.0	12.0	10.0	—	—	—

Shim screw

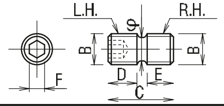
Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N•m)
		A	B	C	D	E	F		
	**SSW-535**	6.3	M5×0.5	7.0	3.1	3.5	—	—	6.5
	SSW-745	8.4	M7×0.5	8.0	2.9	4.5	—	—	8.0

Parts

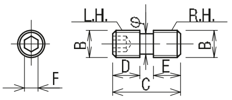
Wedge screw

Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N･m)
		A	B	C	D	E	F		
	**LS-1**	4.6	M6×1.0	22.0	8.5	8.5	3.0	—	6.0
	**LS-101**	4.6	M6×1.0	16.0	6.5	6.5	3.0	—	6.0
	LS-106	4.6	M6×1.0	14.5	6.5	5.0	3.0	—	6.0
	LS-107	4.6	M6×1.0	13.0	5.0	5.0	3.0	—	6.0
	**LS-109**	5.5	M7×0.75	19.0	7.5	8.0	—	T-25	7.0
	LS-110	4.8	M6×0.75	22.0	8.0	8.0	—	T-15	6.0
	LS-180	6.0	M8×1.0	19.0	7.0	8.0	—	T-27	8.0

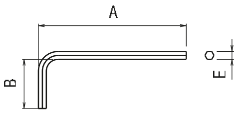
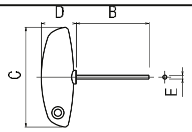
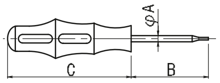
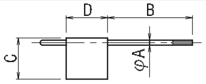
Rest button screw

Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N･m)
		A	B	C	D	E	F		
	**LS-113**	3.7	No.10-32UNF	10.2	4.5	4.1	2.4	—	—

Clamp screw

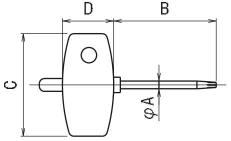
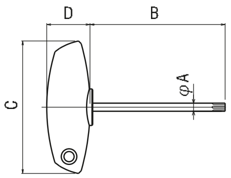
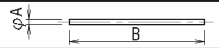
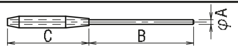
Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N･m)
		A	B	C	D	E	F		
	**SLS-3**	6.0	M8×1.0	20.0	8.0	8.0	4.0	—	8.0

Wrench

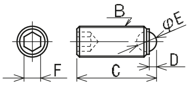
Drawings	Cat. No.	Dimensions (mm)					Wrench size
		A	B	C	D	E	
	**LW-015**	46.5	14.0	—	—	1.5	—
	LW-020	52.0	15.0	—	—	2.0	—
	LW-025	59.5	18.0	—	—	2.5	—
	LW-030	67.0	20.0	—	—	3.0	—
	LW-035	71.5	22.5	—	—	3.5	—
	LW-040	75.0	25.0	—	—	4.0	—
	LW-045	80.5	27.0	—	—	4.5	—
	LW-050	80.0	28.0	—	—	5.0	—
	LW-120	137.0	45.0	—	—	12.0	—
	LW-140	154.0	56.0	—	—	14.0	—
	**A-030**	—	60.0	80.0	28.0	3.0	—
	**A-07SD**	4.0	60.0	80.0	—	—	T-7
	A-08SD	4.0	70.0	80.0	—	—	T-8
	A-10SD	4.0	70.0	95.0	—	—	T-10
	A-20SD	5.0	90.0	105.0	—	—	T-20
	A-25SD	5.0	100.0	105.0	—	—	T-25
	**A-06**	1.7	34.5	15.0	15.0	—	T-6
	A-07	2.0	34.5	15.0	15.9	—	T-7
	A-08	2.3	39.0	19.0	19.0	—	T-8

Parts

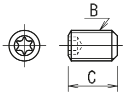
Wrench

Drawings	Cat. No.	Dimensions (mm)					Wrench size
		A	B	C	D	E	
	**A-10**	3.0	40.0	40.0	20.0	—	T-10
	A-15	3.5	45.0	40.0	20.0	—	T-15
	A-20W	4.0	45.0	40.0	20.0	—	T-20
	**A-15T**	4.0	100.0	80.0	26.0	—	T-15
	A-20	4.0	100.0	100.0	32.0	—	T-20
	A-20L	5.5	200.0	100.0	32.0	—	T-20
	A-25	4.5	100.0	100.0	32.0	—	T-25
	A-27	5.5	100.0	100.0	32.0	—	T-27
	A-30	6.0	100.0	100.0	32.0	—	T-30
	A-40	7.0	100.0	100.0	32.0	—	T-40
	AP-20	4.0	100.0	100.0	32.0	—	20IP
	**AD-1845**	1.8	45.0	—	—	—	—
	**AD-2080**	2.0	45.0	35.0	—	—	—

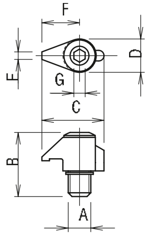
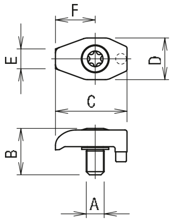
Wedge lock screw

Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N•m)
		A	B	C	D	E	F		
	**LSM-512**	—	M5×1.0	12.6	1.0	3.0	2.5	—	—

Adjustable screw

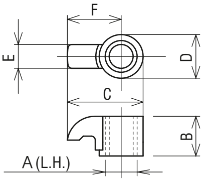
Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N•m)
		A	B	C	D	E	F		
	**RSW-05008**	—	M5×0.8	8.0	—	—	—	T-10	—

Clamp set

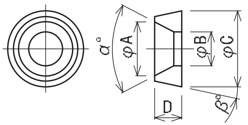
Drawings	Cat. No.	Dimensions (mm)							Wrench
		A	B	C	D	E	F	G	
	**DCM-1**	M5×0.8	13.8	13.8	6.8	2.0	8.5	2.5	—
	DCM-5	M6×1.0	17.0	16.5	8.9	2.0	10.0	3.0	—
	**DCM-17**	M4.5×0.75	11.7	18.0	10.5	5.0	10.0	—	T-20
	DCM-18	M3.5×0.6	10.0	13.0	7.6	3.0	7.2	—	T-15

Parts

Clamp

Drawings	Cat. No.	Dimensions (mm)					
		A	B	C	D	E	F
	**DCM-2**	M8×1.0	10.0	19.0	11.0	6.0	13.5

Clamp washer

Drawings	Cat. No.	Dimensions (mm)					
		A	B	C	D	α°	β°
	**CW-11**	8.0	5.0	11.0	4.0	55	12

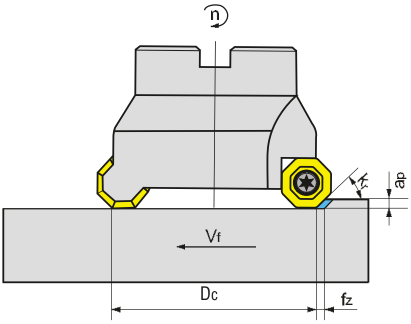
Terminology and Formulas (for milling)

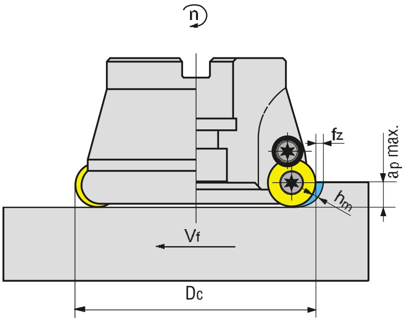
D_c = Cutting diameter mm.
a_e = Width of cut mm.
a_p = Depth of cut mm.
f = Feed rate per revolution mm/rev.
f_z = Feed rate per tooth mm/t.
D_e = Effective cutting diameter mm.
V_c = Cutting speed m/mm.
Q = Metal removal rate cm³/min.
l = Machined length mm.
V_f = Feed speed mm/min.
D_{ap} = Max cutting diameter at specific depth mm.
Z_n = Total number of edges in the tool

Z_c = Effective number of teeth
h_{ex} = Max chip thickness mm.
h_m = Average chip thickness mm.
k_{c1} = Specific cutting force (hex = mm) N/mm².
P_c = Net cutting power KW.
k_r = Major cutting edge deg.
V_{co} = Constant for cutting speed
C_{vc} = Correction factor for cutting speed
n = Spindle speed min^{-1} .
n_{mt} = Efficiency KW
m_c = Rise in specific cutting force (kc) as a function of chip thickness

General formulas

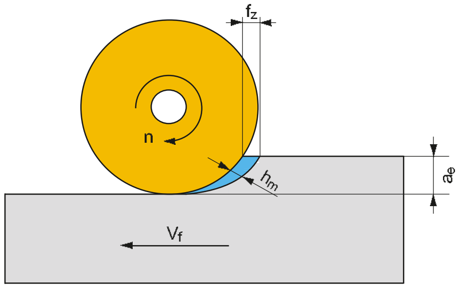
Cutting speed	$V_c = \frac{\pi \times D_c \times n}{1000} = \text{m/min.}$	Spindle speed	$n = \frac{V_c \times 1000}{\pi \times D_c} = \text{min.}^{-1}$
Feed speed	$V_f = f_z \times n \times z_n = \text{mm/min.}$	Feed per tooth	$f_z = \frac{V_f}{n \times z_n} = \text{mm.}$
Feed per revolution	$f = \frac{V_f}{n} = \text{mm/rev.}$	Metal Removal rate	$Q = \frac{a_p \times a_e \times V_f}{1000} = \text{cm}^3.$
Specific cutting force	$k_c = k_{c1} \times h_m^{-m_c} = \text{mm/min.}$	Effective cutting diameter	$D_e = 2 \times \sqrt{a_p \times (D_c - a_p)} = \text{mm.}$
Average chip thickness (side & facemilling) when ae / Dc ≤0.1	$h_m = f_z \sqrt{\frac{a_e}{D_c}} = \text{mm.}$	Net power	$P_c = \frac{a_p \times a_e \times V_f \times k_c}{60 \times 10^6 \times n_{mt}} = \text{kW}$
Average chip thickness when ae / Dc ≥ 0.1	$h_m = \frac{\sin k_r \times 180 \times a_e \times f_z}{\pi \times D_c \times \arcsin\left(\frac{a_e}{D_c}\right)} = \text{mm.}$	Cutting time	$T_c = \frac{l}{V_f} = \text{min.}$





Up Cut and Down Cut

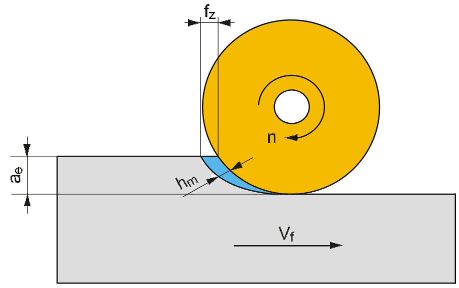
Down cut milling



- same workpiece direction, feed rate and rotation of milling cutter.
- chip cross-section start on the strongest point.

Generally down milling should be prefered if rigid machine is available.

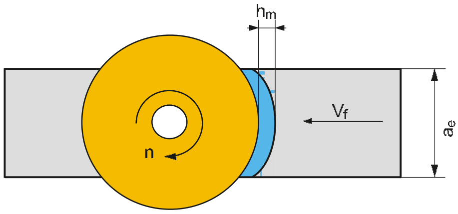
Up cut milling



- the feed rate of workpiece is counter-clock-wise to the sense of milling cutter rotation.
- chip cross-section start on the weakest point.

Up milling should be applied on instable milling machine and workpiece materials with higher hardness.

Tool with central work piece

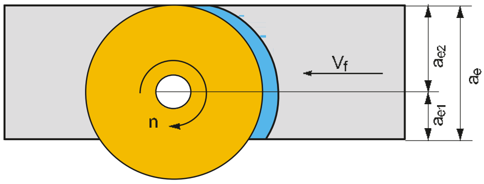


Formulas :

$$h_m = \frac{\sin(k_r) \times 180 \times a_e \times f_z}{\pi \times d_c \times \arcsin\left(\frac{a_e}{d_c}\right)}$$

$$f_z = \frac{h_m \times \pi \times \arcsin\left(\frac{a_e}{d_c}\right)}{\sin(k_r) \times 180 \times a_e}$$

Tool with outside center work piece



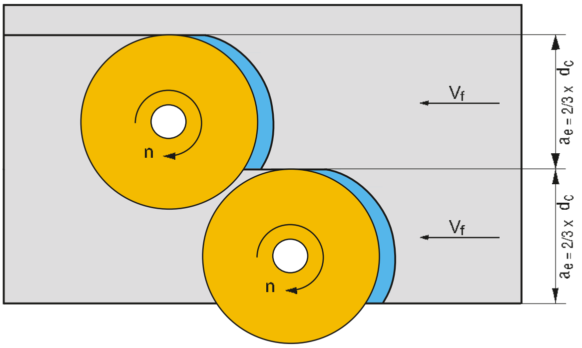
Formulas :

$$h_m = \frac{\sin(k_r) \times 360 \times a_e \times f_z}{\pi \times d_c \times \left[\arcsin\left(\frac{2 x a_{e1}}{d_c}\right) + \arcsin\left(\frac{2 x a_{e2}}{d_c}\right)\right]}$$

$$f_z = \frac{h_m \times \pi \times d_c \times \left[\arcsin\left(\frac{2 x a_{e1}}{d_c}\right) + \arcsin\left(\frac{2 x a_{e2}}{d_c}\right)\right]}{\sin(k_r) \times 360 \times a_e}$$

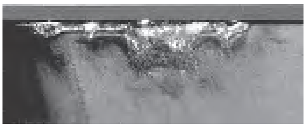
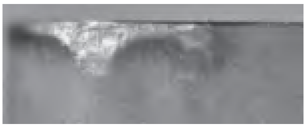
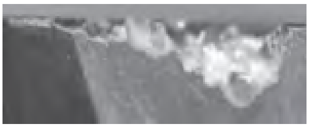
Suggested milling operation

We suggest to work like this when possible or in any case work with tangential tool exit. Up cut and down cut is possible with Ae Max. 2/3 of tool diameter.



Troubleshooting

APPLICATIONS
Milling

PROBLEM	CAUSE	RECOMMENDED ACTION
Chipping 	• insert grade • speeds & feeds	• Change to tougher grade • Increase the cutting speed • Reduce the feed/tooth
Flank Wear 	• insert grade • speeds & feeds	• Use a more wear-resistant grade • Reduce the cutting speed • Increase the feed/tooth
Crater Wear 	• insert grade • speeds & feeds	• Use a more crater wear-resistant grade • Reduce the cutting speed • Reduce the feed/tooth
Broken Nose 	• insert grade • speeds & feeds • insert shape	• Use a tougher grade • Adjust the cutting speed • Adjust the feed/tooth • Use a thicker insert
Poor Surface Finish	• insert grade • speeds & feeds • insert shape • tool shape	• Use a more wear-resistant grade • Increase the cutting speed • Use a polished insert • Use a higher rake cutter
Burrs, Chipping, etc.	• insert grade • tool shape	• Increase the cutting speed • Reduce the feed/tooth • Use a higher rake cutter
Vibration	• speeds & feeds	• Reduce the cutting speed • Reduce the feed/tooth

Troubleshooting

APPLICATIONS
Drilling

PROBLEM	CAUSE	RECOMMENDED ACTION
Drill Breakage	• speeds & feeds • cutting fluid • others	• Maintain constant feed rate • Reduce the cutting speed • Reduce the feed rate • Increase coolant flow • Use a machine with sufficient horsepower • Tighten work piece clamping
Center Point Breakage	• tool • speeds & feeds • others	• Reduce drill overhang • Maintain constant feed rate • Reduce the feed rate when starting drill • Use a machine with sufficient horsepower • Tighten work piece clamping
Peripheral Cutting Edge Breakage	• tool • speeds & feeds • others	• Reduce drill overhang • Maintain constant feed rate • Reduce the cutting speed • Use a machine with sufficient horsepower • Tighten work piece clamping
Chipping	• tool • speeds & feeds • cutting fluid • others	• Reduce drill overhang • Maintain constant feed rate • Change the feed rate • Increase coolant flow • Use a machine with sufficient horsepower • Tighten work piece clamping
Long Stringy Chips	• tool • speeds & feeds	• Less lead angle • Increase hone • Maintain constant feed rate • Increase the feed rate
Chip Form Varies	• speeds & feeds • cutting fluid • others	• Maintain constant feed rate • Maintain constant coolant flow • Use a machine with sufficient horsepower

Troubleshooting

APPLICATIONS
Drilling

PROBLEM	CAUSE	RECOMMENDED ACTION
Over Size or Out-of-Round	• tool • speeds & feeds • others	• Reduce drill overhang • Increase lead angle • Increase the cutting speed • Reduce the feed rate • Use a machine with sufficient horsepower • Tighten work piece clamping
Poor Surface Finish	• speeds & feeds • others	• Maintain constant feed rate • Increase the cutting speed • Reduce the feed rate • Use low feed rate when starting drill • Use a machine with sufficient horsepower • Tighten work piece clamping
Galling on Drill Body	• tool • speeds & feeds • others	• Reduce drill overhang • Reduce the cutting speed • Increase the feed rate • Use a machine with sufficient horsepower • Tighten work piece clamping
Vibration	• tool • speeds & feeds • others	• Use light hone • Reduce drill overhang • Maintain constant feed rate • Use a machine with sufficient horsepower • Tighten work piece clamping

Material Cross Reference

Carbon steel

Japan	USA	Germany	
JIS	AISI/SAE	W.-nr	DIN
S10C	1010	1.0301	C10
S15C	1015	1.0401	C15
S20C	1020	1.0402	C22
S25C	1025	1.0406	C25
S30C	1030	1.0528	C30
S35C	1035	1.0501	C35
S40C	1040	1.0511	C40
S45C	1045	1.0503	C45
S50C	1049	1.0540	C50
S55C	1055	1.0535	C55
S58C	1060	1.0601	C58

Nickel chromium steel

JIS	AISI/SAE	W.-nr	DIN
SNC236	3135	1.5710	36NiCr6
SNC415	3415	1.5732	14NiCr10
SNC631	—	—	—
SNC815	3310	1.5752	14NiCr14
SNC836	—	—	—

Nickel chromium molybdenum steel

JIS	AISI/SAE	W.-nr	DIN
SNCM220	8620	1.6523	21NiCrMo2
SNCM240	8640	1.6546	40NiCrMo22
SNCM415	—	—	—
SNCM420	4320	—	—
SNCM439	4340	1.6582	35CrNiMo6
SNCM447	—	—	—
SNCM630	—	—	—
SNCM815	—	—	—

Chromium steel

JIS	AISI/SAE	W.-nr	DIN
SCr415	5015	1.7015	15Cr3
SCr420	5120	1.7020	20Cr4
SCr430	5130	1.7033	34Cr4
SCr435	5132	1.7034	37Cr4
SCr440	5140	1.7045	42Cr4
SCr445	5147	—	—

Chromium molybdenum steel

JIS	AISI/SAE	W.-nr	DIN
SCM415	—	1.7262	15CrMo5
SCM420	—	—	—
SCM430	4130	1.7218	25CrMo4
SCM435	4137	1.7220	34CrMo4
SCM440	4140	1.7223	41CrMo4
SCM445	4145	—	—

Manganese steel and Manganese chromium steel

Japan	USA	Germany	
JIS	AISI/SAE	W.-nr	DIN
SMn420	1522	—	—
SMn433	1536	—	—
SMn438	1541	—	—
SMn443	1541	—	—
SMnC420	—	—	—
SMnC443	—	—	—

Carbon tool steel

JIS	AISI/SAE	W.-nr	DIN
SK1	W1-13	—	—
SK2	W1-11 1/2	—	—
SK3	W1-10	1.1545	C105W1
SK4	W1-9	—	—
SK5	W1-8	1.1525	C80W1
SK6	W1-7	1.1525	C80W1
SK7	—	1.1620	C70W2

High speed steel

JIS	AISI/SAE	W.-nr	DIN
SKH2	T1	—	—
SKH3	T4	—	—
SKH10	T15	—	—
SKH51	M2	1.3343	S6-5-2
SKH52	M3-1	—	—
SKH53	M3-2	1.3344	S6-5-3
SKH54	M4	—	—
SKH56	M36	—	—

Alloy tool steel

JIS	AISI/SAE	W.-nr	DI
SKS11	F2	—	—
SKS51	L6	—	—
SKS43	W2-9 1/2	—	—
SKS44	W2-8 1/2	—	—
SKD1	D3	1.2080	X210Cr12
SKD11	D2	1.2379	X100CrMoV5
SKD12	A2	1.2363	X100CrMoV51
SKD2	—	1.2436	X210CrW12
SKD5	H21	1.2581	X30WCrV9
SKD61	H13	1.2344	X40CrMoV5

Stainless steel (Ferritic)

JIS	AISI/ASTM	W.-nr	DIN
SUS405	AISI 405	1.4724	X6CrAl13
SUS429	AISI 429	—	—
SUS430	AISI 430	1.4742	X6Cr17
SUS430F	AISI 430F	1.4104	X12CrMoS17
SUS434	AISI 434	—	—

Material Cross Reference

Stainless steel (Martensitic)

Japan	USA	Germany	
JIS	AISI/ASTM	W.-nr	DIN
SUS403	AISI 403	—	—
SUS410	AISI 410	1.4006	X10Cr13
SUS416	AISI 416	—	—
SUS420J1	AISI 420	1.4034	X20Cr13
SUS420F	AISI 420F	—	—
SUS431	AISI 431	1.4057	X20CrNi172
SUS440A	AISI 440A	—	—
SUS440B	AISI 440B	—	—
SUS440C	AISI 440C	—	—

Stainless steel (Austenitic)

JIS	AISI/ASTM	W.-nr	DIN
SUS201	AISI 201	—	—
SUS202	AISI 202	—	—
SUS301	AISI 301	—	—
SUS302	AISI 302	—	—
SUS302B	AISI 302B	—	—
SUS303	AISI 303	1.4305	X10CrNiS189
SUS303Se	AISI 303Se	—	—
SUS304	AISI 304	1.4301	X5CrNi1810
SUS304L	AISI 304L	1.4306	X2CrNi1911
SUS304NI	AISI 304N	—	—
SUS305	AISI 305	1.4303	X5CrNi1812
SUS308	AISI 308	—	—
SUS309S	AISI 309S	—	—
SUS310S	AISI 310S	—	—
SUS316	AISI 316	1.4401	X5CrNiMo17122
SUS316L	AISI 316L	—	X2CrNiMo17132
SUS316N	AISI 316N	1.4404	—
SUS317	AISI 317	1.4438	X2CrNiMo18164
SUS317L	AISI 317L	1.4438	X2CrNiMo18164
SUS321	AISI 321	—	—
SUS347	AISI 347	1.4550	X6CrNiNb1810
SUS384	AISI 384	—	—

Heat resistant steel (Austenitic)

JIS	AISI/ASTM	W.-nr	DIN
SUH31	—	—	—
SUH35	—	—	—
SUH36	—	—	—
SUH37	—	—	—
SUH38	—	—	—
SUH309	AISI 309	—	—
SUH310	AISI 310	1.4845	CrNi2520
SUH330	AISI 330	—	—

Heat resistant steel (Martensitic)

Japan	USA	Germany	
JIS	AISI/ASTM	W.-nr	DIN
SUH21	—	—	CrAl1205
SUH409	AISI 409	1.4512	X6CrTi12
SUH446	AISI 446	—	—

Heat resistant steel (Ferritic)

JIS	AISI/ASTM	W.-nr	DIN
SUH1	—	—	—
SUH3	—	—	—
SUH4	—	—	—
SUH11	—	—	—
SUH600	ASTM 616	—	—

Grey cast iron

JIS	AISI/SAE	W.-nr	DIN
FC100	20	0.6010	GG 10
FC150	25	0.6015	GG 15
FC200	30	0.6020	GG 20
FC250	35	0.6025	GG 25
FC300	40	0.6030	GG 30
FC350	50	0.6035	GG 35

Nodular cast iron

JIS	AISI/SAE	W.-nr	DIN
FCD400	60-40-18	0.7040	GGG 40
FCD450	60-40-8	0.7045	GGG 45
FCD500	65-45-12	0.7050	GGG 50
FCD600	80-55-06	0.7060	GGG 60
FCD700	100-70-03	0.7070	GGG 70

Tool Steel Brand Cross Reference

Steel for cold molding

Group	JIS	AISI	Aichi Steel	Sanyo Special Steel	Daido Steel	Nippon Koshuha Steel	Hitachi Metals	Nachi Fujikoshi	Udde Holm	Bohler
Carbon tool steel	SK105	W1-10		QK3	YK3					K990
Alloy tool steel	SKS93		SK301	QK3M	YK30	K3M	YCS3			
	SKS3		SKS3	QKS3	GOA	KS3	SGT		ARNE	K460
	SKD1	D3		QC1	DC1	KD1	CRD		SVERKER3	K100, K107
	SKD11	D2	SKD11	QC11	DC11	KD11	SLD	CDS11	SVERKER21	K105, K110
	8% Cr		AUD15 AUD11	QCM7 QCM8	DC53	KD11MAX KD11S, KD21	SLD8	MDS9	SLEIPNER	K340
	Die steel (Matrix type)		SXACE		DCMX	NOGA	ARK1		CALDIE UNIMAX	W360
	SKD12	A2			DC12	KD12			RIGOR	K305
	Pre-harden 40HRC				GO40F	KAP65	HPM-MAGIC		IMPAX HH	
	Flame tempered steel		SX105V	QF3	GO5	KRCX	HMD5		FERMO	
	Low temperature air cooled steel				GO4	KSM	ACD37			
	Impact resistant steel		AKS4	QF1	GS5	KTV5	YSM			
	Others		AUD11X				SLD10 SLD-MAGIC	ICS22	CALMAX ELMAX VANCRON40 VANADIS4E VANADIS10	K390 K890
High speed tool steel	SKH51	M2		QH51	MH51	H51	YXM1	SKH9		S600
	SKH51 type							SKH9D		
	SKH55 type					HM35	YXM4	HM35 HS53M		S705
	SKH57 type					MV10	XVC5	HS93R DURO-SP		S700
	Matrix type			QHZ	DRM1 DRM2 DRM3 MH85	KMX1 KMX2 KMX3	YXR3 YXR7 YXR33	DURO-F1 DURO-F3 DURO-F7 DURO-V2 DURO-V5		
Sintered high speed tool steel	SKH40				DEX40		HAP40	FAX38	VANADIS30	S590
	Matrix type				DEX-M1 DEX-M3		HAP5R			
	Others			SPM23 SPM30 SPM60 SPMR8	DEX20 DEX60		HAP10 HAP50 HAP72	FAX31 FAX40 FAX55 FAXG2	VANADIS23 VANADIS60	S290 S390 S690 S790

Tool Steel Brand Cross Reference

High speed tool steel

Group	JIS	AISI	Aichi Steel	Daido Steel	Nippon Koshuha Steel	Hitachi Metals	Nachi Fujikoshi	Udde Holm	Bohler
Tungsten type	SKH2	T1			H2	YHX2	SKH2		S200
	SKH3	T4			H3		SKH3		S305
	SKH4	T5			H4		SKH4		
	SKH10	T15			HV5				
Molybdenum type	SKH51	M2	QH51	MH51	H51	YXM1	SKH9		S600 S614 S401
	SKH52	M3-1			H52				
	SKH53	M3-2			HV1				S607
	SKH54	M4			HV2		HM4		
	SKH55				HM35	YXM4	HM35		S705
	SKH56	M36			HM36		HM36		
	SKH57				HV10	XVC5	HS93R		S700
	SKH58	M7			HM3		HM7		S400
	SKH59	M42			HM42	YXM42	HM42		S500
	Others				S70	YXM27 YXM60	HS53M HS97R HM1 HMT12 HM33 SKH9D DURO-SP		
Matrix type	Matrix type		QHZ	DRM1 DRM2 DRM3 MH85	KMX1 KMX2 KMX3	YXR3 YXR33 YXR7	DURO-FZ DURO-F1 DURO-F3 DURO-F7 DURO-V2 DURO-V5		
Powdered type	SKH40		SPM30	DEX40		HAP40	FAX38	VANADIS30	S590
	Others		SPM23 SPM60 SPMR8	DEX20 DEX60 DEX-M1 DEX-M3		HAP10 HAP50 HAP72 HAP5R	FAX31 FAX40 FAX55 FAXG2	VANADIS23 VANADIS60	S290 S390 S690 S790

Tool Steel Brand Cross Reference

Steel for plastic mold

Group	Hardness (HRC)	JIS	AISI	Aichi Steel	JFE Steel	Kobelco	Sanyo Special Steel	Daido Steel	Nippon Koshuha Steel	Hitachi Metals	Nachi Fujikoshi	Udde Hdm	Bohler
Pre hardened steel	13	SC type	1055		JFE-MD1	KTSM21 KTSM21M KTSM2A KTSM22	PC55		KPM1 KPMAX				
	28	SCM type	4140		JFE-MD3 JFE-MD5	KTSM31		PDS3					
	33	SCM (Improved)	P20			KTSM3M	PCM30	PX5 PXA30	KPM30	HPM7		IMPAXHH	M200 M201 M238
		SUS type	420					S-STAR D-STAR	GHX 420M	HPM38	PROVA-400 PROVA-450	STAVAX	M303 M310
		SUS type (Free cutting)						G-STAR	U630	HPM77		RoyAlloy	M315
	35	SUS type	S17400				QSH6	NAK101		PSL		CORRAX	N700
	36	SCM (Improved)	P20						JHX				
	40	SUS type										EDRO400	
		SKD61 (Improved)	H13					DH2F	KAP90F	FDAC			
		Others	P21				PCM40S	NAK80	KAP88	HPM-PRO			M461
			P21 (Free cutting)				PCM40	NAK55	KAP65	HPM1			M261
			P21 (Rust resistant)							CENA1			
										HPM-MAGIC		NIMAX	
Quench tempered steel	60	SKD11 (Improved)	D2	AUD11			QCM8	PD613	NOGA	HPM31		RIGOR SLEIPNER CALDIE CALMAX	K105 K110 K340
	57	SUS type 440C	440C				QPD5 SPC5 (Powdered)	SUS440C		SUS440C	440C PROVA-500 (Powdered)	ELMAX	M340 M390 N685 N690 N695
	52	SUS type 420						S-STAR D-STAR G-STAR	GHX	HPM38 HPM38S HPM77	PROVA-400 PROVA-450	STAVAX POLMAX MIRRAX	M310 M330
Age hardened steel	Over 50	Maraging steel						MAS1C	KMS18-20	YAG	EXEO-M21		V720 V721
		Others										CORRAX	
	40	Non-magnetic steel							NMS1	HPM75			

Tool Steel Brand Cross Reference

Steel for hot molding

Group	JIS	AISI	Aichi Steel	Kobelco	Sanyo Special Steel	Daido Steel	Nippon Koshuha Steel	Hitachi Metals	Nachi Fujikoshi	Mitsubishi Steel	Udde Hdm	Bohler
Alloy tool steel	SKD4					DH4	KD4					
	SKD5	H21				DH5	KD5					
	SKD6	H11				DH6	KD6				VIDAR	W300 W400
	SKD61	H13	SKD61		QD61	DHA DHA1	KDA	DAC			ORVAR-2M	W302
	SKD61 (Improved)		AUD61 AUD60A		QDA61 QDN	DHA2 DH21 DHA-WORLD DH31-S DH31-EX	KDA1 KDA1S KDAMAX	DAC3 DAC10 DAC55 DACMAGIC			ORVAR-S DIEVAR	W303 W403
	SKD61 (Free cutting)					DH2F	KAP90F	FDAC				
	SKD62	H12			QD62	DH62	KDB					
	SKD7	H10				DH72	KDH1					W320
	SKD7 (Improved)		AUD72		QDH	DH71 DH73 DH32		DAC40 YEM-K	DURO-N1			
	SKD8	H19				DH41	KDF					
	SKD8 (Improved)					DH42	KDF4	MDC-K				
	SKT4		SKT4A	SKT4	QT41	GFA	KTV	DM			ALVAR14	W500
	SKT4 (Improved)			KTH4	QDT	GF78	TD3					
	Precipitation hardening steel		AUD91 MPH-K			DH76				HD22B		
	Others				QF5	DHA-Thermo					BURE BLADER	
High speed tool steel	Matrix type				QHZ	DRM1 DRM2	KMX1	YXR33	DURO-FZ DURO-F1			

Hardness Conversion Table

Approximate conversion value for vickers hardness of steel

Vickers	Brinell 10mm ball Load 3,000 kgf		Rockwell			Shore	Tensile strength MPa (kgf/$_{2}$)
HV	Standard ball	Tungsten carbide ball HB	A scale Load 60 kgf 120°diamond cone HRA	B scale Load 100 kgf 1/16 inch steel ball HRB	C scale Load 150 kgf 120°diamond cone HRC	HS	
1900	–	–	93.1	–	80.5	–	–
1800	–	–	92.6	–	79.2	–	–
1700	–	–	91.9	–	77.9	–	–
1600	–	–	91.3	–	76.6	–	–
1500	–	–	90.5	–	75.3	–	–
1450	–	–	90.1	–	74.6	–	–
1400	–	–	89.6	–	74.0	–	–
1350	–	–	89.1	–	73.4	–	–
1300	–	–	88.7	–	72.7	–	–
1250	–	–	88.3	–	72.1	–	–
1200	–	–	87.9	–	71.5	–	–
1150	–	–	87.5	–	70.9	–	–
1100	–	–	87.1	–	70.3	–	–
1050	–	–	86.6	–	69.6	–	–
1000	–	–	86.2	–	68.9	–	–
940	–	–	85.6	–	68.0	97	–
920	–	–	85.3	–	67.5	96	–
900	–	–	85.0	–	67.0	95	–
880	–	(767)	84.7	–	66.4	93	–
860	–	(757)	84.4	–	65.9	92	–
840	–	(745)	84.1	–	65.3	91	–
820	–	(733)	83.8	–	64.7	90	–
800	–	(722)	83.4	–	64.0	88	–
780	–	(710)	83.0	–	63.3	87	–
760	–	(698)	82.6	–	62.5	86	–
740	–	(684)	82.2	–	61.8	84	–
720	–	(670)	81.8	–	61.0	83	–
700	–	(656)	81.3	–	60.1	81	–
690	–	(647)	81.1	–	59.7	–	–
680	–	(638)	80.8	–	59.2	80	–
670	–	630	80.6	–	58.8	–	–
660	–	620	80.3	–	58.3	79	–
650	–	611	80.0	–	57.8	–	–
640	–	601	79.8	–	57.3	77	–
630	–	591	79.5	–	56.8	–	–
620	–	582	79.2	–	56.3	75	–
610	–	573	78.6	–	55.7	–	–
600	–	564	78.9	–	55.2	74	–
590	–	554	78.4	–	54.7	–	2055(210)
580	–	545	78.0	–	54.1	72	2020(206)
570		535	77.8	–	53.6	–	1985(202)
560		525	77.4	–	53.0	71	1950(199)
550	(505)	517	77.0	–	52.3	–	1905(194)
540	(496)	507	76.7	–	51.7	69	1860(190)
530	(488)	497	76.4	–	51.1	–	1825(186)
520	(480)	498	76.1	–	50.5	67	1795(183)
510	(473)	479	75.7	–	49.8	–	1750(179)
500	(465)	471	75.3	–	49.1	66	1750(174)
490	(456)	460	74.9	–	48.4	–	1660(169)
480	448	452	74.5	–	47.7	64	1620(165)
470	441	442	74.1	–	46.9	–	1570(160)
460	433	433	73.6	–	46.1	62	1530(156)
450	425	425	73.3	–	45.3	–	1495(153)
440	415	415	72.8	–	44.5	59	1460(149)
430	405	405	72.3	–	43.6	–	1410(144)
420	397	397	71.8	–	42.7	57	1370 (140)
410	388	388	71.4	–	41.8	–	1330 (136)
400	379	379	70.8	–	40.8	55	1290 (131)
390	369	369	70.3	–	39.8	–	1240 (127)
380	360	360	69.8	(110.0)	38.8	52	1205 (123)
370	350	350	69.2	–	37.7	–	1170 (120)
360	341	341	68.7	(119.0)	36.6	50	1130 (115)
350	331	331	68.1	–	35.5	–	1095 (112)
340	322	322	67.6	(108.0)	34.4	47	1070 (109)
330	313	313	67.0	–	33.3	–	1035 (105)
320	303	303	66.4	(107.0)	32.2	45	1005 (103)
310	294	294	65.8	–	31.0	–	980 (100)
300	284	284	65.2	(105.5)	29.8	42	950 (97)
295	280	280	64.8	–	29.2	–	935 (96)
290	275	275	64.5	(104.5)	28.5	41	915 (94)
285	270	270	64.2	–	27.8	–	905 (92)
280	265	265	63.8	(103.5)	27.1	40	890 (91)
275	261	261	63.5	–	26.4	–	875 (89)
270	256	256	63.1	(102.0)	25.6	38	855 (87)
265	252	252	62.7	–	24.8	–	840 (86)
260	247	247	62.4	(101.0)	24.0	37	825 (84)
255	243	243	62.0	–	23.1	–	805 (82)
250	238	238	61.6	99.5	22.2	36	795 (81)
245	233	233	61.2	–	21.3	–	780 (79)
240	228	228	60.7	98.1	20.3	34	765 (78)
230	219	219	–	96.7	(18.0)	33	730 (75)
220	209	209	–	95.0	(15.7)	32	695 (71)
210	200	200	–	93.4	(13.4)	30	670 (68)
200	190	190	–	91.5	(11.0)	29	635 (65)
190	181	181	–	89.5	(8.5)	28	605 (62)
180	171	171	–	87.1	(6.0)	26	580 (59)
170	162	162	–	85.0	(3.0)	25	545 (56)
160	152	152	–	81.7	(0.0)	24	515 (53)
150	143	143	–	78.7	–	22	490 (50)
140	133	133	–	75.0	–	21	455 (46)
130	124	124	–	71.2	–	20	425 (44)
120	114	114	–	66.7			390 (40)
110	105	105	–	62.3			
100	95	95	–	56.2			
95	90	90	–	52.0			
90	86	86	–	48.0			
85	81	81	–	41.0			

Tooling by

DIJET®

Milling & Drilling

Vol.3

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- Osaka Plant
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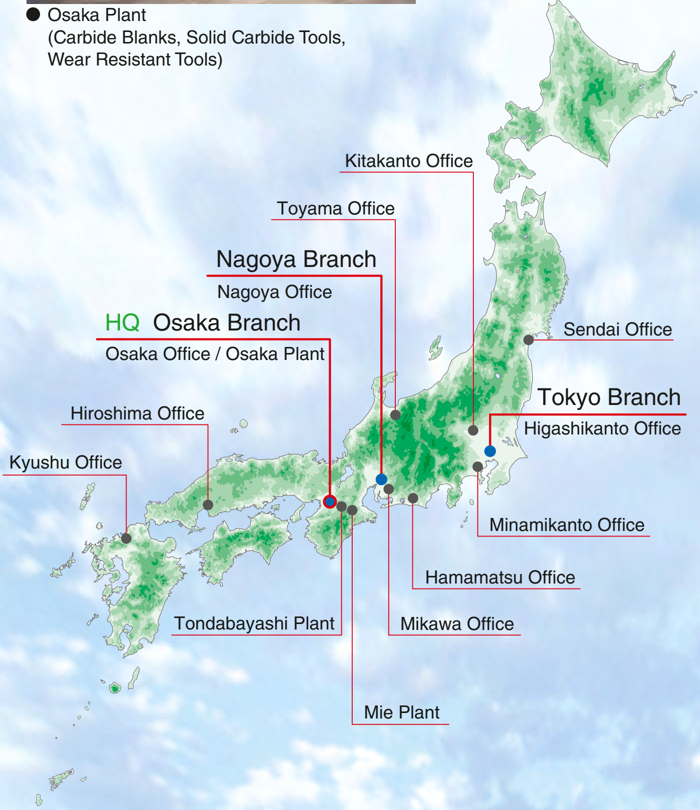

- Mie Powder Plant (Raw Materials)

- Mie Carbide Plant (Carbide Blanks)

- Mie Tool Plant
(Indexable Tools, Solid Carbide Tools)

- Tondabayashi Plant (Raw Materials)

Break Through

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